Applying the Rasch Model to Measure First-Year Students’ Perceptions of College Academic Readiness

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Abstract

Universities and colleges often use surveys as a method for collecting data on students’ educational experiences. As results from student surveys are used to create new policies, re-examine existing policies and provide the basis for resource allocation, it is vital that the survey itself is a solid quality measure. This study utilizes the Rasch model to assess the quality of one rating scale question that is administered to first year students to measure perceived levels of college academic readiness at a large, southeastern, research I university. Results suggest that first-year students perceive themselves as prepared for college academics. While the instrument is found to be a suitable measure for its purpose, this study provides suggestions for improving the survey.
Perspectives

A great deal of discussion has been raised in the field of higher education regarding whether or not incoming students are prepared for the rigors of college academics. Earning a high school degree and even earning a high grade point average does not ensure that students will be successful in earning a college degree. High schools and postsecondary institutions alike are offering programs and services geared towards bridging the transitional gap between the high school and college experiences. Conley (2008) explains that college is fundamentally different than high school. Although the course titles or disciplines may sound similar to high school subjects, the pace of the courses, the way the content is approached and the expectations of the instructors varies greatly from high school to college. While the transition from high school to college can pose a challenge for all students, students who are the first in their families (referred to as first generation college students) to attend college are at a heightened risk when it comes to a lack of academic preparation (Hudley, Cho, Barry, & Kelly, 2009, McKay & Estrella, 2008, Pascarella, Pierson, Wolniak, & Terenzini, 2004). One explanation for why first generation students are at a greater risk of being less prepared for college academics is that as compared to their non-first generation peers, the parents of first generation students do not understand the significance of enrolling in a challenging pre-college curriculum (Reid & Moore, 2010). In order for any student to be successful in college coursework, they must encompass a level of college readiness that they may not have acquired in their high school experiences. Conley (2008, p 4) defines college readiness as the amount of preparation that a student must encompass in order to enroll and successfully pass, without remediation, in a credit-bearing general education course at a four-year, postsecondary institution.
According to the U.S. Department of Education, Institute of Education Sciences, National Center for Educational Statistics, in 2005, 46% of high school 12th graders have science skills that are considered to be below the basic level. Officials with American College Testing (ACT) reported that many of the high school test takers did not meet benchmark scores on math and science sections of the ACT, both of these areas are considered to be indicators of first year success in college coursework (Cavanagh, 2003). In addition, college students lack skills in time management, study skills and test preparation (Conley, 2008). As a result, these students are taking supplemental and remedial courses at community colleges and using alternative platforms for students to gain developmental skills, such as Plato, an on-line tutoring system (http://www.studyweb.com/Post-Secondary-Solutions.aspx). Bright students who have strong high school grade point averages are failing out of college and high school valedictorians are struggling to maintain passing grades in their college courses.

The objectives of this study are to answer the following questions, 1) Do first-year students perceive themselves as academically ready for the rigors of a college curriculum at a large, research I institution? and 2) Is the rating scale a valid and quality measure to be used in collecting data regarding students’ perceptions of college academic readiness?

Methods

Data Source

The sampling frame included responses from 1665 first year students at a large research university in the southeast United States. The mean high school grade point average of the first year, fall 2009 cohort was 3.52, the mean comprehensive ACT score was 24.68 according to the Office of Institutional Research. This data is consistent with first year cohorts at the university for the past ten years. The Office of Institutional Research sent out a broadcast email with an
imbedded web-survey link to all first year students (as determined by the University Registrar) at the university in the fall 2009 semester. Instructions read that the survey would take approximately 15-20 minutes to complete. Students were informed that although student identification numbers were collected, all responses would be aggregated and kept confidential. Student responses were stored on a secure web server on a university computer in the Office of Institutional Effectiveness. All data were aggregated and stored in an excel spreadsheet on the secure sever belonging to the Office of Institutional Effectiveness. While students were informed that their student identification and responses were to be kept confidential, student identifiers were kept intact for the researchers to ensure that all students who responded were in fact first year students at the university.

The entire instrument was comprised of twenty-nine items including six items for questions pertaining to student demographic information. The scale examined in this study was a five-point likert-type rating scale (1 – Strongly Disagree, 2 – Disagree, 3 – Not Sure, 4 – Agree, 5 – Strongly Agree). The survey item asked respondents to indicate how much they agree or disagree with a series of thirteen statements related to academic readiness. The survey instructions stated that there are no correct or incorrect responses and instructed students to rate the response that best reflects their values and beliefs. The statements were adapted from existing scales on the topics of student self-efficacy and procrastination, both of which are shown to be indicators of student college readiness in existing literature.

Analysis

Using Rasch analysis, a rating scale model was applied to test the overall data fit to the model by using the software package, WINSTEPS version 3.57.4 (Linacre, 2005). Rasch analysis uses an item response theory model which measures unidimensional attributes (Bond &
Fox, 2007). In this study, Rasch modeling was used to measure academic readiness. A unique attribute of Rasch analysis is that the data fits the model, whereas with classical test theory, a model is selected based upon the data (Bond & Fox, 2007).

Of the 1665 respondents who submitted responses to a web-based survey, 1595 respondents were measured on the 13 rating scale items this study examined. Given that this survey is asking about perceptions of college readiness, it is reasonable to believe that not every person will have an opinion or response to every question. 140 responses were coded as missing. Missing data was treated as missing. The Rasch model enables the researcher to leave the missing data points as “missing” rather than input an average or other missing data techniques. The result is a model that can assist researchers in interpreting missing data points without the missing data affecting the model.

Results

The results of the study indicate a fairly normal distribution. The majority of first-year students self-identify that they are ready for college academics. One observation made from viewing Figure 1 is that some of the items on the survey were reverse coded. For example, question j was very difficult to endorse, however upon further investigation, this item is reverse coded and states, *I’m a time waster now, and I can’t seem to do anything about it.* As this item is reverse coded, the difficulty to endorse item j indicates that students strongly disagreed with the statement. Using the Rasch model and the variable map enabled attention to be focused on the reverse coded items. Using classical test theory, this finding may not have been caught, however using Rasch analysis, the relationship between the person and item data are provided. In viewing the variable map, it was evident that some of the survey items were reverse coded as the items did not fit the person.
One suggestion would be for the survey designers to recode the items as raw scores before analyzing. For example, with question j, instead of listing a 5 (Strongly Agree) the raw score could be changed to a 1 (Strongly Disagree) before running the data. Recoding the reverse items provides a more accurate depiction of the distribution, especially for audiences who view the outputs and who are not aware of the reverse coded items. For example, if the variable map was presented to an audience of parents or educators, the graph could be interpreted as the majority of students responding that they strongly agree to items such item, j which states, I’m a time waster now, and I can’t seem to do anything about it. When the data is recoded to take into account the reverse coded items, as seen in Figure 2, the distribution is also normal.

Another key finding is that the mean of the students is greater than the mean of the items. These findings hold true both before and after the reverse coded items have been accounted for although when the items have been re-coded to account for the reverse coded survey items, there is a greater distance between the mean of the students and the mean of the items. This typically suggests that the items are too easy for the ability of the respondents (persons). In this study, the survey is too easily endorsable for the respondents.

Overall, first year students reported high levels of academic readiness. The item that was easiest to endorse with item m which reads, I am very capable of succeeding at the University. Items c, e, l, and i were also easy items to endorse. Items that fell in the middle (not easy or hard to endorse) were items a, I am good at research and writing papers, d, I find my academic work interesting and absorbing, and item g, I know how to perform well on tests. At the end of the fall 2009 semester, the mean university grade point average for the first year, fall 2009 cohort was 2.82 or the equivalent to a C utilizing the university’s grading scale for a 2.82 grade point average. This is a slightly higher grade point average at the university than in the previous years.
In conclusion, the results of this study indicate that the survey participants perceive themselves as academically ready for the rigors of a college curriculum at a large, research I institution. Furthermore, the rating scale is a valid and quality measure to be used in collecting data regarding students’ perceptions of college academic readiness. In addition, findings indicate that the reverse coded items need to be noted and taken into consideration, especially when using this data with classical test theory where data is taken in the aggregate and reverse coded items may be misinterpreted. A final suggestion would be to incorporate additional items at the top of the variable map, or in other words, are more challenging or less endorsable by the participants. As most of the survey items are easy to endorse, the survey is not very useful for identifying areas where the students feel they lack academic readiness. The addition of challenging items on the survey could provide college administrators with a stronger and further detailed interpretation of the specific content areas where students feel underprepared in terms of college academic readiness.
Figure 1 First-Year Students, Reverse coded items present.

STUDENTS - MAP - QUESTIONS
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  3  . +
  
  
  
  
  
  2  . +

  . | T
  
  . # T “I'm a time waster”
  . ### |

1 .## +
  .## S|S “I delay finishing my jobs” “I drag my feet”
  .### | “I put off improving my work habits”
  .##### | “I wait until the last minute”
  .###### |
  .###### M|
  .####### M| “I am good at research & writing”
  .######## S| “I find my academic work interesting” “I know how to perform well”
  .####### |
  .## | “I know how to schedule my time”
  . | “I know how to take notes”
  . T | “I am a good student” “I do well in school”
  . | S
-1 . +
  . |
  . 
  | T
  . | “I am capable of success at college”
  |
-2 <less>|<frequ>
EACH ’#’ IS 22.
Figure 2  First-Year Students, Reverse coded items adjusted for.

STUDENT - MAP - QUESTION
<more>|<rare>

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.## | |
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2
.## +
.##### S|
.####### |
.######## |
1
.####### +
.############ M| "I wait until the last minute"
.############ | S "I put off improving my work habits"
.############ | "I am good at research and writing"
0
.############ +M
.############ S| "I know how to schedule my time"
.######## | "I know how to take notes"
.#### | S "I am a good student"  "I do well in school"
-1
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.  |
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-2
+ 
EACH "#" IS 13. EACH "." IS 1 TO 12
Discussion & Importance of Work

While the majority of students in this study report that they perceive themselves as academically ready for the rigors of college academics, on a national level, students’ academic performances in college and on college entrance exam scores do not reflect that students are academically ready for college work. Do the students in this study have an inaccurate perception of their levels of academic readiness or an unrealistic understanding of the rigors of college academics? If students who are scoring below national benchmarks on academic exams feel academically ready for a college curriculum, then how do colleges close the gap between the actual level of a student’s academic readiness and the student’s perceived levels of academic readiness? If a student perceives themselves as ready for college academics, they may be less likely to utilize college resources such as campus tutoring services or writing centers.

The results of this study showed that the majority of students who took the survey reported that as fall, first year students, they felt academically ready for the rigors of the university. Upon completion of the semester, the mean grade point average was 2.82, or a C average. In conclusion, the students who participated in the survey indicated that they were academically ready for college academics while the cohort, on average earned a C grade point average. It is worth noting that a future follow-up study where the participants’ grade point average at the conclusion of the first college semester could be sorted from the total cohort, in order to reflect the students who actually completed the survey. The mean grade point average is taken in aggregate from the entire cohort and does not take into account students who did not complete the survey or take into considerations, the students who may have left the university before completing the entire semester. A further consideration for future research would be to
replicate this study using first generation college student status as a variable. As a growing body of research suggests, first generation college students are characteristically less prepared for college than are their peers (Hudley, Cho, Barry, & Kelly, 2009, McKay & Estrella, 2008, Pascarella, Pierson, Wolniak, & Terenzini, 2004). Using first generation status as a variable would allow researchers to examine whether or not differential item functioning exists between first generation and non-first generation college students in measuring self-reported levels of academic readiness. This design would be useful for college administrators to better understand how to proactively support student populations that demonstrate low levels of college academic readiness.

Understanding why first-year students, who underperform academically report high levels of perceived academic readiness, could assist universities and colleges in proactively preparing students for the rigors of a college curriculum. A practical application would be to use the findings from this survey as a basis for offering students increased opportunities in the areas that they report lower levels of academic readiness. For example, instructors could tailor course assignments aimed towards increasing students’ confidences in their research and writing abilities or devote greater time in class to these topics.

This study could be made stronger by comparing the results of this study to the students’ performances on college entrance exams and benchmark assessments instead of comparing this study’s survey results to national statistics. It would also be beneficial to have these same students retake this survey in the spring semester after they have experienced a full semester of academics at the university to see whether or not their self-reported levels of college academic readiness has changed once they have been exposed to the college curriculum.
References


