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Increasing PhD student self-awareness and self-confidence through strengths-based professional development

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Strengths-based programs have emerged as asset-based approaches to professional development that promote positive student engagement and success. This paper shares the outcomes of a strengths-based professional development program provided to biomedical and health sciences graduate doctoral students within an academic health center. Program outcomes and changes in participants' perceived confidence when identifying and applying their strengths in different contexts were evaluated through a mixed methods design that included a Likert-based survey and thematic analysis of qualitative responses. Findings strongly suggest that most participants lacked the self-confidence and/or self-awareness to recognize their own strengths prior to the program. Themes that emerged upon implementation of the program point to the following outcomes: participants gained an increased understanding of their strengths, confidence that the knowledge gained about their strengths would help them learn more effectively in laboratory settings, an increased belief that they possess natural talents and skills that make them good scientists and strong members of their research team, and confidence that applying their strengths will help them to overcome both personal and professional challenges. This program shows promise to strengthen graduate student self-awareness and self-confidence. Further studies are needed to understand and measure how asset-based programs such as this can impact graduate student resilience, science identity, and overall student success.

KEYWORDS

graduate, strengths, professional development, biomedical, health sciences, science identity, STEM

Introduction

Stemming from the field of positive psychology, strengths-based approaches (Park et al., 2004; Peterson, 2004) have been formally used on undergraduate (UG) campuses for over two decades to engage students. They range from being utilized in first year experience courses (Burris et al., 2010; Stebleton et al., 2012), to career (Stebleton, 2010), and leadership development courses (Lane and Chapman, 2011; Soria et al., 2019). Studies of strengths-based programs have demonstrated positive student outcomes in absenteeism, grades, and tardiness

(Williamson, 2002; Clifton and Harter, 2003), an increased ability to work effectively in teams and groups, and in developing leadership skills (Soria et al., 2015). One study of UG students demonstrated that students who routinely used their strengths experienced greater subjective well-being in both mental and physical health (Proctor et al., 2011). Positive associations have also been reported between strengths awareness and academic self-efficacy (Soria and Stubblefield, 2014), academic engagement (Soria and Taylor Jr, 2016), retention (Soria and Stubblefield, 2015b; Soria and Taylor Jr, 2016), and optimism (Soria and Stubblefield, 2015a). Students also gained appreciation for the strengths of others, an externally focused benefit (Soria and Stubblefield, 2015b).

Traditional models of student success have expanded over the years, and now consider additional factors that are crucial in a student persisting, succeeding, and thriving. For example, a more inclusive model of student success can include the following elements: academic achievement; engagement in educationally purposeful activities; satisfaction; acquisition of desired knowledge, skills, and competencies; persistence; attainment of educational objectives; and post-college performance (Kuh et al., 2007).

A positive connection in the form of better academic outcomes exists among students with a positive outlook, who also believe they are making a difference, and are investing effort (engagement) in their academics. In addition to short-term academic outcomes, these students overall had more success compared to peers of similar backgrounds (differences in demographics did not impact this; Schreiner, 2010). Based upon this and other studies, Schreiner defined what it means to be a thriving student noting that along with being academically successful, they “experience a sense of community and a level of psychological well-being that contributes to their persistence to graduation and allows them to gain maximum benefit from being in college.” She identified thriving as a distinct construct made up of five distinct elements, all traits amenable to change over time, leaving opportunity for designing interventions to promote thriving and ultimately student success (Schreiner, 2010). Both the concepts of thriving and strengths-based approaches are rooted in positive psychology, where an individual’s natural talents are identified, cultivated, and leveraged to promote strong performance and meaningful lives (Keyes, 2002). They are also related to the concept of flourishing (Keyes, 2002; Seligman, 2011) which refers to emotional well-being, resiliency to meet challenges, and active and productive engagement with others and the social world.

In addition to academic outcomes, the positive value of a strengths-based approach and the intentional use of personal strengths has been observed in the corporate or industry setting. Positive outcomes include increased employee engagement, with resulting higher productivity, employee retention, and performance (Connelly, 2002; Harter et al., 2002; Clifton and Harter, 2003). For those who use their strengths regularly at work, there are increases in psychological measures of hope, subjective well-being, and confidence (Clifton and Harter, 2003; Park et al., 2004), as well as higher levels of self-efficacy and workplace performance (Govindji and Linley, 2007; Linley et al., 2009). Moreover, inviting people to use their strengths regularly in new and different ways resulted in increases in happiness, sustained for over six months, and a decrease in depression for up to three months (Proyer et al., 2015).

The reported outcomes of strengths-based programs have primarily focused on adult employees in large organizations, high

school students, and UG students. Within the setting of the health sciences, our population of interest, one review of studies using personality frameworks within health sciences education found only three articles specifically using the Clifton Strengths® assessment and all were descriptive studies (Janke et al., 2015; Bloom, 2018; Yee et al., 2018; Childs-Kean et al., 2020). Of note, several pharmacy schools have leveraged Clifton Strengths® within PharmD leadership courses (Boyle et al., 2004; Sorensen et al., 2009). A significant gap within the strengths-focused research literature is investigation of outcomes of strength-based approaches within health sciences graduate student (PhD) populations. The doctoral student experience includes academic aspects like UG students, such as coursework, but a large amount of graduate student time is spent in a workplace setting, where they have an employee-like existence as an individual and as part of a research team. They often interface daily with their primary advisor/mentor, who has not necessarily been trained in management and leadership themselves. Graduate students in the biomedical and health sciences face challenges and stressors during this time of their life with the expectation of increased responsibility and accountability, and navigating school, work, and life. Students can easily become overwhelmed, setting the stage for burnout, lower academic productivity, and diminished well-being (Hyun et al., 2006). Students may begin to doubt their ability as a scientist when facing challenges and setbacks, which cause them to struggle and question their abilities (Osborne, 1995, 1997; Seymour and Hewitt, 1997; Cokley, 2002). Given the unique stressors that doctoral training in the biomedical and health sciences can introduce, we sought to explore how strengths-based programming can be used in this population to provide them with tools to navigate various aspects of their training experience and then beyond. In addition to the previously cited literature, we point to the Recommendations section of the Association for Study of Higher Education Report (2007) that states “Institutions that focus on student success, subscribe to a talent development philosophy, and create a student-centered culture are better positioned to help their students attain their educational objectives.” They go on to recommend an asset-based talent development philosophy as it relates to teaching and learning (Kuh et al., 2007).

In this paper we present the outcomes of a strengths-based program with the objectives to (a) enable identification, understanding, and development of students’ distinct talents and strengths, (b) strengthen student communication skills about their own talents, (c) promote increased awareness of and appreciation for others’ unique talents and strengths, and (d) help students discern the value all members bring to the research team. While several well-established and validated tools to measure talents do exist, such as VIA character strengths, we elected to utilize the Clifton Strengths® assessment (Clifton and Nelson, 1992; Clifton and Anderson, 2001; Harter et al., 2002) and framework which has been successfully used in the academic setting across stages and disciplines for many years. Our primary survey research questions were two-fold: (1) Will strengths-based development experiences increase students’ perception of their ability to be successful in graduate school? and (2) Will strengths-based development experiences increase students’ belief that they have the skills to be a strong scientist and a valuable member of their research team?

The purpose of this study is to explore the relationship between the strengths-based programming and participant’s perceptions of their abilities.

Methods

All strengths-based development sessions and experiences were designed and delivered by the same individual with extensive experience in STEM undergraduate and graduate education, and in strengths-based teaching and coaching. Sessions were optional and were open to all PhD students at the West Virginia University academic health center, which encompasses five schools and has an approximate enrollment of 215 PhD students. Sessions were offered over 1 year's time and students who elected to participate in the development sessions ($n = 40$) took the CliftonStrengths® assessment 1–2 weeks prior to the introductory workshop session. The five dominant talent themes from each participant's report were the focus of the programming. Sessions were based upon the stated objectives and began with an introductory interactive strengths-based workshop focused on talent identification and understanding. This 90-min initial workshop included a combination of strengths education, self-reflection, and active engagement that provided tools and resources to further participants' knowledge of their natural talents. They learned about their own needs as students, energizers that promote the effective use of their talents, and specific motivators and demotivators connected to their respective talent themes. Students left the session having developed a draft statement that incorporated their new strengths knowledge into an 'elevator pitch,' through a process that guided them in recognizing and communicating the value of their talents to themselves and others. This was followed by a more advanced 90-min workshop that was primarily interactive (not didactic) and focused on talent development and usage. Participants explored how they can invest in talent development and apply their talents to relevant tasks and goals. They also learned strengths-based approaches to managing their weaknesses. Workshop sessions were held more than once to provide flexibility with student availability. Session attendance ranged from 10 to 20 people per session. The time between the introductory sessions and the advanced sessions was ~5 months for all participants to allow time for students to integrate the new information between sessions. Both sessions allowed students to hone in on their own Top 5 strengths and to discuss them with a trained coach and their peers. The overall aggregate top five talent themes for the workshop group were also presented so that they could begin to gain a better understanding of the strengths of their colleagues. Students were offered the opportunity for one 30-min individual meeting with a strengths coach to discuss their report. Of the 40 participants, 18 students did participate in individual coaching through this program. Others may have pursued this through other means. [Figure 1](#) illustrates the key components of the program.

Survey instrument

After completion of the program, the 40 PhD students who participated in one or more sessions received an email invitation to complete an anonymous online survey built and housed within the secure REDCap system. Invited participants had all completed their last strengths session at least 1 month prior to completing the survey. Questions included both quantitative and qualitative options in the form of Likert-scale response items and open-ended response items, respectively. They were formulated to assess the impact of the strengths-based programming on student/science identity, self-awareness, and interpersonal interactions. A mixed-methods

approach was utilized to assess the research questions posed in this study as the purpose of this study is to gain a comprehensive understanding of the impact of this strengths-based programming ([Creswell, 2015](#)).

The survey (appendix item) consisted of 31 items and was taken once at the completion of the program utilizing a pre-/post retrospective design to maximize evaluation of participant knowledge change over time and minimize the likelihood of encountering the Dunning-Kruger effect ([Dunning, 2011](#)). This process allowed for the participants to reflect on their knowledge before and after the program, based on what they learned throughout the programming. Eighteen questions asked students to consider their perception before participating in the strengths-based programming and then their perception afterward. These questions were based upon a Likert Scale (1 = strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, and 5 = strongly agree). An additional six questions asked students about their confidence level in select areas after participating in the strengths-based program, also using a Likert scale (1 = very confident, 2 = confident, 3 = somewhat confident, and 4 = not confident). Seven questions were open-ended with prompts that asked participants to explore what new insights they gained about themselves, the value their strengths bring to their team, and how they leverage their strengths in different scenarios. Since the survey instrument was meant to assess multiple areas important to the graduate student experience as part of this study, a variety of sources were used by the researchers to generate the single survey. Questions with a focus on strengths knowledge and application were adopted from [Stebleton et al. \(2012\)](#). Questions related to resilience ([Connor and Davidson, 2003](#); [Smith et al., 2008](#)), science identity ([McDonald et al., 2019](#); [Robinson et al., 2019](#)), and belonging ([Johnson, 2012](#); [Ramsey et al., 2013](#); [Sandrone, 2022](#)) were adopted from validated tools or conceived through close review of the literature. Participants were asked to select the gender with which they identify and their current year of graduate studies. All survey responses were gathered and maintained in a secure data collection system (REDCap). No compensation or incentives were provided for participation in the study and the study was deemed exempt by the West Virginia University Institutional Review Board (Protocol #): 2012192615.

Data analysis

Likert-scale survey items were analyzed using IBM SPSS Statistics (Version 28) and data were presented as descriptive statistics. A Shapiro-Wilks test of normality was applied for each variable and the Wilcoxon signed-rank test was used to compare the participants' perceived self-confidence (before and after) on the survey. The open-ended-response items of the survey were analyzed utilizing first cycle and second cycle techniques ([Saldaña, 2016](#)). During the initial analysis, *a priori* and *in vivo* coding were utilized. The *a priori* codes were based on the prior literature that influenced the survey design. The use of *in vivo* coding captured the participant's own phrases to shape the codes. The second cycle method consisted of grouping the codes based on prevailing categories or themes. A summary of these themes and corresponding codes can be found in [Table 1](#). Coding was conducted manually within the Microsoft Excel platform. The initial data analysis and coding was conducted by the member of the research team who was not directly involved in the development of and

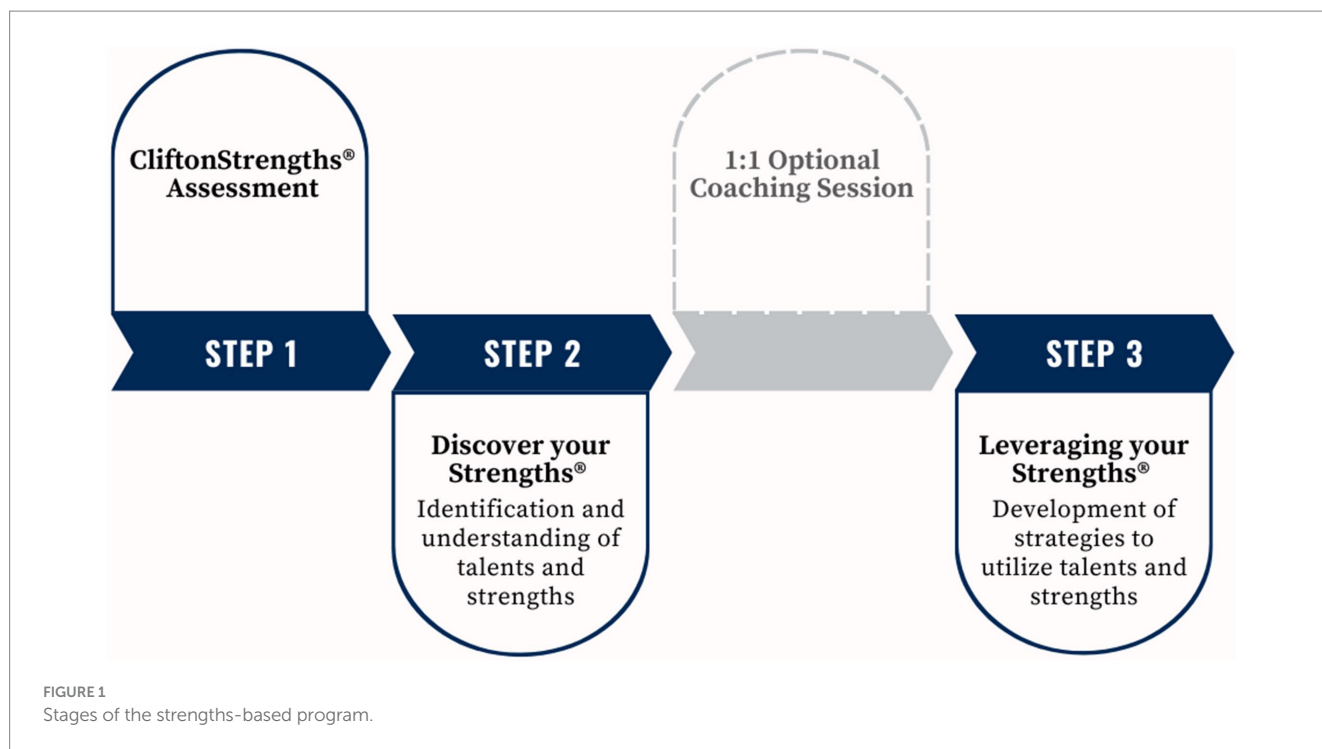


TABLE 1 Summary of codes.

Student identity	Self-awareness	Interpersonal/teamwork
Problem solving	Accomplishing goals	Accomplishing goals
Decision making	Completing tasks	Collaboration
Identity	Confidence	Conflict resolution
Motivation	Decision making	Professional development
Science identity	Personality	Relationship building
	Prioritization	
	Skill recognition	

implementation of the program. Following this initial analysis, both members of the research team discussed the presentation of themes to reach a consensus on the categorization of the codes.

Results

All 40 students who participated in the strengths-based sessions were invited to participate in the survey and 28 of these students completed the survey, resulting in a 70% survey response rate. Students who participated in the strengths programming and were invited to complete the survey included 31 (78%) female-identifying students and 9 (22%) male-identifying students. The overall PhD enrollment at the health sciences center ($n = 215$) consists of 144 (67%) female students and 71 (33%) male students. Additionally, within the overall PhD population, 143 (67%) are in Years 3 and beyond, while 33 (72%) are in Years 1 or 2. Survey participant ($n = 28$) demographics included 21 (75%) identifying as female and 7 (25%) identifying as male. Survey participants were primarily in their third year of graduate school or beyond (61%, $n = 17$). A smaller proportion (39%, $n = 11$) were in their first or second year of graduate studies.

Based upon the student’s reported gender identity and year-in-program, the demographics of the survey participants are relatively similar to the overall program-eligible population.

After independent analysis of the quantitative and qualitative survey data results were then grouped by theme. Through the analysis of the qualitative data, *a priori* themes of identity, self-awareness, and interpersonal interactions/teamwork were identified (Table 1). After comprehensive review of all data, the themes of self-confidence, science identity, and self-awareness emerged and are presented below. The researchers found that interpersonal interactions/teamwork were woven throughout these three major themes. Self-confidence was originally viewed as a sub-category of self-awareness, but through the analysis process was determined to be a major theme presented in the results. The total number of open-ended responses was 108, with an average of 15–16 responses per question. However, all participants who chose to provide qualitative feedback on the survey shared positive experiences and reflections. Excerpts of the free-response data are presented that provide additional context to the results found in the quantitative portions of the survey. As presented in the results, survey questions and associated responses are categorized by primary theme and can be found in Tables 2–4.

Self-confidence

After program completion, 19 (68%) survey participants indicated they felt self-confident in graduate school (agree/strongly agree). The survey participants who reported that they believed they felt self-confident (agree/strongly agree) in graduate school before the program ($n = 10$, 36%) was significantly less ($p < 0.01$). When asked to rate their confidence that understanding their talents and strengths would help them be more successful after completing their graduate degree, 25 (89%) participants indicated that they felt confident or very

TABLE 2 Participant assessment results after the completion of the strengths-based programming (Theme: Self-confidence).

Survey item		% Respondents					Z-Score	p-value
		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree		
I am confident in talking to my peers about my talents and strengths.	Before	0	46	29	25	0	-3.926	<0.001
	After	0	4	18	57	21		
I am confident in talking to faculty about my talents and strengths.	Before	11	43	25	21	0	-4.017	<0.001
	After	4	0	29	50	18		
My unique strengths are valued as a graduate student.	Before	0	18	36	39	7	-2.913	0.004
	After	0	4	29	46	21		
I feel self-confident in graduate school.	Before	21	21	21	32	4	-3.456	<0.001
	After	4	4	25	57	11		
		Not confident	Somewhat confident	Confident	Very Confident	Not confident		
Understanding my talents and strengths will help me to be more successful after completing my graduate program.	After	0	11	43	46			

confident about this statement. These results are also presented in [Table 2](#).

One participant noted, *“I’m more confident in myself and my strengths and I do not second guess myself as much.”* Another stated, *“One of my top strengths is ‘restorative,’ which is a problem-solving skill. I feel great and often gain confidence when I can help my colleagues with problem solving.”* When reflecting upon their strength of “responsibility,” one student stated, *“knowing this as my strength, I’ve been more confident about my work, and it has helped me gain trust from my new team.”*

Science identity

Of specific relevance to this graduate student population, 27 (96%) survey participants indicated agreement that they have natural talents and skills to make them a good scientist after program completion. When reflecting on how they felt about this statement prior to participating in the program, 16 (57%) indicated agreement. The change in their perceptions about this statement was significant ($p < 0.01$). These results are highlighted in [Table 3](#). When asked to share insights they gained about themselves, participants often reflected on their unique strengths. One participant connected their skills in interpersonal interactions to their role as a scientist, stating *“As a scientist, I use my strengths for collaboration and succeed at maintaining deep connections.”*

Extending beyond skills that shape their scientific identity, participants reflected upon their contribution as a scientist in their research teams. At program conclusion, 26 (93%) respondents indicated that they have natural talents and skills that make them a strong member of their research team, compared to the 18 (64%) who reported that they believed this before completing the program ($p < 0.01$). Many participants reflected on their new scientific identity in understanding their role in a team, what it means to them and how their strengths can be fostered within this role. In one reflection, a participant stated, *“I can identify why I may work differently and think through things differently than my lab mates. This has helped me figure out how to work better with people as a team.”*

When asked to reflect upon their ability to apply their strengths to help them learn more effectively in the laboratory at the conclusion of the program, 23 (82%) respondents indicated they felt confident or very confident.

Self-awareness, capitalizing on and using talents

The program resulted in 24 (86%) respondents agreeing with the statement that they felt confident in directing their talents and strengths to accomplish tasks or goals. This was a substantial increase from the 10 (36%) participants who indicated agreement based on their self-perceptions prior to the program ($p = < 0.01$). These results are

TABLE 3 Participant assessment results after the completion of the strengths-based programming (Theme: Science identity).

Survey item		% Respondents					Z-Score	p-value
		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree		
I have natural talents and skills that make me a good scientist.	Before	0	14	29	50	7	-3.372	<0.001
	After	0	0	4	64	32		
I have natural talents and skills that make me a strong member of my research team.	Before	0	11	25	64	0	-3.782	<0.001
	After	0	0	7	50	43		
		Not confident	Somewhat confident	Confident	Very Confident			
Applying my strengths will help me learn more effectively in the laboratory.	After	0	18	57	25			

presented in Table 4. While reflecting on the role that strengths may have on their overall success, one participant stated: “Once I realized that leadership and individualization were my strengths, it helped me be more confident in doing the things I naturally already did. I had always helped to bring people together and encouraged them to do what they were good at, but now I am more confident when I do so, knowing that it is a strength of mine.”

Lastly, 27 (97%) respondents stated that after completing the program they understood how their natural talents and strengths can directly benefit them in graduate school, compared to the 12 (43%) respondents who indicated that they had this understanding before the program ($p < 0.01$). Respondents reflected on utilizing their strengths as follows:

- I realize that things I thought were weaknesses are actually unique strengths if I can learn to use them properly. This was a big revelation for me.
- I remember how to nurture my strengths instead of putting myself down.
- Due to my individualization, connecting with others has helped me be seen as a caring individual, and I am able to foster greater relationships with peers and faculty.
- The empathy, communicator, and activator strengths add value in my work setting as a part of the team. I can be empathetic toward my team members; I can get things started and can communicate my message well.

When asked to reflect upon their level of confidence when applying their talents and strengths to help them overcome setbacks and challenges, 24 (86%) respondents indicated that they felt confident or very confident at the conclusion of the program.

Discussion

The purpose of this strengths-based intervention was to implement an asset-based model to augment traditional biomedical and health sciences graduate student professional development, which often focus on identifying and improving deficiencies or weaknesses. A strengths-based model is built upon the concept that individuals can gain far more when they expend effort to build upon their natural talents than when they spend a comparable amount of effort to remediate weaknesses (Clifton and Harter, 2003). When participants review their strengths assessment results, they identify their areas of most significant potential, known as signature themes or dominant themes. With knowledge, skill, and practice, it is expected that one can transform these natural talents into strengths that can be applied to individual and team tasks and goals. An intervention such as this could be incorporated easily into other evidence-based models of career and professional development programs to enhance the student’s training experience (Byars-Winston et al., 2011; Byars-Winston, 2014).

Previous research on students who participate in strengths-based development in curricular and co-curricular activities demonstrate greater impact in social and psychological thriving (social connectedness, diverse citizenship, positive perspective) domains as opposed to academic (engaged learning and academic determination) thriving domains (Soria et al., 2019). Given the multitude of challenges that graduate students face and the prevalence of mental health and wellness concerns (Evans et al., 2018; Ogilvie et al., 2020) we are in strong support of expanded models of student success (Kuh et al., 2007; Schreiner, 2010). These models should consider aspects beyond academic performance, such as engagement, purpose, and persistence. This program is one intervention we believe can contribute to overall

TABLE 4 Participant assessment results after the completion of the strengths-based programming (Theme: Self-Awareness, capitalizing on and utilizing talents).

Survey item		% Respondents					Z-Score	p-value
		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree		
I can name my own unique talents and strengths.	Before	7	25	36	32	0	-3.993	<0.001
	After	4	0	0	57	39		
I can identify unique talents and strengths in others.	Before	4	21	29	46	0	-4.308	<0.001
	After	0	0	4	68	29		
I understand how my natural talents and strengths can benefit me in graduate and or professional school.	Before	4	18	36	43	0	-4.220	<0.001
	After	0	0	4	54	43		
I am confident in directing my talents and strengths to accomplish tasks or goals.	Before	4	36	25	32	4	-4.122	<0.001
	After	0	0	14	61	25		
		Not confident	Somewhat confident	Confident	Very Confident			
Understanding my talents and strengths will help me to be more successful in graduate school.	After	0	18	46	36			
Applying my talents and strengths can help me overcome setbacks and challenges.	After	0	14	61	25			

student thriving. As mentioned previously, the strengths-based philosophy of developing “confident, efficacious, lifelong learners whose work is infused with a sense of purpose” (Lopez and Louis, 2009) complements the existing training that graduate students receive while taking into consideration their ability to not only survive, but to thrive in graduate training and beyond.

Will strengths-based development experiences increase students’ perception of their ability to be successful in graduate school?

Our first research question centers on self-confidence of students who completed the strengths-based program. Upon completing the program, when students reflected on their current confidence levels

compared to their perceptions of their confidence when they started the program, there were significant increases in overall self-confidence. There were also increases in the student’s belief that using their knowledge of strengths will help them succeed in the future and they gained confidence in their ability to intentionally attain specific tasks and goals through direct application of strengths knowledge.

Why does this matter?

Students who know their strengths feel more prepared to tackle obstacles and overcome adversity. It has been shown that this results in higher optimism and a positive outlook on life (Soria and Stubblefield, 2014, 2015a). Based upon self-efficacy theory (Bandura, 1977), students with a foundation of positive experiences and positive beliefs in their abilities to produce desired effects will be confident and able to capitalize on their strengths knowledge (Bowers and Lopez, 2010). Previous data have found positive associations between

students' strengths awareness and their academic self-efficacy (Soria and Stubblefield, 2014), engagement (Soria and Taylor Jr, 2016), retention (Soria and Stubblefield, 2015b; Soria and Taylor Jr, 2016), and optimism (Soria and Stubblefield, 2015a), all important aspects of student success. Outside of the higher education context, it has been observed that leaders who use their unique strengths have higher performance in the workplace (Linley et al., 2009), as well as increased levels of goal attainment, autonomy, fulfillment, well-being, and optimal functioning (Linley et al., 2010).

A landmark study used longitudinal data collected from the same individuals (National Longitudinal Survey of Youth) over 25 years using repeated measures self-evaluations with questions about career success, job status, education, and health (Judge and Hurst, 2008). Overall observations showed individuals with positive core self-evaluations were translated from an early advantage into later economic success. Individuals with initial higher self-confidence ended up with higher income levels and career satisfaction 25 years later. Regarding physical health, the group with low self-confidence early on reported three times as many health problems 25 years later as compared to the beginning of the study. The group with higher self-evaluations at the time of study initiation reported having fewer health problems than they did 25 years prior. These data strongly supports that one's level of self-confidence not only impacts academic and professional success, but extends to overall well-being, a critical element of concern that we have for graduate students while in training and for their future as the next generation of the scientific workforce.

Will strengths-based development experiences increase students' belief that they have the skills to be a strong scientist and a valuable member of their research team?

Our second research question centered on the concept of science-identity. Here we sought to understand whether strengths-based development would impact a students' belief on whether they have the skills to be a strong scientist and a valuable member of their research team. Upon program completion, students reflected on their confidence levels, and we observed a significant increase in the number of students that indicated that they have natural talents and skills that make them a good scientist and a strong member of their research team.

Why does this matter?

The importance of professional identity development is an important and often overlooked aspect in STEM education. In a review of the field of engineering education the author (Sheppard et al., 2008) noted that it is one of the least realized and most outsourced components. Importantly, there is a known positive relationship between self-efficacy and the development of student concept (identity; Bong and Skaalvik, 2003). Certain traits are stereotyped as being necessary for being a strong scientist. Students may be discouraged because they do not see those stereotypical talents in themselves. Given the diversity of individuals who enter the scientific pipeline and train to be scientists along with known pre-existing stereotypes, there will be variability among students'

perception of science identity. Additionally, most if not all, students begin to doubt their ability as a scientist when encountering difficult coursework, research setbacks, discrimination, or other challenges which cause them to struggle and question their abilities (Osborne, 1995; Seymour and Hewitt, 1997; Cokley, 2002). STEM graduate students and postdoctoral fellows who experience this imposter phenomenon tend to underestimate their own abilities compared to that of their colleagues (Chakraverty, 2019). In this circumstance they are also at greater risk for negative impacts on their self-esteem (Sonnak and Towell, 2001), research self-efficacy (Jöstl et al., 2012), and sense of belonging (Chakraverty, 2019). Though it should be noted there are some students who maintain robust science identities demonstrating stability and even increased identification (Robinson et al., 2018, 2019). It has been shown that this identity maintains relative stability for most elite college students with very slow change over their time in college, if at all; while for those that do experience the shift, it can be quite rapid for some. This same study found that "lower self-efficacy for science tasks and lower perceived academic competence in science at the beginning of college predict a greater likelihood of declines in science identity across four years of college" (Robinson et al., 2018).

Based upon the modern expectancy-value theory (Eccles, 1983), students who highly value science as a part of their identity are more likely to persist on challenging science tasks and continue in the field of science (Sandrone, 2022). Noticing decreases in a student's science identity may indicate or coincide with lessened engagement in the training process and potentially less motivation to continue in the pursuit of science (Robinson et al., 2019). While we did not directly measure science identity upon students entering their graduate program, we used this intervention to highlight for the participants the diversity of talents that scientists may have and the importance and value of traits that are not typically associated with scientist's when we consider the traditional stereotypes. We highlighted that all scientists are not leading with strong strategic thinking approaches, like being analytical; the presence of other talents can be critical to conducting the necessary work and succeeding in science as an individual and a member of a research team. Students in our program ranged across multiple years in graduate school and we expect that there is variation in their identity baseline. Students may be starting at a well-developed level where the intervention was useful, but not as transformative, while others may be less developed in their science identity. We do not expect that year-in-program has a strong influence on this based upon studies of student identities over time. Nonetheless, participating in professional development programs such as this one can have an important influence on professional identity formation.

Thriving, resilience, and belonging

Traditional graduate training environments themselves have inherent structures, processes, or lack thereof, that can set the stage for stress, burnout, and mental health problems. Some examples noted are long work hours (Ferreira, 2003); insufficient work-life balance (Fuhrmann et al., 2011); strained relationships with advisors (Hyun et al., 2006); and financial stress (Furr et al., 2001). The COVID-19 pandemic along with racial protests in response to the tragic deaths of several citizens during 2020 and after may exacerbate these concerns (Schad et al., 2022). A study by the Council of Graduate Schools in the

US and Canada reported that by year 5 of graduate school, 12–33% of life sciences graduate students left their programs without completion (Nagy et al., 2019). Considering these trends, the resiliency of graduate students has been increasingly investigated with numerous risk factors and protective factors having been identified (Jourdan et al., 2021). Factors that influence resilience fall into individual, family, and environmental categories, some being fixed traits while others are amenable to change. Conversations held early in the educational process along with intentional support systems and professional development can be important tools to foster belonging among graduate students (Chakraverty, 2019). Students report that strong social connections to their peers and faculty can have an insulating effect when facing challenges associated with STEM education (Schlemper, 2011). Further, participating in professional development and other interactive activities within programs can aid in forging peer to peer connections and community building among students (Golde, 2000; Rizzolo et al., 2016) which can strengthen identity development. In this strengths-based intervention, we targeted and measured individual factors known to be important for resilience such as self-esteem (Nottingham, 2017) and self-efficacy (Denholm et al., 2006). When we asked participants to reflect upon their level of confidence that applying their talents and strengths can help them overcome setbacks and challenges, 85.7% of respondents indicated that they felt confident or very confident at the conclusion of the program. Given that the overall data support an increased perception of self-efficacy and self-confidence, we are interested in further exploring the impact of strengths-based programming on resilience in biomedical and health sciences graduate programs and how these programs can be used to support belonging and identity development in graduate school.

Conclusion

In this study, we shared participants' outcomes following a strengths-based program for biomedical and health sciences graduate students. We provide evidence for several positive outcomes: (1) increased understanding of how they can apply their natural talents and strengths, (2) increased confidence in applying their strengths toward specific tasks and goals, (3) confidence that the knowledge gained about their strengths would help them to succeed in their career, (4) confidence that the knowledge gained about their strengths would help them learn more effectively in the laboratory, (5) an increase in science identity; belief that they possess natural talents and skills that make them a good scientist and a strong member of their research team, (6) and confidence that applying their talents and strengths will help them to overcome setbacks and challenges. The outcomes of this program lay the foundation for future studies using strengths-based programs to enhance PhD student success and thriving while in graduate school as well as the design of future interventions.

Limitations

While this paper presents multiple positive outcomes of our strengths-based program, the study is not without limitations. First,

while our survey response rate of 70% is not unreasonably low for survey-based research, we, unfortunately, did not receive feedback from 30% of the participants which can introduce a degree of non-response bias. Open-ended responses were limited for those who completed the survey and all participants who chose to provide qualitative feedback on the survey shared positive experiences and reflections. Overall, we may be missing the insight from individuals who felt differently about the program. Additionally, the sample consists of students who would have self-selected to seek and participate in professional development that is optional and different from other career-focused training efforts. Graduate students are often torn between their dissertation work and participating in optional activities that focus on their career and professional development. Because of this, the overall sample size of this study is small, but acceptable to provide pilot data for future work on this topic. Further, 75% of the sample identified as female and 61% were in their third year of their graduate studies or beyond. Hence, we are limited in our ability to generalize these results across all PhD student populations as it relates to gender and year-in-program. Furthermore, while all students participated in talent identification and a strengths development experience, the follow-up experience did vary due to the desire we had for the students to customize their professional development, hence the program elements were not identical across participants. Lastly, given that the survey was collected at a single time point utilizing a pre-post retrospective design, there are inherent limitations associated with participant bias when not having a baseline for each question prior to the program completion. Bias may also be introduced using Likert scales, though standard in survey research, they also present limitations such as response bias and central tendency bias, among others.

Future studies

As this was a pilot program, it will be important to replicate this study with a model that is consistent across all participants (unified model) and to explore the impact it might have on students in their earlier stages of graduate education compared with the latter stages. Future studies will also look at outcomes across different demographics, particularly gender identity and first-generation student status. Additionally, the impact of one-on-one strengths coaching effectiveness with PhD students and how this supplements the group programming will be an important avenue to explore and useful in teasing out the comparative impact of the two components of this program. Lastly, embedding a program such as this in a curriculum where all students in a cohort are exposed will provide further insight and help to address the noted limitation of the self-selection bias common in career development studies. Extending these studies to include other strengths-based measurement tools, such as VIA character strengths (Peterson, 2004) will further validate the findings and allow for more generalizability to strengths-based approaches. Future longitudinal studies are needed to address the longer-term impact of strengths-based programs on characteristics important in navigating graduate school, such as resilience.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by West Virginia University Institutional Review Board. The studies were conducted in accordance with the local legislation and institutional requirements. The ethics committee/institutional review board waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin because the study was deemed non-human subjects research by the IRB.

Author contributions

JL: Conceptualization, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing. CF: Data curation, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing.

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References

- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychol. Rev.* 84, 191–215. doi: 10.1037/0033-295X.84.2.191
- Bloom, T. J. (2018). Comparison of StrengthsQuest signature themes in student pharmacists and other health care profession students. *Am. J. Pharm. Educ.* 82:6142. doi: 10.5688/ajpe6142
- Bong, M., and Skaalvik, E. M. (2003). Academic self-concept and self-efficacy: how different are they really? *Educ. Psychol. Rev.* 15, 1–40. doi: 10.1023/A:1021302408382
- Bowers, K. M., and Lopez, S. J. (2010). Capitalizing on personal strengths in college. *J. Coll. Charact.* 11:1011. doi: 10.2202/1940-1639.1011
- Boyle, C., Beardsley, R., and Hayes, M. (2004). Effective leadership and advocacy: amplifying professional citizenship. *Am. J. Pharm. Educ.* 68:63. doi: 10.5688/ajpe680363
- Burris, S., Ashorn, L. J., Akers, C., Frazee, S., Brashears, T., and McCulloch, A. (2010). The impact of participation on freshmen experiences in a College of Agriculture. *NACTA J.* 54, 37–42.
- Byars-Winston, A. (2014). Toward a framework for multicultural STEM-focused career interventions. *Career Dev. Q.* 62, 340–357. doi: 10.1002/j.2161-0045.2014.00087.x
- Byars-Winston, A., Carnes, M., Gutierrez, B., and Topp, S. (2011). Integrating theory and practice to increase scientific workforce diversity: a framework for career development in graduate research training. *CBE Life Sci. Educ.* 10, 357–367. doi: 10.1187/cbe.10-12-0145
- Chakraverty, D. (2019). Impostor phenomenon in STEM: occurrence, attribution, and identity. *Stud. Graduate and Postdoctoral Educ.* 10, 2–20. doi: 10.1108/SGPE-D-18-00014
- Childs-Kean, L., Edwards, M., and Smith, M. D. (2020). Use of personality frameworks in health science education. *Am. J. Pharm. Educ.* 84:ajpe7231. doi: 10.5688/ajpe7231
- Clifton, D. O., and Anderson, E. P. D. (2001). StrengthsQuest: discover and develop your strengths in academics, career, and beyond. Gallup Organization. Available at: <https://archive.org/details/strengthsquestdi00clifhttps://openlibrary.org/books/OL3326674M>
- Clifton, D. O., and Harter, J. K. (2003). "Strengths investment," in *Positive organizational scholarship*. eds. K. S. Cameron, J. E. Dutton, and R. E. Quinn (San Francisco: Berrett-Koehler), 111–121.
- Clifton, D. O., and Nelson, P. (1992). *Soar with your strengths*. New York, N.Y: Delacorte Press.
- Cokley, K. (2002). Ethnicity, gender and academic self-concept: a preliminary examination of academic disidentification and implications for psychologists. *Cult. Divers. Ethn. Minor. Psychol.* 8, 379–389. doi: 10.1037/1099-9809.8.4.379
- Connelly, J. (2002). All together now. *Gallup Manag. J.* 2, 13–18.
- Connor, K. M., and Davidson, J. R. (2003). Development of a new resilience scale: the Connor-Davidson resilience scale (CD-RISC). *Depress. Anxiety* 18, 76–82. doi: 10.1002/da.10113
- Creswell, J. W. (2015). *A concise introduction to mixed methods research*. John W. Creswell, University of Nebraska-Lincoln. US: SAGE.
- Denholm, C. J., and Evans, T. (2006). Doctorates Downunder: keys to successful doctoral study in Australia and New Zealand. *Australian Council for Educ. Res.* 227.
- Dunning, D. (2011). "The Dunning-Kruger effect: on being ignorant of one's own ignorance" in *Advances in experimental social psychology*, vol. 44 (Academic Press), 247–296.
- Eccles, J. (1983). "Expectancies, values, and academic behaviors" in *Achievement and achievement motives: Psychological and sociological approaches*. ed. J. T. Spence (San Francisco, CA: Freeman), 75–146.
- Evans, T. M., Bira, L., Gastelum, J. B., Weiss, L. T., and Vanderford, N. L. (2018). Evidence for a mental health crisis in graduate education. *Nat. Biotechnol.* 36, 282–284. doi: 10.1038/nbt.4089
- Ferreira, M. (2003). Gender issues related to graduate student attrition in two science departments. *Int. J. Sci. Educ.* 25, 969–989. doi: 10.1080/09500690305026
- Fuhrmann, C. N., Halme, D. G., O'Sullivan, P. S., and Lindstaedt, B. (2011). Improving graduate education to support a branching career pipeline: recommendations based on a survey of doctoral students in the basic biomedical sciences. *CBE Life Sci. Educ.* 10, 239–249. doi: 10.1187/cbe.11-02-0013
- Furr, S. R., Westefeld, J. S., McConnell, G. N., and Jenkins, J. M. (2001). Suicide and depression among college students: a decade later. *Prof. Psychol. Res. Pract.* 32, 97–100. doi: 10.1037/0735-7028.32.1.97

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2024.1379859/full#supplementary-material>

- Golde, C. M. (2000). Should I stay or should I go? Student descriptions of the doctoral attrition process. *Rev. High. Educ.* 23, 199–227. doi: 10.1353/rhe.2000.0004
- Govindji, R., and Linley, P. A. (2007). Strengths use, self-concordance and well-being: implications for strengths coaching and coaching psychologists. *Int. Coach. Psychol. Rev.* 2, 143–153. doi: 10.53841/bpsicpr.2007.2.2.143
- Harter, J. K., Schmidt, F. L., and Hayes, T. L. (2002). Business-unit-level relationship between employee satisfaction, employee engagement, and business outcomes: a meta-analysis. *J. Appl. Psychol.* 87, 268–279. doi: 10.1037/0021-9010.87.2.268
- Hyun, J. K., Quinn, B. C., Madon, T., and Lustig, S. (2006). Graduate student mental health: needs assessment and utilization of counseling services. *J. Coll. Stud. Dev.* 47, 247–266. doi: 10.1353/csd.2006.0030
- Janke, K. K., Farris, K. B., Kelley, K. A., Marshall, V. D., Plake, K. S., Scott, S. A., et al. (2015). StrengthsFinder signature themes of talent in doctor of pharmacy students in five Midwestern pharmacy schools. *Am. J. Pharm. Educ.* 79:49. doi: 10.5688/ajpe79449
- Johnson, D. R. (2012). Campus racial climate perceptions and overall sense of belonging among racially diverse women in STEM majors. *J. Coll. Stud. Dev.* 53, 336–346. doi: 10.1353/csd.2012.0028
- Jöstl, G., Bergsmann, E., Lüftenecker, M., Schober, B., and Spiel, C. (2012). When will they blow my cover? *Z. Psychol.* 220, 109–120. doi: 10.1027/2151-2604/a000102
- Jourdan, C., Ionescu, S., Julien-Gauthier, F., Cantinotti, M., Boulanger, S. J., Kayiranga, D., et al. (2021). Fostering the resilience of graduate students. [Paper Presentation]. *7th International Conference on Higher Education Advances. Editorial Universitat Politècnica de València*. Valencia, Spain.
- Judge, T. A., and Hurst, C. (2008). How the rich (and happy) get richer (and happier): relationship of core self-evaluations to trajectories in attaining work success. *J. Appl. Psychol.* 93, 849–863. doi: 10.1037/0021-9010.93.4.849
- Keyes, C. L. M. (2002). *The mental health continuum: From languishing to flourishing in life*, vol. 43. US: SAGE Publications, 207.
- Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., and Hayek, J. C. (2007). Piecing together the student success puzzle: research, propositions, and recommendations. *ASHE High. Educ. Rep.* 32, 1–182.
- Lane, F. C., and Chapman, N. H. (2011). The relationship of Hope and Strength's self-efficacy to the social change model of leadership. *J. Leadership Educ.* 10, 116–137. doi: 10.12806/V10/I2/RF6
- Linley, P. A., Nielsen, K. M., Wood, A. M., Gillett, R., and Biswas-Diener, R. (2010). Using signature strengths in pursuit of goals: effects on goal progress, need satisfaction, and well-being, and implications for coaching psychologists. *Int. Coach. Psychol. Rev.* 5, 6–15. doi: 10.53841/bpsicpr.2010.5.1.6
- Linley, P. A., Woolston, L., and Biswas-Diener, R. (2009). Strengths coaching with leaders. *Int. Coach. Psychol. Rev.* 4, 37–48. doi: 10.53841/bpsicpr.2009.4.1.37
- Lopez, S. J., and Louis, M. C. (2009). The principles of strengths-based education. *J. Coll. Charact.* 10:1041. doi: 10.2202/1940-1639.1041
- McDonald, M. M., Zeigler-Hill, V., Vrbel, J. K., and Escobar, M. (2019). A single-item measure for assessing STEM identity [original research]. *Front. Educ.* 4:ar78. doi: 10.3389/feduc.2019.00078
- Nagy, G. A., Fang, C. M., Hish, A. J., Kelly, L., Nicchitta, C. V., Dzirasa, K., et al. (2019). Burnout and mental health problems in biomedical doctoral students. *CBE Life Sci. Educ.* 18:ar27. doi: 10.1187/cbe.18-09-0198
- Nottingham, K. (2017). A predictive analysis of the psychosocial outcomes of doctoral students [Ph.D., Capella University]. ProQuest central; ProQuest dissertations & theses global. Available at: <https://www.idm.oclc.org/login?url=https://www.proquest.com/dissertations-theses/predictive-analysis-psychosocial-outcomes/docview/1936650843/se-2?accountid=2837>
- Ogilvie, C., Brooks, T. R., Ellis, C., Gowen, G., Knight, K., Perez, R. J., et al. (2020). NSF RAPID: Graduate student experiences of support and stress during the COVID-19 pandemic. [White Paper]. 1–11. Available at: https://www.montana.edu/covid19_rapid/updated%20NSF_RAPID_GraduateStudentExperiences_Covid19_White_Paper.pdf
- Osborne, J. W. (1995). Academics, self-esteem, and race: a look at the underlying assumptions of the Disidentification hypothesis. *Personal. Soc. Psychol. Bull.* 21, 449–455. doi: 10.1177/0146167295215003
- Osborne, J. W. (1997). Race and academic disidentification. *J. Educ. Psychol.* 89, 728–735. doi: 10.1037/0022-0663.89.4.728
- Park, N., Peterson, C., and Seligman, M. E. P. (2004). Strengths of character and well-being. *J. Soc. Clin. Psychol.* 23, 603–619. doi: 10.1521/jscp.23.5.603.50748
- Peterson, C. (2004). Character strengths and virtues: a handbook and classification. ed. C. Peterson and M. E. P. Seligman (Washington D.C.: American Psychological Association, New York: Oxford University Press).
- Proctor, C., Maltby, J., and Linley, P. (2011). Strengths use as a predictor of well-being and health-related quality of life. *J. Happiness Stud.* 12, 153–169. doi: 10.1007/s10902-009-9181-2
- Prayer, R. T., Wellenzohn, S., Ruch, S., and Ruch, W. (2015). Strengths-based positive psychology interventions: a randomized placebo-controlled online trial on long-term effects for signature strengths vs. a lesser strengths-intervention. *Front. Psychol.* 6:456. doi: 10.3389/fpsyg.2015.00456
- Ramsey, L. R., Betz, D. E., and Sekaquaptewa, D. (2013). The effects of an academic environment intervention on science identification among women in STEM. *Soc. Psychol. Educ.* 16, 377–397. doi: 10.1007/s11218-013-9218-6
- Rizzolo, S., DeForest, A. R., DeCino, D. A., Strear, M., and Landram, S. (2016). Graduate student perceptions and experiences of professional development activities. *J. Career Dev.* 43, 195–210. doi: 10.1177/0894845315587967
- Robinson, K. A., Perez, T., Carmel, J. H., and Linnenbrink-Garcia, L. (2019). Science identity development trajectories in a gateway college chemistry course: predictors and relations to achievement and STEM pursuit. *Contemp. Educ. Psychol.* 56, 180–192. doi: 10.1016/j.cedpsych.2019.01.004
- Robinson, K. A., Perez, T., Nuttall, A. K., Roseth, C. J., and Linnenbrink-Garcia, L. (2018). From science student to scientist: predictors and outcomes of heterogeneous science identity trajectories in college. *Dev. Psychol.* 54, 1977–1992. doi: 10.1037/dev0000567
- Saldaña, J. (2016). *The coding manual for qualitative researchers / Johnny Saldaña*. 3E. Edn. London: SAGE.
- Sandrone, S. (2022). Science identity and its “identity crisis”: on science identity and strategies to Foster self-efficacy and sense of belonging in STEM [Mini review]. *Front. Educ.* 7:871869. doi: 10.3389/feduc.2022.871869
- Schad, A., Layton, R. L., Ragland, D., and Cook, J. G. (2022). Mental health in medical and biomedical doctoral students during the 2020 COVID-19 pandemic and racial protests. *eLife* 11, 1–19. doi: 10.7554/eLife.69960
- Schlemper, M. B. (2011). Challenges and coping in graduate school. *Geographical Bulletin* 52:67.
- Schreiner, L. A. (2010). The “thriving quotient”: a new vision for student success. *About Campus* 15, 67–72. doi: 10.1002/abc.20016
- Seligman, M. E. P. (2011). *Flourish: A visionary new understanding of happiness and well-being*. New York, NY: Free Press.
- Seymour, E., and Hewitt, N. M. (1997). *Talking about leaving*, vol. 34. Boulder, CO: Westview Press.
- Sheppard, S. D. M., Colby, K., Sullivan, A., and Wiliam, M. (2008). *Educating engineers: Designing for the future of the field*. 1st Edn. San Francisco, CA: Jossey-Bass/ Carnegie Foundation for the Advancement of Teaching.
- Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., and Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *Int. J. Behav. Med.* 15, 194–200. doi: 10.1080/10705500802222972
- Sonnak, C., and Towell, T. (2001). The impostor phenomenon in British university students: relationships between self-esteem, mental health, parental rearing style and socioeconomic status. *Personal. Individ. Differ.* 31, 863–874. doi: 10.1016/S0191-8869(00)00184-7
- Sorensen, T. D., Traynor, A. P., and Janke, K. K. (2009). A pharmacy course on leadership and leading change. *Am. J. Pharm. Educ.* 73:23. doi: 10.1016/S0002-9459(24)00594-1
- Soria, K. M., Roberts, J. E., and Reinhard, A. P. (2015). First-year college students' strengths awareness and perceived leadership development. *J. Stud. Aff. Res. Pract.* 52, 89–103. doi: 10.1080/19496591.2015.996057
- Soria, K. M., and Stubblefield, R. (2014). First-year college Students' strengths awareness: building a Foundation for Student Engagement and Academic Excellence. *J. First-Year Experience & Students in Transition* 26, 69–88.
- Soria, K. M., and Stubblefield, R. (2015a). Building strengths awareness and Hope in Students' transition to higher education. *College Student Affairs J.* 33, 47–65. doi: 10.1353/csaj.2015.0007
- Soria, K. M., and Stubblefield, R. (2015b). Knowing me, knowing you: building strengths awareness, belonging, and persistence in higher education. *J. College Student Retention: Res. Theory & Prac.* 17, 351–372. doi: 10.1177/1521025115575914
- Soria, K. M., and Taylor, L. Jr. (2016). Strengths-based approaches in college and university student housing: implications for first-year Students' retention and engagement. *J. Coll. Univ. Stud. Hous.* 42, 60–75.
- Soria, K. M., Werner, L., Roholt, C. V., and Capeder, A. (2019). Strengths-based approaches in co-curricular and curricular leadership: opportunities to magnify Students' thriving. *J. Leadership Educ.* 18, 116–132. doi: 10.12806/V18/I1/R8
- Stebleton, M. (2010). Infusing career assessment into a first-year experience course. Retrieved from the National Career Development Association website: http://associationdatabase.com/aws/NCDA/pt/sd/news_article/29450/_PARENT/layout_details/false
- Stebleton, M. J., Soria, K. M., and Albecker, A. (2012). Integrating strength-based education into a first-year experience curriculum. *J. Coll. Charact.* 13:1877. doi: 10.1515/jcc-2012-1877
- Williamson, J. S. (2002). “Assessing Student Strengths: Academic Performance and Persistence of First-Time College Students at a Private Church-Affiliated College.” *Faculty Scholarship – School of Graduate and Continuing Studies*. 1.
- Yee, G. C., Janke, K. K., Fuller, P. D., Kelley, K. A., Scott, S. A., and Sorensen, T. D. (2018). StrengthsFinder[®] signature themes of talent in pharmacy residents at four midwestern pharmacy schools. *Curr. Pharm. Teach. Learn.* 10, 61–65. doi: 10.1016/j.cptl.2017.09.002