International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 01, 2020
ISSN: 1475-7192

Psychometric Properties and Factor Structure of the University Readiness Survey

Muna Al-Kalbani, Thuwayba Al Barwani, Otherine Neisler,
Hussain Alkharusi, David Clayton and Humaira Al-Sulaimani,
Mohammad Khan

Abstract--- *This study describes the psychometric properties and factor structure of the University Readiness Survey (URS). Survey data were collected from a sample of 2652 students from Sultan Qaboos University. Exploratory factor analysis identified ten significant factors underlining the structure. The results of Confirmatory factor analysis showed a good fit to the data where the indices for the revised model were $\chi 2$ (df = 1669) = 6093.4; CFI = 0.900; GFI =0.926; PCLOSE = 1.00 and RMSAE = 0.030 where each of these indices were above threshold. The overall value of Cronbach's alpha was 0.899 indicating that the instrument score was reliable. Results imply that the URS is a valid measure describing the college readiness pattern among Sultan Qaboos University students and the Arabic version could be used by university counsellors to identify students' readiness factors. Nevertheless, further validation of the USR is recommended.*

Keywords--- *Word Validity, Reliability, Confirmatory Factor Analysis, URS, College Readiness, SQU.*

I. INTRODUCTION

According to Conley, 2010, University readiness of a student can be defined as the ability of a student to enroll, undertake and succeed a credit bearing course at any higher education institution without any remediation. Thus, it is basically linked to the following two factors: academic achievement at high school and test scores on admission tests. Conley, in 2010, identified 4 very specific elements of college/university readiness: self-management skills, knowledge about university, cognitive strategies like problem solving, research, interpretation, reasoning, precision/accuracy and above all content knowledge. In short, we can say that Conley's (2010) model suggests that socio cultural and motivational factors constitute as crucial part of university readiness apart from other factors such as academic performance at school and test scores on psychometric tests.

A number of investigations, in terms of content analysis, of the general education system in Oman showed that students are not exposed to skills and knowledge required for academic success. This probably leads to lack of motivation to learn and leads to a high dropout rate as is evident in many studies (MoNE, 1995; MoE, 1994, 1995, 2007). Several related studies were conducted at Sultan Qaboos University (SQU), to identify the factors affecting student success in the university. For example, Ibrahim, Yahya and Al_ Barwani (1992) sought to examine the predictive validity of secondary school certificate examination results for university performance as measured by

Muna Al-Kalbani, PAM, SQU. E-mail: Muna_alkalbani@yahoo.com
Thuwayba Al Barwani, PAM, SQU.
Otherine Neisler, PAM, SQU.
Hussain Alkharusi, PAM, SQU.
David Clayton, PAM, SQU.
Humaira Al-Sulaimani, PAM, SQU.
Mohammad Khan, PAM, SQU.

Received: 01 Nov 2019 | Revised: 30 Nov 2019 | Accepted: 10 Dec 2019

GPA. The academic subjects investigated were Islamic Education, Arabic, English, Mathematics, History, Geography, Islamic World, Humanities, and Science. The study established the significance of the variables such as gender, semester and subject areas in the prediction of university GPA. School diploma scores alone were not a good predictor. Again personal factors such as motivation were suggested for future research. Along those lines, Al Barwani, Yahya and Ibrahim (1997) collected survey data from 61% of the university faculty about the basic cognitive skills and attitudes that faculty believed to be necessary for academic success. They concluded that there was a deficiency in 88% of the skills and attitudes needed for academic success and suggested that first year courses be introduced to strengthen these skills. Yahya (1997) examined further the motivation aspect by administering a 144 question survey to 491 male and female students reporting that higher motivation was correlated to higher academic achievement. Taken together these results it's obvious that there is a need for further investigation of the elements of university readiness. Therefore, the urgency and importance of developing a reliable and valid measures of the university readiness -related factors that might affect the academic success of university students.

To test aspects of college readiness, several instruments were developed to assess the non- cognitive dimension of college readiness. In this study, the researchers used a College Readiness Survey questionnaire that mainly consisted of items adapted from the questionnaire developed by the TRiO Student Support Services program that is funded by the US Department of Education. Hence, the primary objective of the present study is to provide a rigorous psychometric assessment in terms of validity and reliability of University Readiness Survey Questionnaire scores for SQU students.

II. Purpose of the Study

Two main purposes of the present study are: i) to analyze the factor structure of the University Readiness Survey questionnaire for SQU students, and ii) to provide evidence regarding the internal consistency of the College Readiness Survey questionnaire for the same group of students.

III. Methods

A. Sample

The sample for this study included 2652 students selected conveniently from the population of students entering SQU in September 2013. There were 1400 females and 1252 males.

B. Instrumentation

The new adopted University Readiness Survey questionnaire (URS) measures the individual along ten dimensions: academic confidence, reasons for going to college, teachers in Grade12, career awareness, Arabic reading and writing skills, English reading and writing skills, math and science, social support, tackling college and computer skills. The first version of the URS consists of 71 items with academic confidence measured by 5 items, reasons for going to college by 8, tackling college by 11, teachers by 4 items, career awareness by 5, Arabic reading and writing by 9 items, English reading and writing skills by 9 items, math and science by 7 items, social support by 8 items and computer skills by 5 items. The final version of the UR consisted of 63 items. An overall university readiness level was constructed by an average rating score across all items. The reliability coefficient was 0.893 as measured by Cronbach alpha.

Received: 01 Nov 2019 | Revised: 30 Nov 2019 | Accepted: 10 Dec 2019

C. Procedures

Permission to collect data from the students during the orientation week was requested and obtained from the University Administration. The research team informed the students that a study was being conducted on the motivational orientations and learning resources and strategies adopted by university students. Then, the team requested the participation of the students. Emphasis was placed on the fact that information to be gathered would not influence their admission in the university in any way and that the study would hopefully lead to improved learning in the university. Students who wished to participate in the study were given the URS.

D. Statistical Analyses

Total procedure of four steps was conducted to develop and validate the URS. The first step of the analysis was to examine initial estimates of internal consistency of the URS scores. Internal consistency reliability for each of the URS factors was assessed by Cronbach's alpha (Field, 2005). As a part of the second step of statistical analysis, our focus was to assess the factor structure of the scale items through exploratory factor analysis (EFA). To do so, a randomized split of the data in the sample was used to identify a viable factor structure. Furthermore, randomization function on SPSS 20.0 was used to randomly select a sample of 1000 participants. On these subset of participants, an EFA was carried out to identify the factor structure of the items of the URS. Since the research focused on reducing a larger number of variables to a smaller set of uncorrelated variables (Hair et al (2006), we selected a Varimax with Kaiser Normalization rotation. As a precautionary measure, using two indicators, the data was scrutinized to establish the appropriacy of the sample.

Certain factors were identified by EFA, and the third step of our statistical analysis was thus to use Confirmatory Factor Analysis to confirm and validate these factors. A CFA was then conducted by Using version 16.0 of Analysis of Moment Structures (AMOS) on the remaining 1652 participants out of a total of 3000 students admitted in the University. This was done to decide if the factor structure needed some modification. The use of CFA, which is a structural equation modeling technique used to regulate the goodness of fit between the sample data and a hypothesized model, was to confirm the exploratory model. Based on an amalgamation of theoretical logical and empirical indications, it was decided to add a path to the model. Empirical analysis of the modification indices in AMOS reported improvement in the goodness of- fit to the mode (Kline, 1998). As we know, the addition of a path improves the overall fit of the model when the modification index between two items is high in relation to other modification indices. Research shows that from a theoretical perspective additional support for the inclusion of a path is provided when such items are linked to each other. However, in the absence of any logical or theoretical reasons the path should not be included. In this study, Model fit was measured by what Blunch (2008) suggests as the six most recommended best fit index namely: the Root Mean Square Error of Approximation (RMSEA; <.08 acceptable, <.05 excellent), the Chi-Square ($\chi 2$), P-values (PCLOSE) which is a test of the null hypothesis that RMSEA (in the population) is less than 0.05 (Byrne, 2001). The comparative fit index (CFI: >.90 acceptable, >.95 excellent) of Bentler (1990), the goodness-of-fit index (GFI: >.90 acceptable, >.95 excellent) and the adjusted goodness-of-fit index (AGF1: >.90 acceptable, >.95 excellent). The fourth step of the analysis involved estimating the internal consistency reliability of the URS's scores resulting from the CFAs obtained in the previous phases.

Received: 01 Nov 2019 | Revised: 30 Nov 2019 | Accepted: 10 Dec 2019

IV. RESULTS

A. Internal consistency reliability

Internal consistency reliability for each of the URS factors was assessed by Cronbach's alpha. The output was examined by analyzing the results of the Corrected Item-Total Correlation and Alpha if item is deleted, based on these two tests, eight out of 71 items were removed from the instrument. The overall reliability showed a significant improvement (.475- .829) after the removal of the eight items (Table 1).

Table I: Cronbach's alpha Results For study 1 after Revisions

Subscale	Alpha	Alpha Standardized
Arabic reading and writing skills	0.728	0.734
Math & Science	0.762	0.766
English reading and writing skills	0.828	0.829
Teacher in Grade 12	0.703	0.713
Academic confidence	0.596	0.610
Reasons for going to college	0.678	0.687
Career awareness	0.475	0.475
tackling college	0.658	0.659
social support	0.690	0.697
computer skills	0.762	0.764
Overall reliability	0.891	.893

B. Exploratory Factor Analysis (EFA)

An EFA was conducted to identify a viable factor structure based on a randomized split of the data in the sample. The Kaiser-Meyer-Olkin measure of sampling adequacy index was .899, and Bartlett's test of sphericity was significant, $\chi 2$ (DF = 1711.0) = 2870.7389, $p < .0001$, indicating that the sample and correlation matrix were appropriate for the analysis. The results of EFA analysis are shown in Table 2. The distribution of high factor loading (0.3 and above) across factors demonstrated that ten factors were identified. As shown in table 2, the analysis of the URS data produced ten significant factors, which accounted for 45.76 % of total variance explained. The first factor was labelled "English reading and writing skills", a total of 9 items loaded in this factor, which accounted for 6.69 % of the scale variance. The Second factor explained 5.43% of variance and included 8 items. This factor was labelled "social support". The third identified factor was "Math and Science", which accounted for 5.36% of scale variance, including 7 items with above .30 loaded on it.

The fourth factor was labelled "Reasons for going to college", a total of 7 items loaded in this factor, which accounted for 5.14% of variance explained. The Fifth factor was labelled "Arabic reading and writing skills" and explained 4.93% of variance. It included 9 items with loading above .30. The sixth identified factor was "Teacher in Grade 12", which accounted for 3.81% of scale variance and had 4 items with above .30 factor loading. The seventh identified factor was "Computer Skills", which accounted for 3.77% of scale variance and had 4 items with factor loading above .30. The eighth identified factor was "Academic confidence", which accounted for 3.68% of scale variance, including 5 items with above .30 loaded on it. The ninth factor was labeled "tackling college", a total of 5 items loaded in this factor, which accounted for 3.62% of variance explained. The final factor was labeled "Career awareness", which accounted for 3.34 % of variance, and had only three items with acceptable factor loading. A total of 61 items were retained and used for the next analysis.

Received: 01 Nov 2019 | Revised: 30 Nov 2019 | Accepted: 10 Dec 2019

Table II: Rotated Component Matrix for the URS Questionnaire

	Component									
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
ITEMS25	.717									
ITEMS23	.713									
ITEMS20	.701									
ITEMS19	.668									
ITEMS17	.655									
ITEMS18	.627									
ITEMS24	.573									
ITEMS22	.512									
ITEMS21	.493									
ITEMS55		.721								
ITEMS56		.721								
ITEMS57		.707								
ITEMS54		.405								
ITEMS53		.389								
ITEMS52		.283								
ITEMS51		.272								
ITEMS58		.256								
ITEMS10			.678							
ITEMS11			.672							
ITEMS14			.662							
ITEMS16			.639							
ITEMS15			.639							
ITEMS12			.572							
ITEMS13			.460							
ITEMS38				.725						
ITEMS39				.623						
ITEMS35				.608						
ITEMS40				.550						
ITEMS60				.445						
ITEMS61				.387						
ITEMS66				.387						
ITEMS7					.683					
ITEMS3					.650					
ITEMS4					.642					
ITEMS9					.534					
ITEMS2					.525					
ITEMS6					.519					
ITEMS1					.462					
ITEMS8					.430					
ITEMS5					.369					
ITEMS28						.811				
ITEMS26						.776				
ITEMS27						.725				
ITEMS29						.459				
ITEMS68							.731			
ITEMS67							.692			
ITEMS70							.662			
ITEMS71							.655			
ITEMS30								.795		
ITEMS31								.746		
ITEMS32								.686		
ITEMS33								.314		
ITEMS34								.306		
ITEMS36									.749	
ITEMS49									.658	
ITEMS47									.562	
ITEMS48									.435	
ITEMS50									.329	
ITEMS41										.606
ITEMS43										.566
ITEMS45										.426
Percentage of variance	6.69	5.43	5.36	5.14	4.93	3.81	3.77	3.68	3.62	3.34

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C. Internal Consistency Reliability of the Final Version of URS

Internal consistency reliability for each of the URS factor was assessed by Cronbach's alpha. The overall reliability showed a significant improvement 0.899 shown in Table 3.

Table III: Cronbach's Alpha Results the Final Version of URS

Subscale	*Alpha*	*Alpha Standardized*
Arabic reading and writing skills	0.724	0.730
Math & Science	0.764	0.768
English reading and writing skills	0.824	0.824
Teacher in Grade 12	0.701	0.711
Academic confidence	0.601	0.615
Reasons for going to college	0.670	0.675
Career awareness	0.470	0.471
tackling college	0.661	0.662
social support	0.694	0.700
computer skills	0.684	0.686
Overall reliability	0.894	0.899

D. Confirmatory Factors Analysis (CFA)

Using Analysis of Moment Structures (AMOS) Version 16.0, a CFA was then conducted on a sample of 1652 participants of the sample to determine whether the factor structure required modification. The CFA results showed an adequate fit to study data; indices are all fulfilled to the suggesting requirements for adequate model (Bentler, 1990).

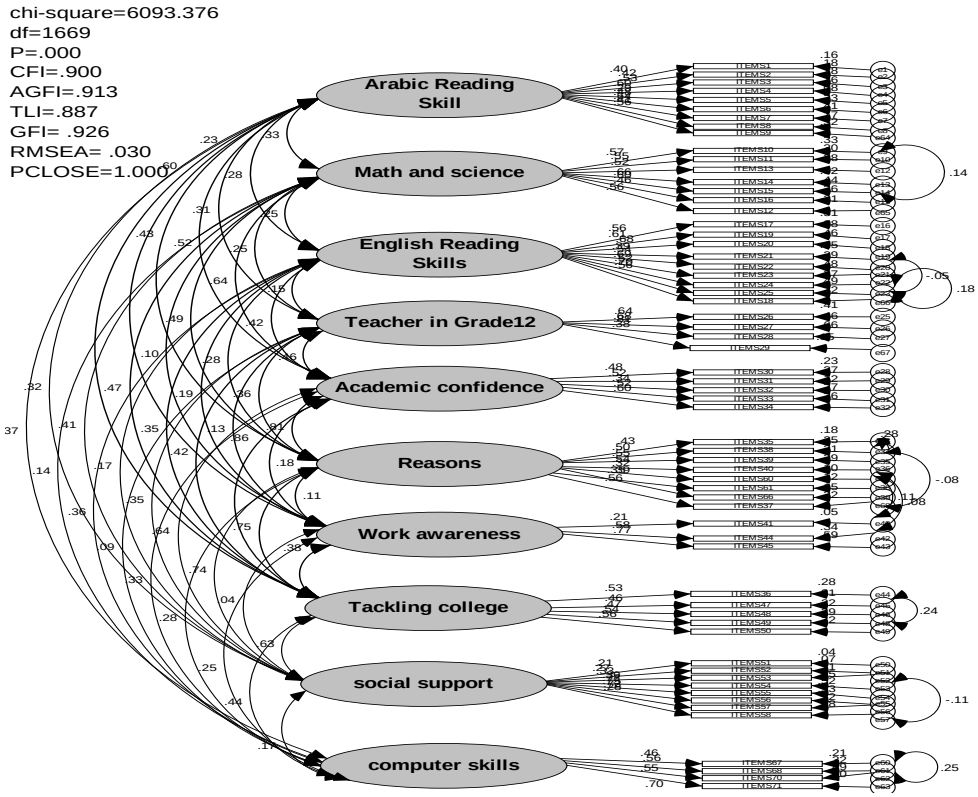

Fig. 1: The Measurement Model for the University Readiness Survey

V. RESULTS AND DISCUSSION

The EFA of the URS produced ten significant factors which accounted for 45.76 % of total variance explained. The items loaded highly (>=.30) on ten separate factors with Eigen values of greater than 1.00. As displayed in table 2, the first factor identified was the English reading and writing skills scale with its a priori items loading entirely on this scale and with factor loadings ranging from .72 to .49. The second identified factor was Social Support. All items loaded on this factor with loadings ranging from .72 to .26.The third identified factor were Math and Science. All items loaded on this factor with loadings ranging from .68 to .46. The fourth factor was identified as Reasons for going to college. Items retained had factor loadings ranging from .73 to .39. The fifth identified factor was Arabic reading and writing skills. Nine items loaded between .68 and .37. The sixth factor identified was the Teacher in Grade 12 scale with its a priori items loading entirely on this scale and with factor loadings ranging from .81 to .46. The seventh identified factor was Computer Skills. Four items loaded between .73 and .66. The eighth factor identified was Academic confidence. Items retained had factor loadings ranging from .80 to .31. The ninth identified factor was tackling College. Five items loaded between .75 and .33.The last identified factor was Career awareness. All items loaded on this factor had loadings ranging from .61 to .43. Total of 61 items retained and used for the next analysis. Results of the EFA support the expected dimensionality of the constructs as proposed in the theoretical interpretation of the URS. In the second stage, The CFA was used to confirm the exploratory model. The CFA results showed an adequate fit to study data; indices are all fulfilled to the suggesting requirements for adequate model (Bentler, 1990). The results of the confirmatory factor analysis confirmed the ten-factor structure of the URS.The overall value of Cronbach's alpha was 0.899 indicating that the instrument was reliable while subscale test-retest reliability estimates represent a good to low level of reliability. The lower number items in some subscale may have a negative impact on this coefficient. These results suggest that five of the ten URS subscales were below the 0.7 threshold for acceptable reliability, while the rest of them were acceptably stable, and thus, led us to conclude that URS is a reliable measure of a stable construct over time and we need to increase the number of items in some subscales to increase the reliability of URS. Findings from all the analyses indicate that the URS scores have produced ten significant factors.

The findings imply that URS could be used by university counsellors in the counselling process. Understanding the areas where a student might struggle can help determine the appropriate support system. Scores developed through the questionnaire should provide a good sense of the various challenges the student faces. Using these indicators by educators is highly recommended to address students' needs and abilities. The results of using these indicators can also contribute to instructional design.

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Received: 01 Nov 2019 | Revised: 30 Nov 2019 | Accepted: 10 Dec 2019