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Assessing Resilience as a Virtue in Learners: Development of a New Scale for Academic Resilience

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College student living life to the max. Interests in the field of psychology and intersections with learning.

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Development of a New Instrument for Academic Resilience.

Abstract:
Resilience is a learner disposition that serves as an aspect of the virtue of fortitude. While many measures exist that examine resilience, few do so in an educational context. Existing scales of academic resilience (e.g., ARS-30) tend to measure resilience as a process by which persons overcome adversity. However, resilience also enables students to achieve their goals and improve their learning outcomes. Factors indicative of this process, such as self-efficacy, adaptive coping, exploration, and willingness to change learning approaches when needed, are not measured in the ARS-30 or other current resilience scales. The proposed Values Resilience Scale (VRI) under study measures resilience as a process that enables one to overcome academic adversity so as to achieve one's fullest academic potential. Such a measure would allow educators to identify students who may be hindered from reaching their utmost potential through their lack of academic resilience, and help students and faculty better integrate the virtue of resilience into student learning experiences. This paper examines the development, reliability, and validity of the VRI.

Resilience and its Role

Resilience reflects the ability or willingness to 'bounce back' and persist in the effort to achieve a goal when faced with challenges [1]. Beliefs related to resilience increase the likelihood that an individual will act resiliently but are not in themselves "resilience". Consequently, resilience is more related to a habitual attitude and is better modeled as a disposition. When supportive of the good, resilience becomes an aspect of the virtue of fortitude [2]. When viewed through a lens of psychometrics, resilience relates to the psychological disposition of self-efficacy, the belief that one's goals can be attained despite obstacles.

Resilience plays a key role both for the professional and for the learner, as these factors influence and help shape the learning process [3]. A study among engineering education graduates found that resilience was ranked as the third most important attribute in achieving success in their academic program [4]. Likewise, resilience has been listed as one of four attributes essential for successful engineers as a lifetime learner [3][5]. For faculty to help form resilience, or any virtue, in their students, it is key that they have tools to reliably assess how students value that particular virtue [2]. Recognizing the expected contribution of resilience for engineering students both as learners and virtuous professionals, this work focuses on an exploratory scale for assessing student valuation of resilience and factors in academic resilience that appear optimal for learning outcomes. At the time of this writing, this work in developing an instrument for assessing student valuation of resilience is still in progress. The paper presents our resilience scale, its initial findings, and the validation process for assessing academic resilience. This

includes a brief introduction relating value with factors related to optimal learning that are also present in our construct of academic resilience.

Introduction

Beliefs related to self-efficacy have been found to significantly enhance a student's academic performance over the academic year [4]. Self-efficacy is the foundation of resilience and the development of perseverance [5]. Resilient students believe in their ability to succeed and persist in their learning despite obstacles which allows them to obtain more positive outcomes than students lacking in academic resilience [1][6]. Resilience not only allows students to overcome adversity, but also to efficiently achieve better outcomes.

Current surveyed measures of academic resilience include the ARS-30, Student Resilience Survey, ELLI, Resilience at Secondary School Scale, and Resilience Scale for College Students. While these scales measure aspects of resilience predicting and measuring a student's ability to recover from obstacles, they give little attention to aspects of resilience vital to optimal learning such as self-efficacy and an openness to changing academic strategies to obtain better outcomes [1][7][8][9]. Recent research suggests that values held by students influence their ability to perform certain academic behaviors [10]. This suggests that students who agree with statements such as "A student should try his or her best" will be more predisposed to persevere than students who disagree.

Assessing Resilience: Framing an Instrument

Resilience is a multi-faceted construct which can include factors from social support to perseverance, depending on the situation in which positive adaptation despite adversity occurs [11]. Given the variety of factors related to the construct of resilience, we identified those that were most closely related to resilience and learning, and particularly those more indicative of the valuing of resilience. How values in learning affect learning outcomes stems from students' receiving, responding, and ultimately valuing, a particular disposition, as proposed in Bloom's affective domain taxonomy [12]. Given prior research that indicates that such valuing affects student outcomes, we predict that students who value resilience will be more likely to demonstrate academic resilience and better achieve their learning outcomes. Drawing on scholarship in valuing and resilience, Table 1 displays a set of factors identified as being relevant to both learning and resilience and provides a brief explanation of how these factors are exhibited in resilient students.

Table 1. Empirically-based Factors for Learning and Resilience

Values in Learning	Values in Resilience
Fortitude: A student should try his best [1], [9].	Fortitude should be included in a measure of academic resilience. Resilient students try their best [13].
Self-Efficacy: A student can succeed [1],[6], [8], [9].	Self-efficacy should be included in a measure of academic resilience. Beliefs in one's ability to succeed are the foundation of all resilience [3], [1], [13], [14].

Willingness to overcome obstacles/make mistakes [8], [9].	Willingness to overcome obstacles/make mistakes should be included in a measure of academic resilience. Resilience is the willingness to overcome obstacles to achieve goals [1], [11], [13]-[15].
Willingness to explore what is the subject of learning [1], [9].	Exploration: A student should explore and pursue academic interests and goals. Exploration should be included in a measure of academic resilience. Resilient students achieve better-than expected outcomes because they explore/pursue beyond what is required [1], [9], [14], [15].

The starting point for developing our exploratory scale was to connect student valuing of academic resilience (e.g., Table 1) with factors/components of other resilience scales that might provide insight into a students' academic resilience. Beyond valuing of resilience, several factors of academic resilience present in the literature were leveraged: Adaptive Coping, Perseverance, Self Esteem, and Predictors of Resilience. Perseverance and the ability to cope with adversity (Adaptive Coping) were the actions most commonly associated with resilience and were found in nearly every surveyed resilience scale [14] [15][16][17][18]. Self-Efficacy was identified as being the basis of resilience, and it is typically included in measures of this construct [3][13].

Predictors of resilience such as social support and optimism bias have historically been an effective way of measuring resilience [13]. Twelve items were selected from among these published scales that tracked with our goals of assessing valuing of academic resilience. Previously validated items from refereed sources (e.g., [1],[7],[13],[17],[18],[19]) that corresponded to our model for academic resilience were adapted for first-draft inclusion. The comparison of these scales to the items identified as predictors of student valuing of resilience are presented in Table 2.

Table 2: VRI Scale items modified from prior resilience scales

Resilience Scale	Modified Items
CD-RISC [13] (Selected 5/25)	I have no one in my life who will always be there for me My life has purpose I take pride in having overcome past obstacles I cannot overcome my academic difficulties
Student Resilience Survey [7] (Selected 2/47)	Getting a bad grade would lower my self esteem I can manage stress from school
Dispositional Resilience Scale [17] (Selected 1/45)	One cannot improve one's ability to learn new material.
Brief Resilience Scale [18] (Selected 1/6)	Academic obstacles make me want to give up
ARS-30 [1] Selected (2/30)	I try my best to succeed academically despite obstacles When faced with academic challenges, I work harder to overcome them

ELLI [8] Selected (1/NA)	I explore other approaches when my strategy appears ineffective

Instrument Design

Leveraging the items and factors identified in Table 2, the research team formulated a 25-question Valuing Resilience Instrument (VRI) aimed at a 7-10 minute completion time. As 20% of the VRI instrument parallels the CD-RISC instrument, we plan to use the CD-RISC as a means of observing concurrent validity. Figure 1 presents the initial version of the VRI, as deployed with the Phase I (first) pilot.

Figure 1. Draft Valuing Resilience Instrument (VRI)

1	I can become a better learner
2	I cannot overcome my academic difficulties
3	Getting a bad grade would lower my self esteem
4	I will achieve my academic goals
5	I can learn anything I put my mind to
6	I am responsible for my academic sucess and failure
7	I cannot learn from my academic mistakes and failures
8	I can manage stress from school
9	School prevents me from being able to relax
10	When I cannot overcome an academic obstacle, I am open to new ways of studying and learning.
11	As needed, I actively work to improve the way I learn and study
12	One cannot improve one's ability to learn new material.
13	I learn from my academic mistakes
14	I am afraid of making mistakes
15	Academic mistakes do not discourage me
16	I try my best to succeed academically despite obstacles
17	It is important for a student to do his or her best
18	When faced with academic challenges, I work harder to overcome them
19	Academic obstacles make me want to give up
20	Perseverance is essential for academic success
21	My life has purpose
22	I have no one in my life who will always be there for me
23	I take pride in having overcome past obstacles
24	I explore other approaches when my strategy appears ineffective
25	I have modified my learning to improve academic results

Instrument Validation

The value of any instrument, and particularly one that attempts to assess aspects of the affective domain, lies in establishing its reliability and validity. To do so, the planned analysis includes three aspects: descriptive statistics, reliability calculations, and validity determinations. Once a finalized scale is developed, each will be approached in the following manner:

Descriptive Statistics:

1) A distribution of total scores (after reverse scoring is applied to appropriate questions) will be examined for skewness and approximations of a normal distribution.
2) Means and Standard Deviations of overall test score data will be calculated.
3) These data will be compared with the descriptive information (course, sex, major, year in school, etc.) available to check for similarity of responses between groups.

Reliability Measures:

1) Internal consistency will be determined by means of a coefficient alpha, examining the extent to which each item contributes to the total score on the test, and thereby also determining if any items do not meaningfully contribute to the scale.
2) A test-retest correlation will compare data taken approximately 12 weeks apart. Overall test scores from these two sessions will be compared via a Pearson's Product Moment Correlation to examine for consistency in responding.

Validity Measures:

1) Convergent Validity will be examined with a Pearson Product Moment Correlation, examining test scores on this newly derived instrument with the CD-RISC, an established measure of resilience **[13]** .
2) Criterion Validity will be correlated through a Pearson Product Moment Correlation examining the relationship between test scores and cumulative GPA. Tests and other representative course assessments, as well as the class grade, will be matched against faculty-perceived improvement in the class and their observations of resilient behavior for their students.
3) A factor analysis will be conducted to examine if sub-scales exist within the measure, and the extent to which they match the hypothesized loading mentioned on Figure 2. The factor analysis will also serve as a secondary means to check for internal consistency.

Phase I-III Experimental Design

The overall experimental design process has broken into three phases: an initial 'Phase I' on a more restricted population, and a 'Phase II' and 'Phase III' with student participants from multiple majors. While Phase I data collection is complete, Phase II will begin during the Spring 2023 semester. Phase III is planned for Fall 2023.

Phase I: Initial VRI Development

The Phase I VRI (Figure 1) was developed in Microsoft Forms, and respondent data was stored on a secure university OneDrive System. Demographic questions were also added to the survey measuring gender, age, GPA, student grade level, and the grade students expected to receive in the course.

Phase I Participants

Following IRB approval, undergraduate students who were taking psychology classes at the authors' university were invited to participate in a pilot study by their university instructors for extra course credit. A link to the online Microsoft Forms survey was provided so that students could complete the survey at their convenience. The first survey question screened participants for the required age of 18. Participants meeting this criterion then reviewed the consent form approved by the IRB, and those desiring to participate answered the rest of the questions as presented to them. Forty-seven participants chose to complete the survey, with one person unable to continue after identifying their age as less than the required age for consent (18). When they finished, they were thanked for their time. Descriptive statistics for study participants can be found in Table 3.

Table 3. Phase I Participant Demographics (n = 46)

GPA	Mean = 3.21	SD = 0.61		
Age	Mean = 19.96	SD = 1.48		
Sex	24% Male	76% Female		
Grade Level	37% Freshman	13% Sophomore	20% Junior	30% Senior
Expected Grade	46% A	52% B	2% C	0% Below C

Phase I Results

A Kaiser-Meyer Olkin (KMO) factor adequacy was run, and a cut-off below .55 was used to identify and eliminate underperforming items. This KMO adequacy was rerun with the top items until item removal did not improve the overall Measurement System Analysis (MSA). The purpose of MSA computation was to assure that a selected measurement system delivers reliable results with repeatability and reproducibility and determines if a measurement system is capable of precise measurement. Of the initial 25 items, 14 items remained with the resulting MSA of 0.77. These items and their individual MSAs are listed in Table 4.

Table 4. Phase I Measurement System Analysis ratings for top items.

Item	Item 4	Item 5	Item 6	Item 7	Item 10	Item 11	Item 13	Item 15	Item 16	Item 17	Item 18	Item 19	Item 24	Item 25
MSA	0.80	0.80	0.67	0.72	0.72	0.78	0.90	0.83	0.70	0.71	0.79	0.77	0.74	0.81

Subsequently, a Coefficient Alpha was calculated on the 14-item scale, and the resulting Alpha value was .85. Furthermore, removing any of these items would not improve reliability of the scale. Preliminary data supports a four-factor solution.

Phase II: VRI Item Revision

The project is currently at this state. Additional items were written, as it was deemed that a 14-item scale would be too brief to adequately support reliability and validity of this construct; bringing the total number of items to 39. These set of items, will be administered to groups of undergraduate students from varying STEM majors. Following this, the KMO factor adequacy, MSA, Coefficient Alpha, and Factor Analysis will be conducted. Depending on these outcomes, some items on the scale may be deleted if they are determined to not adequately measure the construct.

The participants in Phase II will also complete the CD-RISC, and scores on the VRI and CD-RISC will be correlated by means of a Pearson Product Moment Correlation to determine concurrent validity.

Phase III

1. With Phase III participants, test-retest reliability will be calculated for the VRI, via a Pearson Product Moment Correlation, on students who will take the instrument twice, approximately 8 weeks apart.

2. The collection and collation of faculty observations will be made. To support criterion validity, VRI scores will be correlated with faculty ratings of resilience, including identifying students who attended office hours, sought tutoring, etc., the extent of improvement in learning performance over the course of the semester, and their final grades in the course. This will be done through a structured interview and/or questionnaire.

Summary

This paper presents work-in progress on the development and validation of the VRI instrument that targets assessing students' valuing of academic resilience. Our intent with the development of the VRI is to better support faculty in addressing student resilience, and support student growth of a disposition toward resilience in their learning. The paper presented the motivation, framing and validation approach for the instrument. The value of this work is to better understand resilience and its impact on learners, and to contribute to the understanding of student valuing of resilience as actioned/represented by their self-reported attitudes and related actions.

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