



ISSAQ Student Survey: Validity Report

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 **Abstract**

This report presents the initial validity evidence supporting the ISSAQ Student Survey (ISSAQ-SS), an inventory of noncognitive skills used to address student academic success and persistence in higher education. The need, theoretical underpinnings, and scale development of the ISSAQ-SS are first discussed. Next, the results of confirmatory factor analyses are presented using data from eight colleges, universities, and higher education organizations ($n=4,738$). The results supported the ISSAQ-SS score structure, with recommendations for scale improvement also identified. The report concludes by outlining future directions for validity research.



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Introduction

Improving retention, persistence, and graduation is a challenge for nearly every college and university. For several decades, institutions have focused on retaining students after their first year. Typically cited as the highest attrition point, four-year institutions see one in five students leave after the first year, while two-year schools see nearly double that rate of attrition, according to the National Center for Education Statistics (Hussar et al., 2020). These figures, of course, vary significantly depending on several institutional characteristics, such as a school's status as private or public, for-profit or not-for-profit, as well as its selectivity (in the case of four-year institutions).

With such high attrition rates, low graduation rates logically follow. Despite some gains in recent years, data from the National Student Clearinghouse show that only 59.7% of students receive a degree within six years of starting college (Shapiro, Ryu, Hule, Liu, & Sheng, 2019). Again, these rates vary from 40.8% for those starting at public, two-year colleges to 76.5% for those starting at private, not-for-profit four-year schools. Regardless of institutional type, it is startling that, even in the best case, roughly one quarter of students are failing to achieve their educational goals.

The last several decades have brought seemingly innumerable efforts to improve student success outcomes. For our part, DIA Higher Education Collaborators works with colleges and universities to address student success efforts by answering three questions:

1. How do we understand the meaningful strengths and challenges our students bring to college?
2. How do we relate that understanding to student success outcomes?
3. How do we support students to actually improve their likelihood for success?

Based on more than a decade of research and work with institutions of higher education, we find noncognitive skills to be an effective paradigm through which each of these questions can be answered.

Noncognitive Skills Articulate Student Strengths and Challenges

As Eaton and Bean (1995) once posited, most research into student success has taken a sociological, rather than psychological, perspective. They noted:

...we know that some groups of students, such as educationally disadvantaged students and certain minority groups, often adapt poorly to their college environments. We know less about the characteristics of individuals within such a group that increase the likelihood of their remaining in school until graduation. (p. 617).

In other words, research has been helpful in identifying who succeeds and who doesn't, but less able to identify why some students succeed and others don't.

The term “noncognitive” is intended to include a wide array of student skills, behaviors, mindsets, and strategies. However, the most important aspect of noncognitive factors is that they are not part of traditional measures or correlates of intelligence (e.g., test scores, high school grades, class rank). Instead, they refer to the behavioral, motivational, emotional, and social variables that relate to – or in some cases are the outcomes of – student learning and success.

Traditionally, interventions to address noncognitive factors have focused on those behavioral aspects most closely related to academic success, such as study skills, attendance, or engagement. While motivation is often discussed as a key factor related to student success, it is at times attributed to failure rather than used as a paradigm for intervention. Social and emotional aspects of student success have become more prevalent in recent conversations around student success as research into areas such as “grit” and “growth mindset” have become more popular and issues of student mental health have become more salient.

While a broad awareness of noncognitive issues has certainly risen, most institutions lack a unifying language around these factors. Indeed, being able to articulate the meaningful strengths and challenges students bring to college is one of the primary advantages of infusing noncognitive skills into student success strategies.

Noncognitive Skills Significantly Predict Key Student Success Outcomes

There is ample evidence to show that noncognitive skills significantly predict important student success outcomes. Over two decades, repeated large-scale studies (e.g., Markle et al., 2013; Poropat, 2009; Richardson, Abraham, & Bond, 2012; Robbins et al., 2004) have shown three important findings in this area:

1. **Noncognitive skills show statistically and practically significant relationships with outcomes such as grade point average, retention, and grades in entry-level (“gateway”) courses.**
2. **These relationships are significant even when controlling for traditional markers of student potential such as standardized admissions and placement tests (e.g., ACT, SAT) and high school GPA.**
3. **When predicting retention outcomes, noncognitive factors equal – and, in many cases, exceed – measures of academic preparation in their predictive strength.**

Evidence of the predictive efficacy of noncognitive factors is certainly promising, though there are several important things to note. Interestingly, there is not a clear answer to which noncognitive factors are the most significant, given variance in findings across institutions, sub-populations, and outcomes (e.g., Markle, 2016; Markle et al., 2013; Robbins et al., 2004). This emphasizes the need to consider a

wide array of noncognitive factors when attempting to support the success of a wide range of students.

Noncognitive Skills Help Identify Meaningful Student Success Interventions

As a result of the “sociological” approach to student success to which Eaton and Bean referred, most of higher education has adopted a paradigm of student success that leads to understanding without appropriate action. For example, identifying someone as a first-generation college student may help us *identify* they have a lower probability for success, but it doesn’t suggest what steps can be taken to actually *improve* that student’s success. In addition to providing a framework of language to articulate student strengths and challenges, one of the advantages of viewing student success through a noncognitive paradigm is the relationship to interventions (e.g., Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Yeager & Walton, 2011).

Several researchers have argued that this advantage of noncognitive skills comes by identifying the intermediate processes of distal student success outcomes. For example, in their review, Yeager and Walton (2011) emphasize that noncognitive interventions are effective (i.e., impact student outcomes such as grades or retention) when they are tied to well-developed theories of student psychology. Similarly, Walton and Wilson (2018) describe a process of “meaning-making in human behavior,” whereby noncognitive outcomes provide a systematic, testable, and actionable understanding of student success. Yet another paradigm was put forth by Finney, Wells, and Henning (2021), who discussed the value of “program theory” as a model for justifying program assessment by connecting noncognitive outcomes to metrics such as retention. In each case, noncognitive factors are valuable in the student success conversation because they frame a logical understanding of a complex outcome. Moreover, this psychological understanding is malleable, rather than an immutable sociological paradigm.

These interventions come in many forms. Some are what we might think of as a direct intervention, such as providing students with tools and strategies to improve their organizational skills (e.g., planners, calendars, checklists). In other cases, existing institutional resources may serve as the intervention, such as connecting students who lack a sense of belonging to clubs, organizations, study groups, or other social networks. Perhaps most importantly, some interventions may help educators understand how to better work with students, such as indicating to an advisor when a student lacks confidence and may require a different type of conversation or task structure.

ISSAQ Overview

ISSAQ is an assessment-based system designed to help integrate noncognitive skills into an institutional student success strategy. At its core is the ISSAQ Student Survey

(ISSAQ-SS), a broad-based measure of noncognitive skills used to (a) identify student strengths and challenges, (b) structure conversations between institutional staff (e.g., advisors, coaches, counselors) and students, and (c) predict student outcomes such as academic success and retention.

In addition to the student survey, DIA also offers institutional training services to foster an effective adoption and implementation of ISSAQ. These include process mapping to help colleges and universities integrate assessment data into student success efforts, co-curricular mapping to align institutional resources to ISSAQ-SS data, and training for advisors, coaches, and counselors on how to interpret and use ISSAQ-SS data in their work with students.

DIA also provides information services to help institutions interpret data. Among these are local summary reports that identify strengths and challenges common across students, subgroup analyses to examine trends within traditionally underserved populations, and predictive analytics reports to identify local indicators of key student success outcomes.

“ISSAQ” actually represents an acronym that was initially developed during early stages of this work: “The Incoming Student Skills and Attitudes Questionnaire.” The current use of the term no longer adheres to the acronym, but rather refers to this wholistic engagement with colleges and universities. While the measurement of noncognitive skills is critical, it is insufficient to drive institutional change and the improvement of student success. At the same time, without high-quality assessment efforts, institutional changes could be misguided or ineffective. Thus, the goal of this report is to demonstrate the validity evidence supporting the ISSAQ-SS in this context.

The ISSAQ Student Survey

The ISSAQ-SS assesses an array of factors that have been shown to relate to student success. In considering which factors would be appropriate for the survey, the intended uses of the assessment were prioritized. Specifically, three factors contributed to decisions made about assessment scope:

1. Because assessment is designed for early intervention, only factors that could be measured near or prior to college enrollment could be considered, and variables such as engagement (e.g., National Survey of Student Engagement, 2021) or attendance (e.g., Credé, Roch, & Kieszczynka, 2010) were excluded from consideration.
2. Factors shown to have significant predictive validity of academic success and persistence were considered, based primarily on large-scale meta-analyses of research into student success in higher education (e.g., Poropat, 2009; Richardson, Abraham, & Bond, 2012; Robbins et al., 2004).

3. While prediction is one use, formative development of noncognitive factors is also an essential consideration. Thus, a broad-based inventory of noncognitive skills was essential to support individual conversations, rather than focusing upon those indicators that are predictive for the population as a whole. Additionally, this breadth suggested the need to be agnostic to any individual theoretical model, but rather to integrate concepts across multiple models.

The next section of this report will discuss each ISSAQ-SS factor in detail, including the theoretical background and relevance to student success outcomes.

Forms of Validity Evidence

The most common definition of assessment validity is that a ‘test measures what it is supposed to measure.’ Indeed, more recent conversations of validity (e.g., AERA, APA, & NCME, 2014; Kane, 2013) have emphasized the importance of assessment interpretation and use, which would instead posit that a measure is valid when it ‘does what it is supposed to do.’ That is, the interpretation or use of assessment results should be continually examined and supported, but never proclaimed as inherent to the assessment itself. As the Standards for Educational and Psychological Testing (AERA, APA, & NCME, 2014) state:

Statements about validity should refer to particular interpretations for specified uses. It is incorrect to use the unqualified phrase “the validity of the test.” (p. 11)

Both theoretical (e.g., Kane, 2006) and practical (e.g., Benson, 1998) considerations of validity evidence articulate various forms of evidence. Four forms of validity evidence are considered central to the use of the ISSAQ-SS, and while all are not presented here, it is the ongoing pursuit of DIA to evaluate the survey using these parameters.

The first form of validity evidence is referred to as *content* validity evidence, which refers to the alignment of assessment content to established theory and research. This will be demonstrated in the present report in two ways: (1) outlining the underlying research used to formulate the ISSAQ-SS factors; and (2) discussion of the systematic process for item development and review.

Second, *structural* validity evidence demonstrates that relationships among variables within an assessment (e.g., items, scores) occur in expected ways. For example, items within a scale should have strong relationships among one another, but weak or minimal relationships with items from other scales. Structural validity evidence will be demonstrated in this report through confirmatory factor analyses and examinations of score reliability.

Third, *external* validity evidence refers to relationships with variables *outside* the assessment. For example, a test measuring math proficiency should correlate with other measures of math proficiency, but not with measures of language proficiency. For the ISSAQ-SS – particularly considering the assessment’s use – this is primarily focused on indications of predictive validity. That is, do ISSAQ-SS scores correlate with expected student outcomes such as grade point average or retention. DIA is currently in the process of gathering these data from partner institutions, and a study will be available soon. However, external validity evidence will not be presented in the current version of this report.

Fourth, *fairness* is an indication that validity evidence is comparable across key subgroups of interest. As with external validity, this work is under way at DIA and – while not included in this report - will be available in future examinations of validity.

Overview of ISSAQ Factors

The term “noncognitive” has been used for more than a century. (As early as 1898, philosopher E.P. Robins used the term in a paper on epistemology and judgement. Robbins used the term in reference to mental processes other than conscious thought, such as dreaming.) However, the popular purveyance comes from the work of economists such as James Heckman (e.g., Heckman & Rubenstein, 2001; Heckman, Stixrud, & Urzua, 2006), who describe noncognitive skills in reference to “cognitive ability” (intelligence). As Heckman and Rubenstein stated at the beginning of their 2001 study:

It is common knowledge outside of academic journals that motivation, tenacity, trustworthiness, and perseverance are important traits for success in life... It is thus surprising that academic discussions of skill formation almost exclusively focus on measures of cognitive ability and ignore noncognitive skills. (p. 145)

This shift, began by economists more than 20 years ago, was meant to acknowledge indicators of human potential that were not based in common conceptualizations - and just as importantly, common measures – of intelligence. The challenge, however, was that simply suggesting that things other than intelligence should be considered did not provide direction with regard to what *should* be measured. (In fairness, Heckman and Rubenstein’s work did acknowledge this shortcoming and encouraged future research to explore this topic.)

In many areas, however, the term “noncognitive” remained as the de facto term. Indeed, many (e.g., Fickel, 2015) have bemoaned the word. Perhaps the most notable challenge in coming up with a better label is that the realm of “things that

are not intelligence” is quite broad, and any single term generally fails to address that breadth sufficiently.

At DIA, we have taken to defining “noncognitive” as the behavioral, motivational, emotional, and social aspects of student success. The behavioral domain generally deals with tools and strategies students use to succeed academically. The motivational domain refers to students’ attitudes toward success, such as their prioritization and emphasis on success in college and their willingness to persist in the face of a challenge. The emotional domain refers to students’ self-management, including how likely they are to become stressed, what they do in response to stress, and their confidence in themselves. Finally, the social domain deals with students’ relationships with others and how they promote or inhibit their success.

As mentioned, the uses of the ISSAQ-SS focus on articulating student strengths and challenges and predicting future success. As such, the ISSAQ factors are not organized into the behavioral, motivational, emotional, or social domains or scored in aggregate simply for the purposes of simplifying data. Doing so could undermine the appropriate interpretation of students’ strengths and challenges, the ability to connect them with the appropriate resources, or to identify key indicators of their success. While some might feel compelled to simplify these factors (e.g., consolidating factors into behavioral, motivational, emotional, and social scores), doing so may achieve the goal of simplification, but inhibit the efficacy for these key uses.



Figure 1. ISSAQ Success Factors.

In reviewing a wealth of research on student success and keeping in mind the intended uses of ISSAQ stated above, 12 factors were identified for assessment via

the ISSAQ-SS (see Figure 1). In the section that follows, each factor is defined and related to future research. Additionally, evidence of empirical relationships to student success and implications for practical work with students are also discussed.

Organization

Organization is defined as the behaviors and strategies that students use to manage their work and time. It is part of a large body of research addressing key success-related characteristics, such as student study skills, and conscientiousness.

In their expansive review of study skills, Credé and Kuncel (2008) described that, based on the relationship between study skills and academic success, institutions should consider adding study skills measures to their understanding of student success (along with popular indicators such as high school grades and standardized admissions/ placement test scores).

Other large-scale studies have also supported the relevance of organizational skills to student success outcomes in higher education. In his meta-analysis on the relationship between personality and student achievement, Poropat (2009) found that conscientiousness - a domain of personality relating to a wide range of achievement-related behaviors and attitudes, including organization - equaled intelligence in its ability to predict success.

In another meta-analysis, Robbins et al. (2004) found that “academic-related skills,” (“Cognitive, behavioral, and effective tools and abilities necessary to successfully complete task, achieve goals, and manage academic demands,” p. 267) had significant relationships with both GPA and retention, even when controlling for HS GPA and ACT scores.

To be clear, each of these studies refer to broad sets of skills that include Organization, but not Organization specifically. However, Markle et al., (2013), did find that a direct organizational measure significantly correlated with first-semester GPA, retention, and grades in entry-level math and English courses.

Credé and Kuncel described several ways in which study skills relate to student learning. As “direct effects,” study skills have causal impacts on student learning. That is, using such skills facilitates learning, as is the case with time on task. As “mediating” effects, study skills help to explain why students with certain characteristics are more likely to be successful. For example, a study by MacCann, Fogarty, and Roberts (2012) found that, among a sample of community college students, time management had a significant relationship with grades for part-time students, but not full-time students. Thus, time management mediated the relationship between enrollment status and academic success.

Quality Focus

Quality Focus deals with a student's emphasis on high-quality work and avoidance of errors, and relates to concepts such as precision, attention to detail, and even perfectionism. Such factors have been consistently identified as elements of conscientiousness (e.g., Goldberg, 1990; MacCann, Fogarty, & Roberts, 2012), which as mentioned, is a key correlate of student achievement in higher education (Poropat, 2009).

O'Connor and Paunonen (2007) found similar results in their meta-analysis of the relationship between personality domains and post-secondary success. However, they noted variance in the relationship of conscientiousness depending upon the sample. This could be due to an examination of conscientiousness at the domain level - which is broad and complex - rather than an exploration of facets specifically related to student success.

Ultimately, there is little research on the specific relationship of such facets (e.g., *Quality Focus*) to student outcomes. The inclusion of *Quality Focus* in the ISSAQ framework is thus based on its relation to the well-supported factor of conscientiousness, as well as input from subject matter experts. Additionally, there are practical arguments supporting its inclusion.

The concept of "grit" (Duckworth, Peterson, Matthews, & Kelly; 2007) has received significant attention among both scholars and practitioners as a potential paradigm shift in understanding student success. However, more recently, some have criticized grit as being multi-faceted (i.e., not one single construct as its label may suggest), highly correlated with conscientiousness, modestly related with student outcomes, and unimpacted by interventions (see Credé et al., 2017; Meuncks et al., 2017). Particular attention to these criticisms is warranted, as they point to both potential problems with the measurement of grit as well as difficulties in providing actionable, valid interventions.

A more granular factor, such as *Quality Focus*, may play an important role in better understanding such a construct and reducing measurement error. For example, grit is commonly referred to as having at least two dimensions: perseverance of effort and consistency of interest. Both Meuncks et al. and Credé et al. found perseverance of effort to be a stronger predictor of student success.

But what might "perseverance of effort" look like in a student? It could include checking and rechecking one's work, maintaining effort until one's standards of quality are met, and taking the time to plan effectively and execute one's work - all qualities addressed by *Quality Focus*.

Another popular theory, "growth mindset" (Dweck, 2007; 2008) points to the importance of *Quality Focus*. Dweck (2008) explained that, once someone believes

they can get smarter, they (a) emphasize learning as a goal and (b) persist longer in the face of difficulties, and (c) value their own efforts as a mechanism of that improvement. Subsequently, these beliefs manifest as increased time and attention on task (i.e., Quality Focus behavior) that lead to higher achievement.

Engagement

Engagement refers to involvement behaviors that are central to success in college-level courses - such as attendance, timeliness, and assignment completion - and relates to several relevant bodies of literature. Both the [National Center for Student Engagement](#) (NSSE) and the [Center for Community College Student Engagement](#) (CCSSE) reference “active and collaborative learning,” which refers to (as CCSSE states), “the extent to which students participate in class, interact with other students, and extend learning outside of the classroom.” Others (e.g., Margolis, 2001) have referred to the hidden, or implicit curriculum, whereby students learn more than what is explicitly stated for course, program, or institutional learning outcomes. This can include the increased expectations for Engagement behaviors in college-level courses, both within and outside the classroom.

Several studies using NSSE and CCSSE data have supported the predictive validity of active and collaborative learning. In their review of high-impact practices, Kilgo, Sheets, and Pascarella (2014) found that practices focusing on active and collaborative learning were one of only two areas studied (undergraduate research being the other) that significantly impacted a majority of student learning outcomes. McClenney, Marti, and Adkins (2012), in reviewing research on the validity of the CCSSE survey, found active and collaborative learning to be correlated with both the number of terms enrolled and credits attained.

Looking at Engagement through other lenses, Credé, Roch and Kieszczynka (2010) conducted a meta-analysis on the predictive validity of class attendance, finding it to have more predictive efficacy than high school grades or admissions test scores. Markle et al., (2013), found “meeting class expectations,” a scale similar to Engagement, to significantly predict first-semester GPA, retention, and grades in both math and English courses.

The practical relationship between Engagement and student success is perhaps obvious. If students do not attend class and participate effectively, they are highly unlikely to be successful. However, there are two important notes to emphasize. First, students must be made aware of this importance in both policy and practice. For example, Credé, Roch and Kieszczynka found that mandatory attendance policies had a positive impact on actual student attendance. Moreover, efforts like orientation, student success courses, and advising cannot over-stress the importance of students engaging in their own learning.

Second, Engagement is a factor that can serve in a compensatory role for students. As an example, Li et al. (2013) looked at the classroom engagement of community college students in developmental math courses. A vast majority of students with high engagement passed the course, regardless of their incoming academic preparation. However, students with low engagement levels had extremely low passing rates if they entered with low academic preparation, while students with high academic preparation and low engagement still passed most of the time.

Goal Commitment

Motivation is a complex construct with many theoretical conceptualizations. It is also commonly misunderstood by faculty, staff, and administrators, who label students as simply being “motivated” or “unmotivated.” While such attributions may, in some ways, be true, to improve student success, it is necessary to gain a deeper understanding of why and how students are unmotivated so that efforts can be made to change that state.

Goal Commitment in the ISSAQ framework is the facet most closely related to a measure of motivation toward retention, persistence, and completion. Its operational definition, focusing on a student’s value and prioritization of a college degree goal, is rooted in two widely studied theories of motivation and behavior.

First, expectancy-value theory (EVT) frames human behavior as being driven by two perceptions. The “value” aspect deals with an individual’s perceived importance of that behavior, and it is this aspect that is closely related to Goal Commitment.

“Expectancy” refers to an individual’s belief (or expectation) that they are likely to perform that behavior successfully (see Wigfield, Tonks, & Klauda, 2009; note that expectancy relates to Self-Efficacy, which is also included in the ISSAQ framework). Barron and Hulleman (2015), in discussing academic motivations, add perceived cost as an additional aspect of EVT, which is also addressed by several ISSAQ items.

Another noted psychological theory that relates to Goal Commitment is the Theory of Planned Behavior (TpB; Ajzen, 1991; Fishbein & Ajzen, 1975; also referred to as the “Theory of Reasoned Action”). According to TpB, behavior is best predicted by intention, which is in turn predicted by three factors: attitudes, norms, and efficacy. Attitudes refer to positive/negative evaluations of the behavior and are closely related to Goal Commitment. Efficacy, like expectancy, deals with one’s perceived ability to perform the behavior (and, again, relate to Self-Efficacy in the ISSAQ framework). Finally, norms refer to the perceived social acceptance or endorsement of the behavior and relate to several items addressed by Sense of Belonging in the ISSAQ framework.

TpB has been studied and applied in a wide array of settings. Perhaps most importantly, a meta-analysis of behavioral change interventions based on TpB found

them to have significant impacts across a wide array of settings (Steinmetz et al., 2016).

Repeated studies have found factors similar to Goal Commitment to be strongly related to student outcomes in higher education. The Robbins et al. (2004) meta-analysis, comparing academic, noncognitive, and socioeconomic predictors of both academic success and retention, found “academic goals” to have an estimated correlation with retention exceeding that of high school GPA, SAT/ACT scores, and socioeconomic status.

Both Robbins et al., as well as a meta-analysis by Richardson, Abraham, and Bond (2012), found constructs similar to Goal Commitment to be significantly related to GPA, though not in the same magnitude as measures of academic preparation (e.g., HSGPA, ACT/SAT). Finally, Markle et al. (2013) found “commitment to college goals” to be significantly predictive of first-semester GPA, retention, and performance in entry-level English courses.

Reframing “motivation” as Goal Commitment has several practical implications in understanding and supporting student success. First, when working with a student who may be perceived as “unmotivated,” framing motivation using these ISSAQ factors can identify underlying mechanisms of that mindset. Is it due to a student’s lack of belief in themselves (i.e., Self-Efficacy)? Is it because they feel unsupported by those around them (i.e., Sense of Belonging)? Or, is it, in fact, their perceived value of their path in college (i.e., Goal Commitment)?

The relationship between Goal Commitment and student success is likely intuitive: a student is unlikely to put forth effort toward something they do not value and/or prioritize. More importantly, however, this multifaceted framing of motivation allows for more targeted messaging and interventions that relate to a particular student’s strengths and challenges. This helps faculty, staff, and administrators avoid labels such as “unmotivated” and, instead, identify mindsets and attitudes that can be discussed with students.

Persistence

Many educators recognize the importance of students’ responses to challenging situations. Students who maintain or even increase their effort when problems arise are likely to be successful in a variety of situations. This tendency is the focus of *Persistence* in the ISSAQ framework.

Persistence is related to several other theoretical models of student behavior. Perhaps most notably, “grit” (Duckworth, Peterson, Matthews, & Kelly; 2007) has received significant attention among researchers and practitioners as an intuitive paradigm of student success. Duckworth et al. define grit in the following way:

We define grit as perseverance and passion for long-term goals. Grit entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress. The gritty individual approaches achievement as a marathon; his or her advantage is stamina. Whereas disappointment or boredom signals to others that it is time to change trajectory and cut losses, the gritty individual stays the course. (p. 1087-1088)

While this definition contains several attitudes, dispositions, and behaviors, Persistence here focuses on the maintenance of effort in the face of challenges as a singular tendency, based on its inclusion as part of conscientiousness (Goldberg, 1990), which has been shown to predict student success in meta-analytic studies (e.g., O'Connor & Paunonen, 2007; Poropat, 2009). Indeed, the high correlation between grit and factors such as conscientiousness and its facets has been a frequent criticism of the construct (Credé et al., 2017; Meunks et al., 2017).

In addition to meta-analytic studies that have related conscientiousness to student success (e.g., O'Connor & Paunonen, 2007; Poropat, 2009), several studies have examined the predictive power of Persistence in and of itself. For example, Credé et al. (2017) and Meunks et al. (2017) considered “grit” as two separate dimensions: perseverance of effort and consistency of interest. Both studies found perseverance of effort to be the sole significant predictor of academic success (i.e., course grade and end-of-semester GPA). Eskreis-Winkler et al. (2014) found grit to be a significant predictor of persistence behavior in military, professional, and secondary settings, though the study did not examine postsecondary samples. Lastly, a meta-analysis by Richardson, Abraham, & Bond (2012) found “effort regulation,” which they defined as “persistence and effort when faced with challenging academic situations” to be significantly predictive of GPA.

In addition to its intuitive appeal and relation to the grit literature, Persistence is also an important factor in a “growth mindset” approach (Dweck, 2007, 2008). Growth mindset is rooted in the idea that students acknowledge intelligence as malleable and a product of effort rather than innate ability. Subsequently, when faced with a challenge, students with a growth mindset are likely to persist (“Oh, I must not have succeeded because I didn’t try hard enough!”) as opposed to students with a fixed mindset are more likely to give up (“Since my ability isn’t going to change, there’s no use trying again - I’ll just continue to fail.”).

Effort Focus

Effort Focus is a student’s perception that success is a product of effort rather than innate ability. This concept is adapted from “growth mindset” (Dweck, 2006), which has become a popular perspective and paradigm for student success. One challenge with growth mindset, however, is creating an operational definition that could be used in an assessment-intervention context.

Carol Dweck (2000; 2006) defines a growth mindset as “the belief that your basic qualities are things you can cultivate through your efforts” (Dweck, 2000; p. 7). This is contrasted with a “fixed” mindset, whereby students believe that their intelligence is immutable – fixed at birth and unable to be changed. Much of Dweck’s work discusses the ways in which these mindsets impact their behavior and, subsequently, their success.

For example, students who demonstrate a growth mindset are more likely to accept feedback, because it can inform future efforts, while those with a fixed mindset respond negatively, construing feedback as an evaluation of themselves. Similarly, students with a growth mindset are more likely to respond positively to failure. Growth mindset individuals embrace challenge as a part of growth, whereas fixed mindset individuals avoid challenging tasks.

When applying growth mindset in practice, many educators consider both the underlying attributions and resulting perceptions and behaviors as one condition. Herein lies the difficulty in creating an operational definition of growth mindset, not to mention the subsequent steps of measuring students’ attributes or identifying interventions. Thus, Effort Focus isolates that initial perception that success is a product of effort, rather than innate ability.

There is an extant body of literature discussing how theories of intelligence, growth mindset, and related factors impact students’ perceptions, behaviors, and success. However, these studies are currently limited in several ways:

- Much of this literature exists in primary and secondary settings and has not been applied to college students.
- Literature in all settings tends to explore relationships among constructs (e.g., how theories of intelligence relate to goal orientation), but do not refer to observed student outcomes such as GPA or retention.
- Studies are limited to single-institution samples.

Thus, large-scale studies, such as the meta-analyses referred to for other constructs in the ISSAQ framework, have not been conducted to relate growth mindset, theories of intelligence, or related factors to student outcomes in higher education.

Calmness

Calmness refers to a general resistance to stress, whereby students who score low on this factor are more likely to become stressed and those who score high are less likely to do so. (Essentially, *Calmness* is the opposite of one’s sensitivity to stress.) Based on a review of the stress and coping literature generally (e.g., Endler & Parker, 1999; Lazarus & Folkman, 1984), as well as college-specific stress literature (e.g., Dyson & Renk, 2006; Park, Armeli, & Tennen, 2004; Pierceall & Keim, 2007;

Struthers, Perry, & Menec, 2000), and even the consideration of research in high-stress industries (e.g., Clegg, 1999; Deary, Watson, & Hogston, 2003; Edwards & Burnard, 2003), ISSAQ's model of stress includes two important factors: Calmness and Coping Strategies.

According to this research review, what we often perceive as "stress" is a complex phenomenon. It begins with a perception that current stimuli in one's life exceed their resources. For example, a student who is attempting to finish a big assignment, meet expectations at a job, and fit in socially has high demands on their time, energy, and other resources. If they perceive this demand to exceed those resources, stress can ensue. Specifically, Calmness assesses the general tendency for students to have this perception that the events in their life are exceeding the resources available to them.

The results of empirical studies relating student stress and outcomes in higher education are mixed. Two large scale meta-analyses (O'Connor & Paunonen, 2007; Poropat, 2009) found neuroticism - the personality domain most closely related to stress and anxiety - to have essentially zero correlation with student outcomes. Additionally, Markle et al. (2013) found no relationship between students' sensitivity to stress and first-semester GPA, retention, or grades in entry-level math or English courses.

Other studies that focus more specifically on student stress and coping have found a complex relationship between stress, other factors, and student outcomes. For example, Dyson and Renk (2006) found that stress interacted with factors such as masculinity, femininity, and coping strategies to predict depressive symptoms.

Thus, it is unlikely that Calmness alone is a notable predictor of success, but rather should be considered in combination with other factors, such as Coping Strategies, Sense of Belonging, Self-Efficacy, and access to other resources. For example, Piercall and Keim (2007) found that stress and coping interacted in predicting student drinking behavior.

When considering stress in practice, it is important to remember the "Yerkes-Dodson law," which describes a nonlinear relationship between arousal and performance (first described in Yerkes, & Dodson, 1908). That is, if arousal is too low, people are unmotivated and under-perform. If people are too aroused, stress ensues, and performance suffers.

When applied to students, one can easily imagine that, if a student has zero stress, that could be an indication of disengagement. Conversely, if a student is overly stressed, negative outcomes such as anxiety or problematic coping mechanisms may be more likely. Thus, all things being equal, a moderate amount of stress (or, in this case, "Calmness") may be best.

The other important factor to consider in relation to Calmness is coping. As mentioned, students who perceive stress (i.e., score low in Calmness) are not immediately susceptible to many of the negative outcomes associated with stress. If a student perceives a stressful situation, the next factor to consider is how they cope with that situation. As the section on Coping Strategies discusses, there are adaptive coping strategies and problematic strategies. Thus, what we perceive as stress for students truly emerges when a student encounters one of two situations: (1) they perceive stress and feel they have no mechanism with which to cope; (2) they perceive stress, and their coping strategies are problematic. As such Coping Strategies is a logical factor to discuss next.

Coping Strategies

While coping is broadly defined as the response to a stressful situation, there are many ways in which responses can be categorized. Within ISSAQ, *Coping Strategies* refer to the spectrum of ways in which students react to stressful situations, based on well-established theories of stress and coping (e.g., Endler & Parker, 1999; Lazarus & Folkman, 1984).

There are four strategies - two adaptive and two problematic - addressed by the Coping Strategies scale. “Planful problem solving” and “seeking social support,” whereby students either develop a plan to address the source of stress or seek someone to assist in handling the issue, respectively, comprise the two adaptive coping strategies. Questions related to these factors are scored positively in the ISSAQ-SS.

The two problematic strategies are “avoidant” and “emotional” coping. In avoidant coping, students simply do not acknowledge the source of stress or actively seek a means of distraction from it. With emotional coping, students respond using emotion, including negative emotions such as anger or sorrow. Items related to these strategies are scored negatively in the ISSAQ-SS.

Eaton and Beane (1995) were among the first to relate coping strategies to student retention. Using a simple approach/avoidance dichotomy, they found coping strategies to be significantly predictive of student retention within a single institution. While their study showed promise in exploring the role of coping in student retention and success, no available studies have examined this relationship on a large scale. While some studies, notably the Robbins et al. (2004) meta-analysis, have acknowledged the importance of coping, it was not specifically measured. Instead, coping was considered under broader constructs such as social support or academic skills.

The Coping Strategies scale is designed to assess a student’s overall approach to stress and includes items addressing each of the four strategies mentioned here. While this may create some psychometric challenges (e.g., if the four strategies are

distinct and not well represented by a single construct), the overall goal of the scale is to identify whether or not coping is an area requiring discussion and/or intervention – not to present a full diagnostic assessment of a student's coping profile.

Coping Strategies relate to many other factors in the ISSAQ framework. Students' responses to stress are related to how well they can manage tasks (i.e., Organization), their social resources (i.e., Sense of Belonging), and their willingness to ask for guidance (i.e., Help Seeking). Thus, just as with Calmness, a student's Coping Strategies cannot be fully understood in isolation. Rather, considering a student's profile of scores could provide much greater insight into estimating their likely success.

Consider a student who scores low in Coping Strategies. This indicates that they are likely to avoid a problem, fail to develop a plan for solving it, and/or resist asking someone for help in doing so. However, is this because of how they respond to stress, or because of what they perceive as their available resources? By looking at their scores in Organization, Sense of Belonging, and Help-Seeking, one can begin to better understand the “whole student.”

Self-Efficacy

Self-Efficacy refers to an individual's belief that they will be successful in college. Much like Goal Commitment, Self-Efficacy is a critical component of many prevalent motivational theories. As previously discussed, expectancy-value theory (EVT) frames human behavior as being driven by two perceptions. The “value” aspect deals with an individual's perceived importance of that behavior (related to Goal Commitment in the ISSAQ framework). “Expectancy” refers to an individual's belief (or expectation) that they are likely to successfully perform that behavior (see Wigfield, Tonks, & Klauda, 2009), which is closely tied to Self-Efficacy.

The relationship between Self-Efficacy and TpB (Ajzen, 1991; Fishbein & Ajzen, 1975; also referred to as the “Theory of Reasoned Action”) has also been alluded to throughout this report. In TpB, efficacy, like expectancy, deals with one's perceived ability to perform the behavior, and is tied to Self-Efficacy in the ISSAQ framework.

Confidence is a term that is popularly used to describe behavior, and the distinction between confidence and self-efficacy is often muddled. However, noted psychologist Albert Bandura (1997) described confidence as a “nondescript” belief, rather than a specific expectation. Others have referred to confidence as an emotional state (feeling good about something), whereas efficacy is a cognitive one (believing it is likely to happen).

Among large-scale and meta-analytic studies, Self-efficacy is continually found to be one of the strongest predictors of student success, regardless of the outcome. Two meta-analyses (Richardson, Abraham, & Bond, 2012; Robbins et al., 2004) found

measures of self-efficacy to be among the strongest predictors of academic success in higher education, rivaling the predictive strength of high school GPA and ACT/SAT scores. Robbins et al. also found self-efficacy to be among the strongest predictors of retention. Additionally, Markle et al. (2013) found academic self-efficacy to be significantly predictive of first-semester grades and retention, as well as grades in entry-level English courses.

In the context of student success, one of the challenges in examining efficacy dispositions is the wide array of behaviors that might be a part of being a college student. In ISSAQ, Self-Efficacy is targeted toward finishing college, though this is hardly a specific behavior. For example, TpB is often applied to targeted health behaviors (e.g., smoking, exercise), and thus one's perceived efficacy in their behavioral control is more specific. Pajares (1996) noted that measures of self-efficacy that not targeted towards specific behaviors may assess stable personality traits than malleable beliefs.

It is also important to remember that Self-Efficacy is intertwined with a host of other factors. In nearly every theoretical model, self-efficacy is related to previous experience, perceived support, and attitudes toward the outcome (e.g., perceived value). Thus, Self-Efficacy is as much an outcome of these other factors as it is a predictor of future success.

Given all this, Self-Efficacy works differently than many other factors when it comes to intervention. The first step to working with a student with low Self-Efficacy is to understand why. Is it because of challenges in the past, doubt in their own ability, or a perceived lack of support? Interventions will likely not be as direct as with some other constructs. When a student has low Organization, there are tools, strategies, and resources the student can use to improve those skills. No such "direct-to-student" interventions are likely to have the same impact on Self-Efficacy. Rather, research has found that a student's self-efficacy should inform the ways in which teachers, advisors, and others work with them, rather than suggest a direct intervention (Margolis & McCabe, 2006).

Sense of Belonging

Sense of Belonging refers to a feeling of connection to the people within a college or university. It is one of many social integration factors that have been explored as part of retention theories for the last several decades.

Vincent Tinto's (1975) foundational model of retention, as well as his ongoing research over several decades, played a major role in not only drawing attention to student attrition but also shifting perspectives around student success. Perhaps most notable about Tinto's work is the concept that attrition is a social, rather than academic, process. His work - and a great deal more based upon it - supported the

theory that students who do not feel integrated into the social environment of an institution are less likely to feel a commitment to that institution and their studies.

Later research focusing specifically on this perception of social integration and support provided greater depth and clarity in defining the construct. For example, Bollen and Hoyle (1990) proposed the concept of “perceived cohesion” to explain an individual's attachment to a group. Their model included two factors: “feelings of morale,” which referred to a positive or negative attitude about the group as a whole, and “sense of belonging,” which referred to an individual's perceived relationships with members of the group.

Similarly, Elliot, Kao, and Grant (2004) proposed the construct of “mattering” to explain an individual's relationship to a group. In their model, mattering consisted of three components: awareness (“I am the object of others' attention”), importance (“I am the object of others' concern”), and reliance (“Others look to me”).

Finally, France, Finney, and Swerdzewski (2009) integrated these and other theories with a specific focus on the adjustment of college students. In defining “university attachment,” the authors referred to “group attachment” (affiliation with the university itself) and “member attachment” (affiliation with the people within the university).

The France et al. model provides the most insight into ISSAQ's framing of student social perceptions. Sense of Belonging is closely related to member attachment, as the factor focuses on personal relationships within the institution. Contrast this with Institutional Commitment (discussed below), which deals with an attitude toward the college or university itself.

Several large-scale studies have examined constructs similar to Sense of Belonging in relation to student success outcomes. A meta-analysis by Robbins et al. (2004) found that both perceived social support and social involvement were significant predictors of both first-year GPA and retention. However, Markle et al. (2013) and Richardson, Abraham, and Bond (2012) found little connection between measures similar to Sense of Belonging and student outcomes.

One hypothesis for these variances in findings is that Sense of Belonging has differential effects on certain student subpopulations (e.g., Johnson et al., 2007; Maestas, Vaquera, & Zehr, 2007; Mark, 2007). For example, one could easily imagine that students from traditionally underserved populations (e.g., first-generation college students, students from underrepresented minority groups) could either feel different levels of belonging, or experience belonging differently as a part of their success. Feeling disconnected may differentially affect a student of color from a low-income family than a white student from an affluent background. In this case, observing a single effect of Sense of Belonging across a heterogeneous student sample may be difficult.

Institutional Commitment

Institutional Commitment refers to a student's attitude toward the college or university as a whole, as opposed to the individuals within that institution. According to Tinto (1975), students who do not feel integrated into the social environment of an institution are less likely to feel a commitment to that institution. As a result, they were more likely to disengage from their academic work and withdraw from college altogether.

Later work by Nora and Cabrera (1993) explored the potential dimensionality of institutional commitment, finding two factors. They found a general factor, including students' perceptions of institutional quality, educational value, and fit, and an affinity factor, which included students' perceived similarity of values with the institution. It is the general factor that most closely relates to the ISSAQ conceptualization of Institutional Commitment.

Large-scale studies have shown interesting effects of Institutional Commitment, depending on the outcome of interest. Richardson, Abraham, & Bond (2012) and Markle et al. (2013) found essentially no predictive effects of measures similar to Institutional Commitment, while Robbins et al. (2004) found a small but statistically significant correlation between institutional commitment measures and first-year GPA. However, when examining correlations with first-year retention, Robbins et al. found a much larger effect.

Understanding the relationship between Institutional Commitment and student success requires a consideration of several factors. First, even in Tinto's initial work, institutional commitment was a mediating factor. According to his model, students began by feeling socially disconnected from the institution, which subsequently impacted their commitment to the institution, followed by a decreased commitment to their studies. Thus, while a great deal of attention was paid to institutional commitment in later research, it was only one of several factors in Tinto's model of attrition.

It is also important to understand how Institutional Commitment functions in modern higher education. For one, students attend college for very different reasons now, as opposed to the 1970s, when Tinto was formulating his theories of retention. The Higher Education Research Institute at UCLA has conducted a national survey of first-year college students annually since 1966. Among students surveyed in 1975 - when Tinto wrote his seminal work - only 59.7% listed "being very well off financially" as an important reason for attending college. Only 50.1% rated "being successful in business" as an important reason (Astin, King, & Richardson, 1976). Conversely, in 2018, 85.1% of students rated "being able to get a better job" as an important reason for college attendance, and 73.3% endorsed "being able to make more money" (Stolzenberg et al., 2019).

Due to changes in the survey, there isn't directly comparable data. But these results support - and few would disagree - that employability and financial considerations are an increasing consideration among modern college students, if not the primary or even sole factor. At the same time, social factors, which were heavily addressed in previous surveys, but wholly excluded from the attendance question in 2018, seem to be less important in students' minds.

Another key factor to consider is the increased inclusion of community college students in conversations about student success. According to the [Community College Research Center](#), more than a third of all students in higher education are enrolled at a community college, and the last decade has seen an increased focus on improving their success (e.g., Baily, Smith Jagers, & Jenkins, 2015).

According to [CCRC](#), roughly 80% of students who begin at a community college intend to transfer to a four-year institution. In these cases, students may be more committed to their target institution than their current community college. Subsequently, Institutional Commitment may be difficult to pinpoint and certainly could have a differential relationship with success than Tinto initially theorized.

Thus, whereas many - particularly those working in large, flagship four-year institutions - may consider Institutional Commitment a central component, there are many student and institutional cases where it could either have less importance or different mechanisms to student success. Nevertheless, understanding students' attitudes toward their institution can be critical, particularly as it relates to other factors such as Goal Commitment or Help-Seeking.

Help Seeking

Help Seeking refers to students' attitudes toward and tendency to ask for assistance when problems arise. While the ISSAQ scale includes a singular, general factor, scale conceptualization and development were informed greatly by the work of Stuart Karabenick (1998, 2003, 2004; Karabenick & Newman, 2013).

Karabenick proposed that seeking help - an observed behavior - was not simply a unidimensional behavior or trait. Rather than viewing students as either willing or unwilling to seek help, Karabenick proposed several dimensions that not only articulated the underlying perceptions of help-seeking behavior but also qualified the ways in which students seek help. Among these were:

- **Threat:** Do students view help-seeking as an indication of weakness, or a sign to others that they are unable to succeed on their own?
- **Efficacy:** Do students believe that, if they seek help, it will be effective?
- **Source:** Do students ask for help from friends and family or formal sources such as faculty and staff?

- **Function:** Do students seek help to foster learning, or simply to assist in task completion?

While these specific factors are not quantified in the ISSAQ framework, they did contribute to the development of items and the guidance of feedback and interventions.

Some large-scale studies have shown Help Seeking and similar constructs to be predictive of academic success. Both Markle et al. (2013) and Richardson, Abraham, & Bond (2012) found help seeking scales to be significantly correlated with academic success. However, Markle et al. saw no significant relationship with retention.

Generally, research into help seeking has tied the construct to more specific resource access behaviors. For example, Buscemi et al. (2010) explored the role of help seeking in the use of alcohol treatment programs among college students. Similarly, Eisenberg et al. (2007) studied the role of help seeking in relation to students' use of mental health resources.

As with several other factors in the ISSAQ framework, Help Seeking is as much an outcome of previous experiences in students' lives as it is a predictor of their success in college. Conversations with students can help uncover just why they are willing to seek help, which is critical to determining how to best connect students with resources (and encouraging them to do so on their own).

This is where Karabenick's framework of help seeking becomes most useful. Threat, for example, is an initial issue to discuss that can be helpful in many cases. Many practitioners will note that students from many traditionally underserved populations are more likely to be hesitant to ask for help. Karabenick and Newman note that this is because, in several ways, help seeking is a cultural process. Students from such populations may view higher education as a different, almost foreign culture, and thus unlikely to ask for help.

Additionally, certain students, because of their background, may be less likely to ask for help. If students already feel like an outsider because of their background (e.g., first generation college student, student of color), asking for help can be - in their eyes - and indication of weakness or inability (Shapiro, 1983).



Scale Development

Item Development Process

ISSAQ-SS items were developed through two sources. First, the framework discussed in the previous section was used to consult the International Personality

Item Pool (IPIP; Goldberg, 1999; Goldberg et al., 2006). The IPIP is a bank of more than 3,000 items across a wide array of personality domains, constructs, and facets, and is freely available for both research and commercial purposes. In nearly all cases, the items contained in the IPIP did not exactly match the needs of the ISSAQ-SS. Thus, items were rephrased to match a higher education context, adjust complexity or reading level, or to match the operational definition of the ISSAQ factor.

The second source of items was through internal development within DIA. The staff at DIA has more than 10 years of experience assessing noncognitive skills in higher education contexts similar to that of ISSAQ. The IPIP and internal item development efforts were continued until roughly 10 items were created to address each factor.

The final step in the item development process was to consult with experts in the field. Nine subject matter experts (SMEs) reviewed each item within the context of ISSAQ and the operational definition of each factor. Among these experts were three educators with backgrounds in educational measurement and psychometrics (each of whom worked in a four-year university setting), three coaches who worked with students from underserved populations in post-secondary settings, and three professionals from the community college sector. Among the community college representatives were two senior administrators, one of whom has expertise in student success programming, and a senior counselor with a doctoral degree in clinical psychology and experience using noncognitive assessments in student counseling. In total, the SMEs represented five different organizations from geographically varied areas of the United States.

SMEs were instructed to evaluate each item using the following criteria:

1. **Relevance:** Does this behavior seem relevant to this construct or student success generally?
2. **Reading level:** Does this reading level seem suitable for a population of incoming college students? Note: This should include a range of institutions of higher education, including community colleges.
3. **Context:** Could item wording be changed to provide a more authentic context?
4. **Modernity:** Are there dated terms that might limit validity?
5. **Reportability:** Is a respondent capable of accurately reporting this behavior/attitude?
6. **Sensitivity:** Does this item unnecessarily ask the respondent to report sensitive information?
7. **Fairness:** Does this item contain content that might disadvantage or adversely impact a particular population of students?

Based on SME input, items were edited and – where recommended – removed from consideration. The initial item set was then piloted using a sample of 242 college

students from two community colleges and a non-profit organization that coaches students across multiple colleges and universities. The pilot results were used as an initial screen to remove items that showed essentially no correlation to other items within the factor. The results of the pilot analyses are presented in Table 1, showing the reliability of each scale before and after the removal of uncorrelated items.

Item Format and Scoring

All ISSAQ items are presented on a four-point, Likert-type scale (1="Strongly disagree," 2="Somewhat disagree," 3="Somewhat agree," 4="Strongly agree"). As noted in Table 1, several items are reverse-scored. Note that all items in the calmness scale are reverse-scored. This is because the items themselves refer to students' susceptibility to stress, but the factor is reframed to a positive orientation (i.e., more is better) to facilitate score interpretation.

ISSAQ-SS scores are produced in a four-step process. First, the item score is calculated by taking the numerical value of each item response, reverse-scoring where appropriate. Second, the "raw score" is calculated using the mean of those item responses. Third, the "scaled score" is calculated by standardizing the raw score using current ISSAQ population data. In this step, a z-score is calculated by subtracting the raw score from the mean, then dividing by the standard deviation. To facilitate score interpretation (namely to avoid the interpretation of negative scores for students scoring below the mean), a constant is added to the z-score such that the final scaled scores have a mean of 5 and a standard deviation of 1.

Table 1. Reliability of ISSAQ-SS scales before and after initial pilot.

Scale	Pilot Item Set		Operational Item Set		
	Items	Reliability (α)	Items	Reliability (α)	Reverse-Scored Items
Organization	9	.818	8	.824	0
Quality Focus	8	.840	6	.830	0
Engagement	12	.844	9	.856	0
Goal Commitment	12	.832	12	.832	1
Persistence	11	.759	9	.778	1
Effort Focus	11	.624	9	.665	3
Calmness	10	.842	8	.862	8
Coping Strategies	20	.771	15	.795	6
Self-Efficacy	14	.842	11	.837	4
Sense of Belonging	13	.746	10	.771	5
Institutional Commitment	9	.869	7	.876	0
Help Seeking	12	.753	9	.758	6

Scaled scores are important because of the potential misinterpretation of raw scale averages. With measures of cognitive ability, items vary in difficulty. For example, a student could perform well on a test of basic numeracy, but struggle on an essay in English literature. Differences in these scores may not represent differences in the student's math and English ability as much as they represent differences in the difficulty of the two measures. Similarly, raw scores (i.e., averages of item responses) can differ across two noncognitive constructs because of the general tendency for people to agree with certain types of items. Creating scaled scores facilitates the interpretation of scores across individuals, groups, and other variables by placing all factors on the same scale.

While these scaled scores are available to ISSAQ users, there is an additional scoring step for reporting to coaches and students. Given that these scores are intended to determine whether support should be provided, a dichotomous cut-point is determined at .2 standard deviations above the mean. Students above that point receive a "strength" score, indicating that this is a factor upon which they can capitalize to be successful. Students below that point receive an "opportunity" score, indicating that additional work could be required in this area. These scoring classifications were informed by growth mindset research and are labeled as such to encourage students to put forth effort toward improvement.

The use of the .2 standard deviation distinction is, admittedly, limited. For many social scientists, .2 SD's is a well-established benchmark for a small but meaningful effect size, based on an oft-cited 1992 study by Jacob Cohen. While Cohen's guidelines were widely accepted for a time, they have recently received criticism (e.g., Correll, Mellinger, McClelland, & Judd, 2020) because they are, in short, arbitrary, and the standards for "meaningful" effect sizes vary based on field of study, measure, and several other factors. Additionally, such a distinction as this would ideally be based on empirical, rather than normative, criteria. Nevertheless, as empirical criteria are currently unavailable, .2 SD's serves as the current – albeit imperfect – cut score, with plans for future research to explore alternatives.

Administration

The ISSAQ-SS is administered online through the Resonant Education survey platform. Students access the survey through one of two administration methods. In a "cohort" model, students' email addresses are uploaded into the Resonant platform by the college or university, then a direct invitation is sent to the student. The survey invitation contains a unique link so that responses can be tied directly to the students' email address, allowing for more effective linkages to other institutional data. The second method of administration is an "open-link" model, whereby a single URL is created in the Resonant platform. This URL can then be distributed via email or other means so that any student could access the survey.

The advantage of the cohort model is the authentication of student identity and the subsequent ability to tie responses and scores to other data – primarily student success outcomes. The disadvantage of this model is that institutions must know the students they are trying to assess, and those students must have reliable access to the same email used by the institution. In the open-link model, access is the primary advantage: any student who can access the link can respond to the survey. The primary drawback of this approach is that institutions are then reliant on students' self-reports of name, email address, or other identifying information if they wish to tie responses and scores back to institutional data.

Factor Analyses

Sample

Data for the factor analysis were collected from two sources. The first was a “beta-test” administration – an expanded form of the pilot during which live reporting was unavailable to users. The second source was the initial wave of operational testing. Both forms used the same set of items and were only differentiated by the availability of live scoring and reporting to users (“Operational Item Set” in Table 1). Table 2 below shows composition of both the beta ($n=5,461$) and operational ($n=1,516$) samples.

In terms of institution type, 88.2% of the sample came from 4-year institutions, 8.8% came from 2-year colleges, and 2.9% of the sample came from non-profit organizations that coach students at both 2-year and 4-year institutions. Prior to the analyses described below, data were cleaned to remove rushed responses, in which students completed the survey in less than five minutes ($n=191$; <3%). Additionally, the data were cleaned to remove students with missing data. The final list-wise sample size after these considerations was 4,738 students.

Method

A series of unidimensional confirmatory factor analyses (CFAs) were fitted to data from 12 ISSAQ sub-scales to evaluate the fit between the hypothesized factors and student response data. This approach was chosen because of the way in which the ISSAQ model was developed. The ISSAQ-SS model does not represent a singular theory. Thus, the goal of the factor analytic process was not to test a singular, overarching theoretical structure. If that was the case, then a single CFA, modeling all 12 factors, would have been appropriate.

Table 2. Institutional sample sizes in ISSAQ data collection.

Organization	Organization Type	n	% of total Sample
<i>Beta Administration</i>			
A	4-year, public university	5,086	72.9%
B	Community college	188	2.7%
C	Community college	70	1.0%
D	Not-for profit HE coaching organization	69	1.0%
E	Not-for profit HE coaching organization	39	0.6%
F	Community college	5	0.1%
G	4-year, public university	4	0.1%
<i>Total - Beta Administration</i>		<i>5,461</i>	<i>78.3%</i>
<i>Operational Administration</i>			
H	4-year, private university	827	11.9%
B	Community college	355	5.1%
G	4-year, public university	239	3.4%
D	Not-for profit HE coaching organization	95	1.4%
<i>Total - Operational Administration</i>		<i>1,516</i>	<i>21.7%</i>

Moreover, this was not exploratory research designed to establish a unifying theoretical structure. If this was the case, an exploratory factor analysis would have been a suitable first step in articulating a factor structure.

Rather, ISSAQ treats each construct as a distinct factor within a diverse toolkit, integrating multiple theories and bodies of research. Thus, the goal of these analyses was to evaluate the proposed structure and, where appropriate, identify items that do not align to that structure.

Prior to fitting the CFA models, responses were reverse-scored where appropriate. CFAs were conducted using the R package lavaan, version 0.6-9 (Rosseel, 2012). Given multivariate non-normality, CFAs were fitted using the Satorra-Bentler (S-B) post-hoc adjustment for non-normality. To aid in interpretation and model identification, the factor variance was set to 1.0.

For each scale, current and potential “optimal” model fit was evaluated in two-stages. In the first stage, the standardized loadings were evaluated to identify items with a tenuous relationship with the sub-scale construct. Items were considered for removal if the latent factor accounted for less than 10% of the variability in the item (i.e., the square of the standardized loading was < 0.10). 11 items were recommended for removal across all sub-scales (See Table 3).

Table 3. ISSAQ Items Removed Due to Weak Factor-Item Relationship.

Sub-scale	Item	R^2
Goal Commitment	Q30R	0.07
Persistence	Q36R	0.09
	Q37	0.08
Effort Focus	Q45R	0.09
	Q48R	0.06
Coping Strategies	Q63R	0.02
	Q65R	0.01
	Q68R	0.08
	Q74R	0.04
	Q76R	0.01
Sense of Belonging	Q97	0.09

In the second stage, the recommended items were removed, and the CFAs were re-run to evaluate the internal structure of the factors. Each factor’s internal structure was evaluated based on fit of the sub-scale model to the data. As these were the first factor analyses conducted on ISSAQ-SS data, the “optimal fit” models – those excluding the recommended items – are presented here, given that these models will be used in future ISSAQ-SS scoring.

Generally speaking, adequate model-data fit within a factor analytic framework suggests the items relate to one another and the latent factor as theoretically expected. Here, model-data fit was evaluated via four indices: the S-B chi-square of model fit, the comparative fit index (CFI), standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). The S-B chi-square of model fit is a statistical test evaluating fit of the model to the data, where non-significant estimates suggest close model-data fit. However, chi-square indices are highly stringent measures of exact fit, and thus often suggest models do not fit the data, even when the model may be a plausible explanation for the data.

Moreover, chi-square tests are sensitive to sample size and may suggest model-data misfit simply due to large sample sizes. Given these limitations of the chi-square test of model fit, interpretations of model-data fit more heavily relied on CFI, SRMR, and RMSEA.

CFI, SRMR, and RMSEA were evaluated given their sensitivity to model misspecification yet lack of sensitivity to sample size. CFI is an incremental fit index which compares the improvement of a specified model over a baseline model, in this case a model that has complete lack of fit to the data. Higher values are desirable. SRMR is a summary of the average residuals, or difference between the observed and model-implied relationships. Lower values are desirable. RMSEA is a summary of misfit per degree of freedom and accounts for model parsimony. Lower values are desirable. Models were considered to have adequate fit to the data when SRMR and at least one other fit benchmark was met (Hu & Bentler, 1998): CFI > 0.90, SRMR < 0.08, and RMSEA < 0.08 (Hu & Bentler, 1999; West, Taylor, & Wu, 2012).

Although these benchmarks are widely used in educational measurement, they are guidelines and may not generalize in all contexts (Marsh, Hau, and Wen, 2004). As such, inter-item correlation residuals were also considered when evaluating fit of the model to the data. Inter-item correlation residuals represent the difference between the observed and model-implied relationships. Although SRMR also summarizes the difference between observed and model-implied relationships, evaluating inter-item correlation residuals is also valuable because they may highlight areas of misfit which SRMR hides, as well as highlight specific items for further review. Inter-item correlation residuals $> |0.15|$ were considered indicative of local misfit. See Table 4 for the items identified as having local misfit. Large inter-item correlation residuals may be due to lack of item alignment to the construct and/or other items within the scale, wording effects, or other construct-irrelevant factors. In some instances, items with large inter-item correlation residuals were removed for further evaluation of content and general item quality.

It is important to note that fit indices and correlation residuals are empirical tools used to understand model-data fit. However, item content is as equally important and necessary to support interpretations and uses of ISSAQ-SS sub-scale scores. In some instances, it may be beneficial to retain items with less than desirable fit, if the item content is necessary to meet the theoretical and practical interpretations of ISSAQ-SS constructs.

The final 12 ISSAQ-SS factors were evaluated for internal consistency reliability via omega (ω ; McDonald, 1999). Omega was calculated for the factor reliability post-CFA instead of Cronbach's alpha, as Cronbach's alpha is often an underestimate of reliability (DeShon, 1998) in educational settings. Omega was calculated using the R package *semTools*, version 0.5-5 (Jorgensen et al., 2021).

Table 4. ISSAQ-SS Items Identified as Having Local Misfit

Sub-scale	Item	Status	Justification
<i>Organization</i>	Q4	Retained	No clear content reason for misfit
	Q8	Retained	
<i>Quality Focus</i>	Q9	Retained	No clear content reasons for misfit
	Q12	Retained	
<i>Engagement</i>	Q15	Removed	May measure a secondary construct related to attendance
	Q17	Removed	
	Q22	Removed	
<i>Goal Commitment</i>	Q32	Removed	May measure a secondary construct related to support
	Q33	Removed	
	Q34	Removed	
<i>Persistence</i>	Q40	Removed	May measure a secondary construct related to others
	Q41	Removed	
<i>Calmness</i>	Q58R	Removed	Low inter-item correlations and local misfit
<i>Coping Strategies</i>	Q62	Retained	May measure a secondary construct related to problem-solving. Given the large number of items, they were retained so DIA may evaluate the sub-scale in its entirety for content
	Q64	Retained	
	Q69	Retained	
	Q71	Retained	
	Q72	Retained	
<i>Self-Efficacy</i>	Q75	Retained	May measure secondary construct related to life satisfaction
	Q78R	Removed	
	Q81R	Removed	
	Q82	Removed	
<i>Sense of Belonging</i>	Q86	Removed	May measure secondary construct related to pace
	Q90	Retained	No clear content reason for misfit
Q96	Retained		
<i>Institutional Commitment</i>	Q98	Retained	No clear content reason for misfit
	Q99	Retained	
<i>Help Seeking</i>	Q109	Retained	No clear content reason for misfit
	Q113	Retained	No clear content reason for misfit

Results

The fit indices and internal consistency reliability estimates for each of the final 12 models are in Table 5. Sense of Belonging, Calmness, Effort Focus, Engagement, Goal Commitment, Help Seeking, Institutional Commitment, and Persistence were considered to have adequate model-data fit, suggesting alignment between the data and theoretical latent sub-score. Both Organization and Self-Efficacy met the adequate fit benchmark for SRMR but were just outside of the benchmark for RMSEA or CFI. Both Quality Focus and Coping Strategies sub-scales showed several large correlation residuals, suggesting the need for review of these items. For Quality Focus, there was no clear content reason for the misfitting items.

As previously discussed, the Coping Strategies factor is comprised of four approaches – two adaptive and two maladaptive strategies. As such, the large local misfit among items is not surprising. Nevertheless, the theoretical and practical interpretations of these data justify a unidimensional representation of this construct.

Although Institutional Commitment met adequate fit benchmarks for CFI and SRMR, there is local misfit between two items. Given there was no clear content reason for this, those items were retained. These items will be evaluated in future iterations of the survey.

Item-level information is presented in Table 4, which shows items identified as having local misfit, and the Appendix (standardized loadings and R^2 for all items, by subscale). The standardized loadings are interpreted as the standard deviation change in the item response for every change in one standard deviation of the latent sub-scale. The R^2 values represent the variability in item responses accounted for by the latent sub-scale.

Reliability is related to the relationships between and among the item responses and the latent sub-scale. Comparatively, Effort Focus has a more conservative reliability, which is directly related to the relatively weak relationships between the latent sub-scale and items. Items on the Effort Focus subscale will be evaluated in future iterations of the survey.

Note that an additional CFA was not run if the R^2 between a latent factor and an item dropped below 0.10 after the initial removal of items with weak factor-item relationships. Two items (Q46R, Q51) on the Effort Focus sub-scale have a factor-item relationship < 0.10 . These items did not present local misfit, but given their weak factor-item relationship, they may not measure the same construct as the rest of the Effort Focus items and will be evaluated in future versions of the survey.

Conclusions from CFA

It is common for research efforts to begin with an exploratory factor analysis to establish a theory's viability, then subsequently use confirmatory factor analyses to verify a theoretical model. Here, we have used confirmatory factor analyses as an earlier step in scale development because the ISSAQ-SS stood on a substantial amount of extant research. Additionally, CFAs were used – not to establish theoretical structure – but to support score validity. In other words, the issue was not to determine the optimal empirical structure of the 113 items on the ISSAQ-SS, but rather (a) to determine if the current score structure is tenable and (b) why improvements should be made in future versions of the survey. These analyses have achieved both goals. First, the model-data fit across scales was adequate to support the current scoring structure. Additionally, items across several scales were identified to either be edited, removed, or replaced in future versions of the ISSAQ-SS.

Table 5. CFA Results for ISSAQ Sub-scales.

Sub-scale	Items	S-B chi-square	df	RMSEA (upper CI , lower CI)	CFI	SRMR	Reliability (ω)
Organization	8	957.057*	20	0.11 (0.11 , 0.12)	0.90	0.05	0.85
Quality Focus	6	660.922*	9	0.14 (0.13 , 0.15)	0.87	0.06	0.76
Engagement	6	360.697*	9	0.11 (0.10 , 0.12)	0.95	0.05	0.81
Goal Commitment	8	480.277*	20	0.09 (0.08 , 0.10)	0.92	0.04	0.77
Persistence	5	113.304*	5	0.08 (0.06 , 0.09)	0.97	0.03	0.76
Effort Focus	7	261.109*	15	0.07 (0.06 , 0.07)	0.89	0.04	0.58
Calmness	7	942.53*	14	0.13 (0.12 , 0.14)	0.93	0.04	0.90
Coping Strategies	10	3822.432*	35	0.17 (0.16 , 0.17)	0.71	0.12	0.83
Self-efficacy	7	376.384*	14	0.08 (0.08 , 0.09)	0.93	0.04	0.76
Sense of Belonging	9	711.180*	27	0.09 (0.08 , 0.09)	0.90	0.05	0.79
Institutional Commitment	7	566.783*	14	0.11 (0.10 , 0.11)	0.95	0.04	0.87
Help Seeking	9	893.435*	27	0.09 (0.08 , 0.10)	0.91	0.05	0.82

* $p < 0.05$

Success Indices

Predicting student success is one of the primary uses of the ISSAQ-SS. As such, in addition to data on the individual ISSAQ-SS factors, institutions are also provided with composite success indices designed to help focus levels of intervention based on a student's likelihood of success.

Indices are provided in two domains. First, an academic success index is provided to indicate students' likely grades in college-level courses. Second, a retention index is designed to indicate the students' probability to persist over time. As noted, previous large-scale studies have shown that academic and non-cognitive factors differ in their ability to predict these outcomes, suggesting the need to create different composite scores for each (Robbins et al., 2004; Markle et al., 2013).

To create the success index scores, the 12 noncognitive factors are combined with student self-reports of previous academic success (high school GPA, standardized admissions test scores). As not all students will have complete data, all scores are placed onto a z-score scale to accommodate such situations. In this way, a student with no data available receives a score of zero – imparting the average impact of that factor (i.e., 0) - onto the success index.

Table 6. Academic and noncognitive factor weights in calculating success indices.

Factor	Academic Weight	Retention Weight
Test Score	1.00	.50
HSGPA	1.00	1.00
Calmness	.00	.00
Coping Strategies	.00	.00
Effort Focus	.00	.00
Engagement	.50	1.00
Goal Commitment	.50	1.00
Help Seeking	.00	.50
Institutional Commitment	.00	.00
Organization	.25	.00
Persistence	.25	.25
Quality Focus	.25	.00
Self-Efficacy	.50	.50
Sense of Belonging	.00	.50

Scores are then weighted to calculate the index. As outcomes data were not available at the time of development, weights are based on the extensive body of research cited in this report. Thus, success indices currently use a logical, rather

than empirical weighting to identify a student's likelihood for success. Table 6 shows the weight of each factor in success index calculation.

In reporting success index scores, a growth mindset-informed approach is again used. Normative scoring (e.g., low, medium high) may reinforce a fixed mindset among students and those working with them. Thus, while a quantitative cut is used to establish score bands, scores are reported with qualitatively different actions.

Students scoring at .2 standard deviations below the mean or lower on either success index are given a score of "Support," suggesting active outreach is necessary. Students scoring between within .2 SDs of the mean are given a score of "Engage," suggesting that those students could benefit from connecting with existing institutional resources. Finally, students scoring the highest - .2 SD's above the mean or more – are given a score of "Guide." This suggests that students are likely to be successful but could benefit from connecting with either targeted support resources (based on individual noncognitive characteristics) or with resources that could advance their learning and development (e.g., undergraduate research, serving as peer mentors).



Conclusions, Future Directions

This report outlines the extensive work put forth to this point to ensure that the ISSAQ-SS is a high-quality tool for identifying student strengths and challenges, supporting student success interactions, and ultimately improving success in higher education. As shown here, the 12 ISSAQ-SS factors are based on a comprehensive review of the literature – conducted with intended assessment uses in mind – that integrates multiple theoretical perspectives to outline a diverse set of noncognitive tools important for student success. The item development process was both closely tied to the research review, but also informed by input from subject matter experts in higher education. Finally, the confirmatory factor analyses conducted here provide structural validity evidence to support the current score structure.

With that, there is still a great deal of work ahead for the ISSAQ-SS. To both extend and validate this body of research, there are several general areas that will be explored.

Validation and Scale Improvements

It is worth reiterating that the factor analysis efforts conducted here were an initial empirical evaluation of score viability and examination of potential item adjustments. While these goals were achieved, there is potential that the observed model-data fit capitalized on the sample at hand, rather than a true reflection of the

structure of these items with the underlying theory for ISSAQ-SS sub-scales. Future studies should validate these models on other data to verify the current results.

Moreover, items recommended for removal or content review should be thoroughly examined to determine if they should be revised and added back into the scoring model, or if they are truly not needed to represent the theoretical and practical interpretations of the ISSAQ-SS factors.

Future research could also consider the response scale of the survey or the type of analysis used to examine its validity. Generally, items with five or more response options are considered continuous for practical use. All ISSAQ-SS sub-scales have a four-point response scale. As such, an ordinal CFA model may be an appropriate alternative. An ordered CFA model was evaluated for the Coping Strategies scale, and when comparing results, fit did not appear to differ from the continuous CFA model. Given fit did not dramatically differ, the underlying construct of ISSAQ-SS subscales was considered continuous. However, future studies may consider ordered CFAs for future iterations of internal structure validity evidence. Alternatively, a broader response scale (i.e., five or more response options) may be considered.

External Validity Evidence

Given ISSAQ's focus on student success, the most pressing need is to relate ISSAQ-SS data to tangible student success outcomes. Given the wealth of research into noncognitive assessment and student success, we believe ISSAQ-SS stands on solid ground in its present state. However, validity evidence must be continually gathered and evaluated. Thus, future studies will correlate ISSAQ-SS data to academic and retention outcomes. These results can help to inform multiple aspects of the survey, including item selection, scoring, reporting benchmarks (i.e., success index cut scores), and factor weighting.

Fairness

Ensuring the fairness of the ISSAQ-SS across groups is of great importance, and psychometric analyses provide many mechanisms for evaluating potential bias across key subpopulations. Future studies should consider multi-group CFAs and invariance studies to evaluate the structure of ISSAQ-SS across gender, racial or ethnic groups, socioeconomic status, and other key student variables.



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Appendix: Standardized Loadings and Item R² for ISSAQ-SS Sub-scales.

Sub-scale	Item	St. Loading	R²
<i>Organization</i>	Q1	0.644	0.415
	Q2	0.725	0.526
	Q3	0.563	0.317
	Q4	0.650	0.423
	Q5	0.619	0.383
	Q6	0.617	0.381
	Q7	0.668	0.446
	Q8	0.665	0.442
<i>Quality Focus</i>	Q9	0.594	0.353
	Q10	0.583	0.340
	Q11	0.596	0.355
	Q12	0.586	0.343
	Q13	0.617	0.381
	Q14	0.579	0.335
<i>Engagement</i>	Q16	0.785	0.616
	Q18	0.813	0.661
	Q19	0.745	0.555
	Q20	0.599	0.359
	Q21	0.474	0.225
	Q23	0.502	0.252
<i>Goal Commitment</i>	Q24	0.572	0.327
	Q25	0.753	0.567
	Q26	0.704	0.496
	Q27	0.551	0.304
	Q28	0.528	0.279
	Q29	0.693	0.480
	Q31	0.520	0.270
<i>Persistence</i>	Q35	0.419	0.176
	Q38	0.642	0.412
	Q39	0.647	0.419
	Q42	0.642	0.412
	Q43	0.496	0.246
	Q44	0.675	0.456

Sub-scale	Item	St. Loading	R²
<i>Effort Focus</i>	Q46R	0.219	0.048
	Q47	0.592	0.350
	Q49	0.416	0.173
	Q50	0.495	0.245
	Q51	0.274	0.075
	Q52	0.391	0.153
	Q53	0.484	0.234
<i>Calmness</i>	Q54R	0.798	0.637
	Q55R	0.762	0.581
	Q56R	0.787	0.619
	Q57R	0.560	0.314
	Q59R	0.734	0.539
	Q60R	0.771	0.594
	Q61R	0.746	0.557
<i>Coping Strategies</i>	Q62	0.651	0.424
	Q64	0.499	0.249
	Q66	0.764	0.584
	Q67	0.712	0.507
	Q69	0.563	0.317
	Q70	0.710	0.504
	Q71	0.467	0.218
	Q72	0.526	0.277
	Q73R	0.318	0.101
Q75	0.533	0.284	
<i>Self-efficacy</i>	Q77R	0.577	0.333
	Q79R	0.579	0.335
	Q80	0.476	0.227
	Q83	0.571	0.326
	Q84	0.595	0.354
	Q85	0.705	0.497
	Q87	0.463	0.214

Sub-scale	Item	St. Loading	R²
<i>Sense of Belonging</i>	Q88R	0.649	0.421
	Q89	0.482	0.232
	Q90	0.377	0.142
	Q91R	0.442	0.195
	Q92R	0.688	0.473
	Q93R	0.729	0.531
	Q94R	0.633	0.401
	Q95	0.378	0.143
	Q96	0.457	0.209
<i>Institutional Commitment</i>	Q98	0.623	0.388
	Q99	0.647	0.419
	Q100	0.803	0.645
	Q101	0.762	0.581
	Q102	0.745	0.555
	Q103	0.760	0.578
	Q104	0.543	0.295
	<i>Help Seeking</i>	Q105R	0.657
Q106R		0.747	0.558
Q107R		0.716	0.513
Q108R		0.814	0.663
Q109		0.443	0.196
Q110R		0.392	0.154
Q111R		0.493	0.243
Q112		0.389	0.151
Q113		0.418	0.175