



White Paper

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# 2022 Scientific Evidence for the HESI<sup>®</sup> Admission Assessment (A2) for Nursing and Healthcare Education Programs



# 2022 SCIENTIFIC EVIDENCE FOR THE HESI ADMISSION ASSESSMENT (A2) FOR NURSING AND HEALTHCARE EDUCATION PROGRAMS

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## INTRODUCTION

Employment in healthcare is projected to grow 16% over the next 10 years, faster than any other occupational group in the US. According to the Bureau of Labor Statistics ([Occupational Outlook Handbook – Healthcare Occupations](#)), the total number of job openings in healthcare is expected to reach 2.6 million by 2030. To help fill the growing number of positions, nursing and healthcare education (NHE) programs need to prepare more graduates. However, low numbers of enrolled students and high attrition rates are common concerns among programs that contribute to the workforce shortage.

Large numbers of qualified applicants are rejected from NHE programs. According to the NLN 2019-2020 Biennial Survey (Mazinga, 2021), Associate Degree in Nursing (ADN) programs had the highest number of rejected qualified nursing applications at 35%, followed by Bachelor of Science in Nursing (BSN) programs (29%), and Practical/Vocational Nursing (PN/VN) programs (25%). Applicants were turned away due to reasons such as faculty shortages and limited availability of clinical sites (NLN, 2020).

NHE student attrition also contributes to the declining numbers of program graduates (Hamshire et al., 2019). Attrition rates vary with estimates of 20-30% in radiography (Dougherty, 2017; McAnulla et al., 2020), nursing (Caponnetto et al., 2021), and respiratory therapy programs (Kinkle, 2020). Student attrition is slightly lower but still a concern in paramedic (15-20%; Tilghman, 2022) and dental hygiene programs (10%; Moore et al., 2016; Sanderson, 2014). Given limited student enrollment, retaining students admitted into NHE programs is paramount.

Admission testing is an important factor in identifying qualified NHE program applicants. A selective admission process enables programs the opportunity to select applicants demonstrating the necessary academic knowledge and skills needed for student success. Many NHE programs use standardized admission exams designed to assess academic readiness and identify weaker content areas. Using outcomes of standardized assessments assist program administrators in making data-informed admission decisions (Holmström et al., 2022; Noone & Najjar, 2021). Admission criteria for NHE programs vary within and across disciplines. Programs noted below<sup>1</sup> are among those most commonly reporting completion of a standardized assessment as part of the admission process.

<sup>1</sup> Findings provided by a focused review of websites associated with nursing and healthcare education programs. Programs listed alphabetically.

- Dental Assisting
- Dental Hygiene
- Emergency Medical Science/Paramedics
- Health Sciences
- Licensed Practical Nursing/Licensed Vocational Nursing
- Medical Assisting
- Medical Laboratory Technology
- Physical Therapy Assistant
- Registered Nursing
- Radiography/Radiologic Technology
- Respiratory Therapy
- Sonography
- Surgical Technology
- Veterinary Technology

Although admission criteria vary by health profession, a common consideration concerns the ability of a student to succeed in the program (Kinkle, 2020; Menser & Hughey, 2020; Moore et al., 2016; Rudy et al., 2017). Identifying the strongest indicators of student success outcomes is imperative for NHE programs. Admitting students who are academically prepared for the rigors of an NHE curriculum could improve student retention rates and produce graduates who can fill vacancies in the current healthcare workforce.

The purpose of this paper is to provide an overview of the HESI Admission Assessment (A2) and examine recent research related to its use in NHE programs. The following question guided the literature search: For NHE program applicants, which A2 exams and performance scores are correlated to student academic success? Implications for NHE programs and suggestions for future research are discussed.

## OVERVIEW OF THE HESI ADMISSION ASSESSMENT (A2)

The A2 is a standardized and proctored entrance exam completed by applicants of NHE programs. The exam has been used for over 20 years to assess the academic readiness of prospective students for diverse programs. The A2 also identifies students' academic strengths and areas where improvement may be needed to fully support their academic program success. The A2 evaluates knowledge and skills in three primary academic areas: English Language (measured by exams in Reading Comprehension, Grammar, and Vocabulary), Math (measured by a Basic Math exam), and Science (measured by exams in Anatomy and Physiology, Biology, and Chemistry). Each of the seven A2 exams yields a percentile performance score representing the applicant's academic knowledge and skill. A composite percentage score is provided by averaging the results of all exams completed. Table 1 provides a visual overview of the A2's structure.

**Table 1: Academic Areas, Exam Descriptions, and Details**

A2 Academic Area and Exams	Exam Description	Number of Scored Items	Estimated Time to Complete (minutes)
<b>English Language (160 minutes)</b>			
Grammar	Important grammatical terms and uses in grammar, common grammatical errors, parts of speech	50	50
Reading Comprehension	Health-related reading scenarios – to identify main ideas, understanding of passages and words in context, logical inferences	50	60
Vocabulary and General Knowledge	Words used in healthcare and general settings	50	50
<b>Math (50 minutes)</b>			
Basic Math Skills	Basic addition, subtraction, multiplication, fractions, decimals, ratios and proportions, household measures, etc.	50	50
<b>Science (75 minutes)</b>			
Anatomy/Physiology	General A/P terminology, anatomical structures, and systems	25	25
Biology	Water, biological molecules, metabolism, cells, cellular functions, photosynthesis	25	25
Chemistry	Physical and chemical matter, periodic table, chemical equations, reactions, bonding	25	25
<b>Composite</b>			
Dependent on Exams Administered	Averaged performance score from all completed exams		

A2 scores indicate prospective students’ academic knowledge and skills, and interpretive parameters identified in the [HESI A2 Faculty Scoring Guide](#) help provide context for the results. In general, scores of 90-100% represent ‘excellent’ academic ability to support future program success. Scores ranging from 80-89% suggest ‘very good’ preparation for success. Scores less than 80% are interpreted and differentiated by academic levels. Preparation is considered ‘satisfactory’ for scores of 75-79% for applicants to associate or baccalaureate healthcare education programs. For applicants to certificate programs (such as practical nursing or medical assisting), scores of 70-79% indicate ‘satisfactory’ preparation for success. Applicants attaining scores lower than satisfactory may need educational remediation to successfully complete a healthcare education program.

Quality standards to optimize the A2's ability to evaluate applicant knowledge and skills are incorporated into exam construction, administration, and evaluation. A2 items are written by subject matter experts who have participated in extensive standardized item-writing training. All items are reviewed for editorial style, content, and potential biases. After development, each item is pilot tested before it is used as a scored component of an exam. Items are reevaluated each time an exam is given and nationally normed. Performance scores are calculated from test items that are randomized within each exam. Reliability estimates (KR-20) of the A2 exams range from 0.90 - 0.99 (Chen & Voyles, 2013). Multiple versions of each exam are available if repeated assessment is needed. Programs can elect to administer all seven A2 exams or customize the number of exams to ensure those administered are most pertinent to NHE programs.

There are several benefits for NHE programs incorporating the A2 into their admission processes. Scoring reports available to institutions and program applicants identify areas of strength and areas of weakness that may need academic remediation. These reports help institutions identify academic areas where developmental activities may be needed to enhance student success. Understanding a priori where an applicant or cohort of applicants may need additional support can enhance program planning. Program applicants seeking to improve their A2 scores can use remediation content prior to repeat testing. The [HESI Admission Assessment Exam Review](#) is also a useful resource for applicants to prepare for the A2 or improve their scores.

## LITERATURE REVIEW

### Methods

Scholarly literature databases and repositories were searched to secure relevant research in NHE disciplines. The following question guided the literature search: For NHE program applicants, which A2 exams and performance scores are related to student academic success? Indicators of academic success were not identified a priori but emerged from the relevant literature. Research databases included CINAHL, Medline, and ERIC. ProQuest was searched to evaluate dissertation and thesis research published on the topic. Professional conference repositories were accessed to include gray literature. To enhance relevance of the findings, only recent literature published or disseminated between 2012 and 2022 was included.

### Results

Nineteen scholarly works met the search criteria. All studies were retrospective and descriptive in nature, and both correlational and comparative studies were found. Correlational studies reported A2 scores *related* to student success while comparative studies reported *differences* in A2 scores of successful versus unsuccessful students. Some studies combined A2 exam scores *with other predictors* to look at variance in success outcomes, and in these cases an A2 score indicative of student success was not reported. Minimum admission criteria for the programs studied were not clearly provided in the published research findings.

Relevant findings of each study are presented in the review of the literature in Table 2. Demographics of the study sample are reported as they were described in the original research studies. All studies provided clear identification of the academic program and student sample size, but most reported limited additional sample demographics.

Table 2: Literature Review

Author(s) and Year	Program Type (Sample N) Demographics	A2 Exam	Indicator(s) of Student Success	Exam Scores and Significant Outcomes *p<.05; **p<.01
Bennett et al., 2016	BSN (341) Female: 88% White: 92%	Composite (Modified) • A/P • Math • Reading	Program Completion, NCLEX®FTPR	<u>Program Completion and FTPR</u> • A/P*
Bevel, 2020	PN (93) Female: 93% White: 72%	• Reading	Program Completion	Program Completion • Reading (77.75 vs 70.35)**
Bodman, 2012	ADN (263) Female: 82% White: 90%	Composite (Modified) • Biology • Chemistry • Math • Reading	First-Year Success, Program Completion, HESI Exit Exam Scores	<u>First-Year Success</u> • Composite (85.70 vs 81.87)** • Biology (78.37 vs 67.89)** • Chemistry (76.90 vs 72.70)** <u>Program Completion</u> • Composite** • Biology** • Chemistry** • Math (91.10 vs 88.86)* <u>HESI Exit Exam Scores</u> • Composite**
Cahill, 2019	BSN (387) Female: 86% Mean Age=29	Composite	Program Completion, NCLEX Success	<u>Program Completion</u> • Composite (83.04)* <u>NCLEX Success</u> • Composite
Chen & Voyles, 2013	ADN (506) Female: 80% White: 18% Asian: 41% Hispanic: 32% ESL: 32%	Composite (Modified) • A/P • Grammar • Math • Reading • Vocabulary	First-Term Success	<u>First-Term Success</u> • Composite (81.33 vs 75.15)** • A/P (73.03 vs 68.38)** • Grammar (86.33 vs 79.81)** • Math (84.89 vs 76.49)** • Reading (84.46 vs 78.26)** • Vocabulary (77.96 vs 72.74)**
Dale, 2020	ADN (750) Hispanic: 46%	• English • Math • Science	Program Completion	<u>Program Completion</u> • English** • Math** • Science**

Author(s) and Year	Program Type (Sample N) Demographics	A2 Exam	Indicator(s) of Student Success	Exam Scores and Significant Outcomes *p<.05; **p<.01
Hinderer et al., 2014	BSN (89) Female: 93%	Composite	Program Completion, NCLEX FTPR	<u>NCLEX-FTPR</u> • Composite (84.00)**
House, 2013	BSN (155) Predominantly white females	• A/P • Math • Reading	First-Term Success, First-Year Success	<u>First-Term Success</u> • A/P (73.75)** • Math (89.81)** • Reading (88.70)* <u>First-Year Success</u> • A/P* • Math**
Knauss & Willson, 2013	ADN (157) Female: 88% White: 87% Age: 78% between 19-34 years of age	Composite (Modified) • A/P • Grammar • Math • Reading • Vocabulary	First-Term Success	<u>First-Term Success</u> • Composite (87.18)** • Grammar (90.72)** • Math (88.01)* • Reading (86.40)** • Vocabulary (83.56)**
Manieri et al., 2015	ADN (171) (Additional demographics not provided)	Composite	Program Completion	<u>Program Completion</u> • Composite**
Marshall, 2021	ADN (366) Female: 86% Mean Age = 29 Pell Grant Eligible = 63%	Composite	Program Completion	<u>Program Completion</u> • Composite (83.71 vs 80.54)**
Reinhardt et al., 2019	BSN (350) White: 49% Hispanic: 50%	Composite • A/P • Biology • Chemistry • Grammar • Math • Reading • Vocabulary	First-Term Success, Program Completion, HESI Exit Exam Scores, NCLEX-FTPR	<u>First-Term Success</u> • Composite** • A/P* • Biology** • Grammar* • Math** <u>Program Completion</u> • Composite* <u>NCLEX-FTPR</u> • Composite (80.50 vs 74.50)** • A/P (70.40 vs 63.90)** • Biology (77.40 vs 65.20)** • Chemistry (76.40 vs 71.10)* • Reading (83.80 vs 77.70)** • Vocabulary (79.20 vs 70.40)**

Author(s) and Year	Program Type (Sample N) <i>Demographics</i>	A2 Exam	Indicator(s) of Student Success	Exam Scores and Significant Outcomes * $p < .05$ ; ** $p < .01$
Robert, 2018	ADN (245) Female: 78% White: 82% Mean Age: 29	Composite	Program Completion, NCLEX-FTPR	<u>Program Completion</u> • Composite (89.30 vs 87.78)* <u>NCLEX-FTPR</u> • Composite (88.82 vs 85.46)*
Tartavouille et al., 2018	BSN (149) Female: 88% White: 83% Other: 17% Age 22+: 70%	Composite	Program Completion	<u>Program Completion</u> • Composite (85.22 vs 82.31)**
Turner, 2018	ADN (188) Female: 81% White 53% African American: 14%	<ul style="list-style-type: none"> <li>• English</li> <li>• Math</li> <li>• Science</li> </ul>	Program Completion	<u>Program Completion</u> • English (86.54)** • Science (77.78)**
Twidwell et al., 2019	BSN (124) Female: 86% White 93% Traditional College Age: 94% >25 years of age at time of admission	Composite (Modified) <ul style="list-style-type: none"> <li>• A/P</li> <li>• Chemistry</li> <li>• Math</li> <li>• Reading</li> <li>• Vocabulary</li> </ul>	First-Term Grades, First-Year Success	<u>First-Term Grades</u> • Composite** <u>Some First-Term Grades</u> • Math* • Vocabulary*
Underwood et al., 2013	BSN (184) (Additional demographics not provided)	Composite (Modified) <ul style="list-style-type: none"> <li>• A/P</li> <li>• Math</li> <li>• English (Reading and Vocabulary)</li> </ul>	First-Term Success	<u>First-Term Success</u> • Composite (84.11)** • A/P (75.48)** • English (85.28)** • Math (90.28)*
Vealé et al., 2017	Radiography (90) (Additional demographics not provided)	<ul style="list-style-type: none"> <li>• A/P</li> <li>• Reading</li> <li>• Math</li> </ul>	Course Grades, ARRT Exam FTPR	<u>Course Grades</u> <u>ARRT Exam FTPR</u> • Reading (75.85) • Math (74.36) "...students scoring above 70 on the A2 and making As and Bs in the program all passed the ARRT exam on first attempt" (p. 93).
Wimer et al., 2022	Radiography, 2-year program (81) (Additional demographics not provided)	Composite	HESI Radiography Exit Exam; ARRT Exam FTPR	<u>HESI Radiography Exit Exam</u> • Composite (82.8)** <u>ARRT Exam FTPR</u> • Composite**

Abbreviations: ADN=Associate Degree in Nursing; A/P=Anatomy/Physiology; ARRT Exam=American Registry of Radiologic Technologists; BSN=Bachelor of Science in Nursing; FTPR=First Time Pass Rate; NCLEX=National Council Licensure Exam; PN=Practical Nursing



A total of 4,689 students were represented in the studies with sample sizes ranging from 81 to 750. Most studies were related to nursing education. The studies included programs in Practical Nursing (PN) (n=1) and Registered Nursing (RN) (n=16). There were eight studies with ADN students and eight studies with BSN students. Two studies were conducted with radiography program students.

Exams used to evaluate student knowledge and skills measured by the A2 were clearly identified, as were the correlations in A2 exam scores and student success (Table 3). Thirteen studies reported A2 composite scores, meaning the average of all exams completed was calculated to provide a performance indicator. Many studies evaluated several A2 exams. Exams reported most frequently included Math (n=8), Reading Comprehension (n=6), and Anatomy and Physiology (n=6). The Chemistry exam score was reported separately in two studies. The Science category which is comprised of exams in Anatomy and Physiology, Biology, and Chemistry was reported in two studies.

Frequency of student success indicators across the educational trajectory reported in the research are also noted in Table 3. Successful completion of first term or first year of study were reported in seven studies. Most studies (n=11) reported on timely completion of the educational program. Student success on licensure or certification exams was reported in nine studies.

**Table 3: Summary of A2 Exams and Indicators of Student Success**

A2 Academic Category and Exam	First-Term/ First-Year Success	Course Grades	HESI Exit Exam	Timely Program Completion	Professional or Licensure Exam
<b>ENGLISH Language Category</b>	Underwood et al., 2013			Dale, 2020; Turner, 2018	
<i>Grammar</i>	Chen & Voyles, 2013; Knauss & Willson, 2013; Reinhardt et al., 2019				
<i>Reading Comprehension</i>	Chen & Voyles, 2013; House, 2013; Knauss & Willson, 2013	Vealé et al., 2017		Bevel, 2020	Reinhardt et al., 2019; Vealé et al., 2017
<i>Vocabulary/General Knowledge</i>	Chen & Voyles, 2013; House, 2013; Knauss & Willson, 2013; Twidwell et al., 2019				Reinhardt et al., 2019

A2 Academic Category and Exam	First-Term/ First-Year Success	Course Grades	HESI Exit Exam	Timely Program Completion	Professional or Licensure Exam
<b>MATH Category</b> <i>Basic Math Skills</i>	Chen & Voyles, 2013; House, 2013; Knauss & Willson, 2013; Reinhardt et al., 2019; Twidwell et al., 2019; Underwood et al., 2013	Vealé et al., 2017		Bodman, 2012; Dale, 2020	Vealé et al., 2017
<b>SCIENCE Category</b>				Dale, 2020; Turner, 2018	
<i>Anatomy and Physiology</i>	Chen & Voyles, 2013; House, 2013; Reinhardt et al., 2019; Underwood et al., 2013	Vealé et al., 2017		Bennett et al., 2016	Bennett et al., 2016; Reinhardt et al., 2019; Vealé et al., 2017
<i>Biology</i>	Bodman, 2012; Reinhardt et al., 2019			Bodman, 2012	Reinhardt et al., 2019
<i>Chemistry</i>	Bodman, 2012			Bodman, 2012	Reinhardt et al., 2019
<b>A2 Composite</b>	Bodman, 2012; Chen & Voyles, 2013; Knauss & Willson, 2013; Reinhardt et al., 2019; Twidwell et al., 2019; Underwood et al., 2013	Twidwell et al., 2019; Underwood et al., 2013	Bodman, 2012; Reinhardt et al., 2019; Wimer et al., 2022	Bodman, 2012; Cahill, 2019; Manieri et al., 2015; Marshall, 2021; Reinhardt et al., 2019; Robert, 2018; Tartavouille et al., 2018	Bodman, 2012; Cahill, 2019; Hinderer et al., 2014; Manieri et al., 2015; Reinhardt et al., 2019; Robert, 2018; Wimer et al., 2022

While A2 scores correlated with indicators of student success were identified within each individual research report (Table 2), a broader examination of scores was conducted to determine those most indicative of positive outcomes. Given the limited research available for PN and radiography programs, the A2 scores aligned with student success in Table 4 were found exclusively in the RN program literature.

**Table 4: RN Programs and Indicators of Student Success\***

A2 Academic Category and Exam	Mean A2 Score	Minimum A2 Score	Maximum A2 Score
<b>English Language Category</b>	85.91	85.28 (Underwood et al., 2013) <sup>1</sup>	86.54 (Turner, 2018) <sup>2</sup>
Grammar	88.53	86.33 (Chen & Voyles, 2013) <sup>1</sup>	90.72 (Knauss & Willson, 2013) <sup>1</sup>
Reading Comprehension	86.25	83.80 (Reinhardt et al., 2019) <sup>3</sup>	88.70 (House, 2013) <sup>1</sup>
Vocabulary	80.96	77.96 (Chen & Voyles, 2013) <sup>1</sup>	83.96 (Knauss & Willson, 2013) <sup>1</sup>
<b>Math Category/Basic Math</b>	88.00	84.89 (Chen & Voyles, 2013) <sup>1</sup>	91.10 (Bodman, 2012) <sup>2</sup>
<b>Science Category</b>		77.78 (Turner, 2018) <sup>2</sup>	
Anatomy and Physiology	72.94	70.40 (Reinhardt et al., 2019) <sup>1,3</sup>	75.48 (Underwood et al., 2013) <sup>1</sup>
Biology	77.89	77.40 (Reinhardt et al., 2019) <sup>1,3</sup>	78.37 (Bodman, 2012) <sup>1,2</sup>
Chemistry	76.65	76.40 (Reinhardt et al., 2019) <sup>3</sup>	76.90 (Bodman, 2012) <sup>1,2</sup>
<b>Composite</b>	84.90	80.50 (Reinhardt et al., 2019) <sup>1,2,3</sup>	89.30 (Robert, 2018) <sup>2</sup>

\* Indicators of Student Success:

<sup>1</sup> First-term/First-year Program Success; <sup>2</sup> Timely Program Completion; <sup>3</sup> Professional Licensure Exam

## CONCLUSION

This paper provided a comprehensive literature review of recent scientific evidence for the A2. The review demonstrates the value of the A2 as a measure related to academic success indicators for students in NHE programs. The findings indicate that higher A2 exam scores were positively correlated to first-term and first-year student success, timely program completion rates, and first-time success on professional licensure or certification exams.

Several important limitations need to be considered. Although preliminary evidence suggests the A2 is correlated with course grades and E2 performance scores, additional research in these areas is recommended. Past studies have focused mostly on BSN and ADN programs with homogeneous samples consisting of white females. Thus, the results may not be generalizable to students at other institutions or with other demographics. It is recommended that researchers replicate the studies at PN and healthcare education programs using samples that include students from diverse socioeconomic, cultural, ethnic, and racial backgrounds.

To meet the increasing need for healthcare workers, programs seek to use effective resources that help admit the most qualified students who can succeed in rigorous NHE programs, pass licensure or certification exams, and gain entry into the workforce. Based on the reviewed literature, the A2 can be used to accomplish this goal. These findings can help program administrators and faculty make evidence-based admission decisions to support the applicant selection process. Given that admission testing plays a key role in the success of students, implementing the A2 may have a positive impact on program outcomes. Admitting the strongest candidates may increase student retention and licensure and certification pass rates, which in turn increases the number of NHE graduates, and ultimately contributes to increasing the number of healthcare workers.

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