A Psychometric Analysis of the Study Skills Questionnaire for University of Rwanda Undergraduate Students at National Police College

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Abstract

The current study investigated the structures and dynamics of the study skills questionnaire administered to 398 University of Rwanda (UR) undergraduate students studying in the premises of National Police College (NPC). Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA) revealed that the investigated study skills scales (time management, notes taking, reading, writing, test-preparation, and test taking skills) are multidimensional. Time management, note taking and writing scales were found to have three factors while reading, test preparation and test taking have two factors. The study shows that students need more support in terms of time-planning, notes wording and polishing, content-reading strategies, referencing skills, psychological abilities in preparing tests and standardized attitudes before submitting scripts. The study recommends UR to elaborate the study skills handbook as a guide for students. It also recommends the provision of guidance and counselling services on the use of good study skills.

Keywords

Study Skills, Psychometric Analysis, Undergraduates, Higher Education, Rwanda

1. Introduction

Learning involves the use of proper study skills which are not innate abilities,

but are acquired, and fixed by repeated efforts (Oli, Hossain, & Rashid, 2019). A number of studies investigated levels of students' study skills in higher education (e.g. Ayodele & Adebiyi, 2013; Somuah, Dankyi, & Dankyi, 2014; Didarloo & Khalkhali, 2014; Dinçer & Akdeniz, 2008; Ezeala & Siyanga, 2015; Fereidouni & Cheraghian, 2009; Kumar, 2015; Mashayekhi, Rafati, Mashayekhi, Rafati, Mohamadisardoo, & Yahaghi, 2014; Mukingambeho, Nzahabwanayo, Nzabalirwa, & Nizeyimana, 2019; Nourian, Mohammada, Mousari, & Nourian, 2010; Pepe, 2012; Sekar & Rajendran, 2015; Shackebaei, Siami, Firouzabadi, Memar, Rezaei, Hesari, & Afarangan, 2015; Shahidi, Dowlatkhah, Avand, & Mohammadi, 2014). However, these did not deepen their analysis to identify factor structures and determine how students are doing in different facets of study skills scales. Thus, the present study intends to fill in this knowledge gap by conducting a psychometric analysis of the study skills questionnaire administered to undergraduate students of UR at NPC. While levels of study skills provided a general overview of the layer of the land, the present study is a step further towards unpacking the possible structure underlying each study skill. At a later stage we demonstrate ways in which students fare vis-à-vis dimensions of each study skill set. Thus, this study targets to answering these two questions: 1) Are study skills scales under investigation (time management, notes taking, reading, writing, test-preparation, and test taking) uni-dimensional or multidimensional? 2) How do undergraduate students of UR at NPC rate themselves in the identified study skills dimensions?

The study concerns UR undergraduate students studying at NPC in Musanze district, Northern Province. Three programs of study namely Professional Police Studies—PPS, Law, and Computer Science with the option of Information Security were involved in the study. NPC was essentially chosen as a case to study because its entire student body comprises police officers contrary to other UR constituencies. Moreover, students were chosen as respondents because their opinion is nowadays considered as a necessary factor to evaluate quality education at universities (Hakim, 2014).

This study provides a psychometric tool to measure study skills of UR undergraduate students and possibly those from other higher learning institutions in Rwanda and beyond. Besides, the study highlights undergraduate students' strengths and weaknesses in their study skills. Hence, heads of higher education institutions in Rwanda, teachers, students, parents or guardians are provided with substantial information and insights to take adequate strategies for optimizing academic outcomes in higher learning institutions especially for undergraduate students.

2. Literature Review

2.1. Dimensions of Study Skills Scales in Higher Education

2.1.1. Dimensions of Time Management Study Skills

Several self-report instruments have been designed to measure different aspects of students' time management in higher education. For instance, Macan, Shahani, Dipboye and Phillips (1990) studied correlations of College students' time

management with academic performance and stress. Results of factor analysis revealed that time management scale consists of 4 independent factors: Factor 1 named setting goals and priorities with 15 items; factor 2 termed mechanics-planning, scheduling with 13 items; factor 3 labeled perceived control of time with 13 items; and factor 4 entitled preference for organization with 5 items. It is clear that Macan et al. (1990) saw time management as multi-dimensional with four dimensions.

Britton and Tesser (1991) also analyzed time management questionnaire while studying the effects of time management practices on College grades at the University of Georgia. Factor analysis of 35 items led to the adoption of 18 items with 3 subscales named short-range planning with 7 items, time attitudes with 6 items and long-term planning with 5 items. The results of Britton and Tesser (1991) illustrated that time management is also multi-dimensional with three factors: short-range planning, time attitudes, and long-term planning. Other recent studies analyzed time management questionnaire structure referring to Britton and Tesser's time management scale and came up with three factors bearing the names given by Britton and Tesser (1991). They include Dahie, Osman and Mohamed (2015), Gayef, Tapan and Sur (2017), Al Khatib (2014), Mercanlioglu (2010), Nasrullah and Khan (2015) and Pehlivan (2013).

Razali, Rusiman, Gan and Arbin (2018) determined the relationship between the time management and academic achievement of Malaysia University students. The factor analysis result of 20 items showed three main factors classified as time planning (8 items), time attitudes (8 items), and time wasting (4 items). Thus, time management was seen as multidimensional with three factors named time planning, time attitudes and time wasting.

Furthermore, Rao and Azmi (2018) made a confirmatory factor analysis of the time management scale originally developed by Macan et al. (1990) while developing and validating time management scale of faculty members of Higher Education Institutions in India. The study (Rao & Azmi, 2018) showed that time management is multidimensional with three layers: setting goals and priorities with 6 items, preference for organization with 5 items, and mechanics of time management registering 5 items.

2.1.2. Dimensions of Test Taking Study Skills

Doreen (2008) developed a scale of 31 items to assess students' test taking skills and estimated its psychometric indices at the United Arab Emirates University (UAEB). Using factor analysis procedure, the author extracted four factors: 1) before-test strategies with 8 items; 2) time-management strategies with 7 items; 3) during test strategies with 11 items and 4) after-test strategies with 5 items. The study of Doreen (2008) highlighted the multidimensional nature of test-taking with four layers: before-test strategies, time management strategies, during test strategies, and after test strategies.

Zhang, Liu, Zhao and Xie (2011) studied the use of English test-taking strategy and its effect on students' test performance at Tsinghua University, Beijing,

China. A factor analysis on the English Test-taking Strategy Inventory (ETSI) yielded six factors: 1) test-taking memory strategies with 7 items, 2) test-taking cognitive strategies with 16 items, 3) test-taking compensation strategies with 9 items, 4) test-taking metacognitive strategies with 42 items, 5) test-taking affective strategies with 3 items, and 6) test-taking social strategies (TSS) with 4 items. At this point we see again test taking skills proven to be multidimensional.

Biçak (2013) developed a "Test Preparation and Test Taking Strategies Scale" (TPTTS) to be used by high students preparing for the university selection examinations at national level at Bolu, Turkey. The prepared questionnaire had two main scales i.e. test preparation and test taking strategies with a total of 37 items. To detect the construct validity of TPTTS, exploratory factor and confirmatory factor analyses were applied. The study found that Test preparation strategies scale consists of three sub-scales of 17 items named cognitive strategies (7 items), social strategies (3 items) and metacognitive strategies (7 items) while test taking strategies scale gets four sub-scales of 20 items called item analysis strategies (7 items), time management strategies (4 items), choice prediction strategies (3 items) and after test strategies (3 items). The results of Biçak (2013) evidence that test preparation and test taking study skills are multidimensional.

It is clear that the reviewed literature is rich in studies which analyzed the dimensions of time management, test preparation and test taking study skills questionnaires. However, there is a paucity of studies which analyzed the dimensions of other study skills including note taking, reading, and writing study skills questionnaires. Further, the reviewed literature establishes that items measuring time management, test preparation and test taking study skills scales are multi-dimensional. However, most of them failed to demonstrate levels of students' time management, test preparation and test taking skills in relation to the identified sub-dimensions. Thus, the present research intends to position itself towards confirming or rejecting the multi-dimensionality of time management, test preparation and test taking scales as well as note taking, reading, and writing study skills scales. Finally, the study seeks to indicate how students rate themselves in different study skills subscales, an area which was not explored by most reviewed studies. In other words, the present study seeks to enrich the literature around study skills questionnaire analysis and levels of students' study skills in their different study skills subscales.

3. Methods

3.1. Research Design

This study follows a cross-sectional survey design. It unveils dimensions within the study skills questionnaire administered to UR undergraduate students of NPC and shows how students fare in different subscales of study skills under investigation.

3.2. Participants

The study engaged with undergraduate students of the UR studying in the pre-

mises of NPC located in Musanze district, Northern province. These were police officers living in a particular study environment and having a particular status comparing to other civilian students of the UR. The total study population was 398 undergraduate students of three academic programs i.e. PPS, Law, and Computer Science with the option of Information Security. In this study, we used a census for small populations and considered all 398 students for 2016-2017 academic year as research participants because the number was not too big to be sampled. Students of all years of study, i.e., from year one up to year four were involved in the study.

3.3. Measures

A self-reported battery was used to collect quantitative data. Questionnaire items were adjusted from Bajwa, Gujjar, Shaheen and Ramzan (2011); and Sabbah (2016). The tool was a five-point Likert-type scale survey (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). It included six scales related to key components of study skills under investigation: time management (13 items), notes-taking (11 items), reading (11items), writing (14 items), test preparation (9 items), and test-taking study skills (12 items). Prior to larger data collection, the pilot study was done on 95 undergraduate students of the Forensic Science program. Although NPC students, participants to the piloting phase were not UR students. The questionnaire was refined basing on answers from the piloting phase.

3.4. Procedure

We secured the authorization to carry out research at NPC from the Inspector General of the Rwanda National Police (RNP) through the commandant of NPC. Respondents took part in the study after being explained the drive and necessities of participating in the study. Data were collected from May 1st to 12th in the 2nd semester of the 2017 academic year at NPC/Musanze District. Respondents answered the questionnaire in their respective classrooms and answers were collected the same day. Data entry and analysis were done using the software SPSS 25 and AMOS 25. The instrument was found reliable with the Cronbach's Alpha greater than .72 for all explored scales as per Table 1.

Table 1. Reliability of scales.

Scale	Cronbach Alpha
Time management skills	.77
Notes taking skills	.78
Reading skills	.78
Writing skills	.86
Test preparation skills	.72
Test taking skills	.76

Source: Primary data, 2018.

3.5. Data Analysis: Factor Extraction

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) techniques were used to analyze data. The EFA is a data reduction technique that helps classify a list of items into factors or clusters. Items in the same cluster (called "factor") are usually related and can be named referring to their common features (Field, 2009). In this study, the EFA was conducted using Principal Component Analysis (PCA) to establish whether there are patterns of structures in each study skills set. On the other hand, the CFA is a technique meant to establish whether the structure provided by EFA fits the data. It shows the extent to which the established model fits the data; it measures good fit or poor fit (Byrne, 2013; Brown, 2015). The standardized measures used are presented in Table 2 below.

3.5.1. EFA Assumptions

While conducting EFA on the study skills, three assumptions were verified: the determinant, Kaiser-Meyer-Olkin (KMO), and Bartlett Test of Sphericity. The "determinant" is a measure of the absence or presence of multicollinearity (high levels of correlation between items). The KMO is an indicator of the sampling adequacy while the Bartlett Test of Sphericity gauges the strength of the bivariate relationship between items under investigation (Field, 2009; Plichta & Kelvin, 2013). The standard measures of these three assumptions are provided in Table 3.

Table 2. Standardized measures of CFA goodness-of-fit indices.

CFA goodness-of-fit indices	
Measure	**Threshold**
Chi-square/df (cmin/df)	<3 good; <5 sometimes permissible
P-value for the model	>.05
CFI	>.95 great; .90 traditional; >.80 sometimes permissible
GFI	>.95
AGFI	>.80
SRMR	<.09
RMSEA	<.05 good; .05 - .10 Moderate; >.10 bad
P CLOSE	>.05

Source: Byrne (2013) and Brown (2015).

Table 3. Standardized EFA assumptions.

Assumption	Standard
Determinant	>.00001
KMO	>.60
Bartlett Test of Sphericity	<.50

Source: Field (2009); Plichta & Kelvin (2013).

3.5.2. Extraction of Factors

The extraction of factors was performed to identify a number of dimensions that fit each study skills scale. To determine the number of factors to be extracted, eigenvalue, scree plot, and the percentage of variance explained were considered. The eigenvalue refers to the total amount of variance brought about by a factor in measuring the construct. In this study, the eigenvalues of 1 or greater (Plichta & Kelvin, 2013) was taken as a standard. The scree plot is a graphical representation of all possible factors within a construct. The number of factors to be retained is decided by identifying the sharp break which marks the upward move. The percentage of variance explained refers to the cumulative weight of a number of factors in explaining the construct. The general rule of thumb is that the retained factors d should at least account for a total variance of 40% (Plichta & Kelvin, 2013). While extracting factors, matrix rotation was used to reveal dimensions underlying each study skills scale.

3.5.3. Descriptive Analysis

In order to determine levels of students' study skills in identified subscales, descriptive statistics were used through measures of central tendency and dispersion including maximum, minimum, mean and standard deviation. Subscales were created using the SPSS "Transform-Compute variable" function by summing up scores for all items making up each factor. Subscales created were named considering the nature of their items. Given that the study items were measured on a five-point Likert type scale, the minimum score was calculated by multiplying the number of items by one. Equally, the maximum score was obtained by multiplying the number of items by five. Maximum scores served as a baseline to interpret results from descriptive analysis. Descriptive statistics were calculated drawing on newly computed subscales and results.

4. Findings

4.1. Dimensions of Students' Study Skills

EFA Assumptions and CFA Goodness-of-Fit Indices for Each Study Skills Scale

The investigated study skills scales comprise different items (time managemet with 13, notes taking with 11, reading with 11, writing with 14, test preparation with 9 and test taking skills with 12 items). The task was to uncover possible dimensions (factors) within items of each study skills scale. While conducting EFA, the outputs indicate that all the assumptions are met as it is shown in Table 4, which is an evidence that there were latent dimensions within each study skills scale.

Table 4 shows that the EFA assumptions are met for all study skills scales because the obtained values for each scale satisfied the standardized measures. Basing also on both the scree plot and the rotation matrix, it was evident that each study skills scale was multidimensional with three dimensions for time management, notes taking and writing while reading, test preparation and test taking skills have two dimensions.

The structures were then submitted to CFA to establish whether they fit the data, i.e. to establish whether there is good fit or poor fit. Data obtained are summarized in Table 5.

As Table 5 illustrates, the three or two dimensional models achieve the goodness-of-fit although the *p*-value of the Chi-square is significant for time management, notes taking, reading and writing. This might be attributed to the limited sample size (N = 398). The implication for these findings is that all the study skills scales are multi-dimensional as clarified by their rotation matrix, CFA multi-dimensional model and factor model structure presented and described below.

1) Time management study skills

Looking at the rotation matrix in Table 6, it is noticeable that the study skills time management has three dimensions. The 1st with 5 items, the second with 3 items and the third with 5 items. This is confirmed by the tri-dimension model in Figure 1 below and the three-factor model for time management in Table 7.

2) Notes taking study skills

Basing on the rotation matrix in Table 8, it is evident that the study skills notes taking has three dimensions. Factor one has 5 items, factor two 3 items while factor three records 4 items as confirmed by the three-dimensional model in Figure 2 and the three-factor model of notes taking in Table 9.

Table 4. EFA assumptions for each study skills.

SN	Study skills	EFA assumptions – obtained values		
		Determinant	KMO	Bartlett Test of Sphericity
1	Time management	.096	.81	.00
2	Notes takings	.099	.84	.00
3	Reading	.142	.83	.00
4	Writing	.007	.89	.00
5	Test preparation	.198	.77	.00
6	Test-taking	.107	.82	.00

Source: Primary data, 2020.

Table 5. Obtained CFA goodness-of-fit indices for each study skills.

SN	Study skills	CFA goodness-of-fit indices							
		Chi-square/df (cmin/df)	P-value for the model	CFI	GFI	AGFI	SRMR	RMSEA	P CLOSE
1	Time management	1.71	.000	.95	.96	.94	.04	.04	.81
2	Notes taking	2.017	.000	.95	.97	.94	.05	.05	.45
3	Reading	1.828	.001	.95	.97	.95	.04	.04	.65
4	Writing	1.623	.001	.98	.96	.94	.04	.04	.90
5	Test preparation	1.320	.148	.99	.98	.97	.03	.03	.91
6	Test-taking	1. 343	.056	.98	.97	.96	.03	.03	.98

Source: Primary data, 2020.

Table 6. Rotation matrix: Loadings for time management.

Items	Factor 1	Factor 2	Factor 3
Getting time for personal activities	.823		
Getting time for academic activities	.770		
Satisfaction with the use of time	.660		
Having study materials when studying	.519		
Good time for studying	.456		
Respect of planned activities		.722	
Planning academic and personal activities		.695	
Setting goals		.676	
Class attendance			.734
Punctuality at class and meetings			.718
Starting doing coursework as soon as assigned			.491
Punctuality in submitting course works			.444
Regular review of class notes			.417

Source: Primary data, 2020.

Table 7. The three-factor model for time management

| Factor 1: Time use or allocation	Regression weights
Qn6.12 Getting time for personal activities	.55
Qn6.11 Getting time for academic activities	.58
Qn6.13 Satisfaction with the use of time	.59
Qn6.7 Having study materials when studying	.56
Qn6.6 Good time for studying	.53
Factor 2: Planning of activities	**Regression weights**
Qn6.2 Respect of planned activities	.50
Qn6.1 Planning academic and personal activities	.60
Qn6.3 Setting goals	.62
Factor 3: Punctuality in academic activities	**Regression weights**
Qn6.4 Class attendance	.16
Qn6.5 Punctuality at class and meetings	.48
Qn6.9 Starting doing coursework as soon as assigned	.60
Qn6.10 Punctuality in submitting course works	.40
Qn6.8 Regular review of class notes	.63

Source: Primary data, 2020.
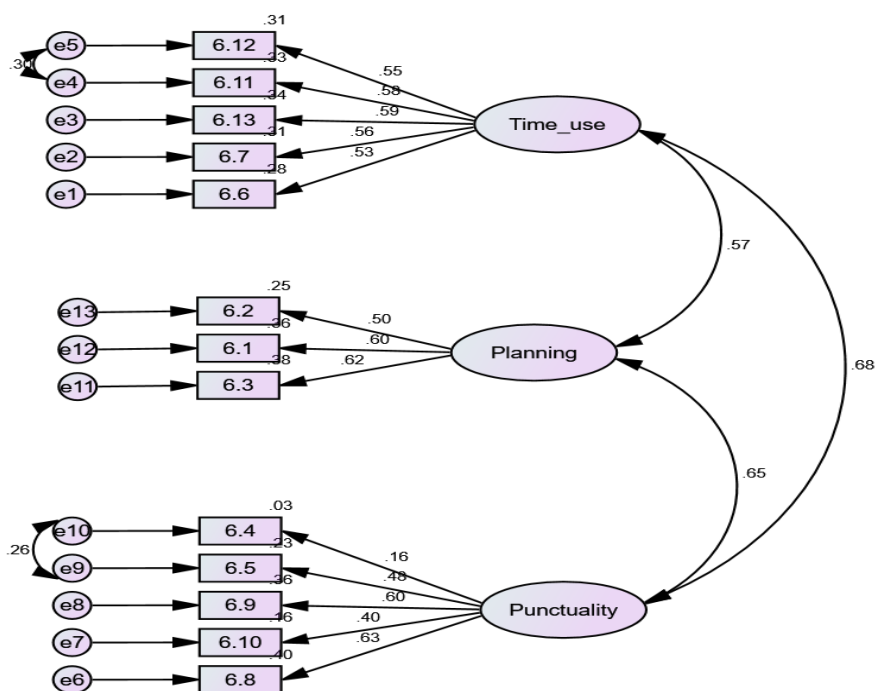
Figure 1. CFA time management: Tri-dimension model. Source: Primary data, 2020.

Table 8. Rotation matrix: Loadings for notes taking.

Items	Factor 1	Factor 2	Factor 3
Taking notes during lectures	.71		
Going to class with notes taking materials	.67		
Ability to follow lecture and class discussion while taking notes	.53		
Taking notes when reading notes	.50		
Taking notes on supplement readings	.50		
Checking notes		.78	
Notes review and editing		.72	
Notes organization		.55	
Putting notes in own words while taking notes			.78
Use of abbreviations and symbols			.68
Starting doing coursework as soon as assigned			.68
Identification of important points while taking notes			.61

Source: Primary data, 2020.

Table 9. The three-factor model for notes taking.

| Factor 1: Notes taking readiness and abilities	Regression weights
Qn7.2 Taking notes during lectures	.47
Qn7.1 Going to class with notes taking materials	.48
Qn7.6 Ability to follow lecture and class discussion while taking notes	.50
Qn7.3 Taking notes when reading notes	.65
Qn7.4 Taking notes on supplement readings	.63
Factor 2: Notes polishing	**Regression weights**
Qn7.10 Checking notes	.62
Qn7.9 Notes review and editing	.71
Qn7.11 Notes organization	.46
Factor 3: Notes wording	**Regression weights**
Qn7.7 Putting notes in own words while taking notes	.58
Qn7.8 Use of abbreviations and symbols	.29
Qn7.5 Identification of important points while taking notes	.72

Source: Primary data, 2020.
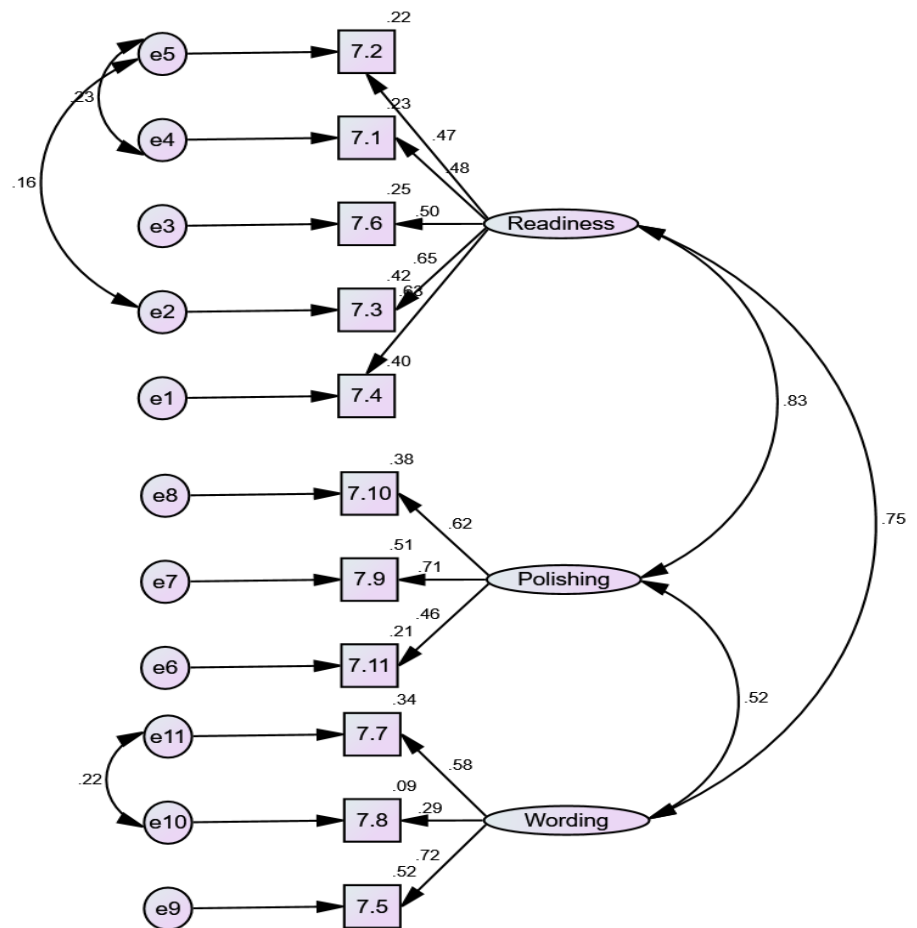
Figure 2. CFA notes taking: Tri-dimension model. Source: Primary data, 2020.

3) Reading study skills

Referring to Table 10, the study skills reading has two factors; factor one with 7 items and factor two with 4 items. The two dimension model in Figure 3 and the two-factor model for reading in Table 11 approve the findings too.

4) Writing study skills

Looking at Table 12, it is manifest that the study skill writing has three dimensions with 6, 3, and 5 respective items. This is confirmed by the tri-dimension model in Figure 4 and the three-factor model for writing in Table 13.

Table 10. Rotation matrix: Loadings for reading.

Items	Factor 1	Factor 2
Getting meaning of new words while reading	.71	
Paying attention to underlined, bold and italicized words	.65	
Underling important parts while reading	.63	
Trying to make connections while reading	.54	
Surveying the reading material	.53	
Distinguishing important and unimportant points while reading	.47	
Reading everything in each paragraph	.41	
Frequent review of the reading material		.70
Summary of the reading material		.68
Satisfaction with the reading ability		.41
Formulation of questions		.61

Source: Primary data, 2020.

Table 11. The two-factor model for reading.

| Factor 1: Form-related reading strategies	Regression weights
Qn8.7 Getting meaning of new words while reading	.49
Qn8.3 Paying attention to underlined, bold and italicized words	.54
Qn8.6 Underling important parts while reading	.54
Qn8.8 Trying to make connections while reading	.57
Qn8.1 Surveying the reading material	.48
Qn8.4 Distinguishing important and unimportant points while reading	.54
Qn8.5 Reading everything in each paragraph	.48
Factor 2: Content-related reading strategies	**Regression weights**
Qn8.9 Frequent review of the reading material	.58
Qn8.10 Summary of the reading material	.52
Qn8.11 Satisfaction with the reading ability	.65
Qn8.2 Formulation of question	.56

Source: Primary data, 2020.
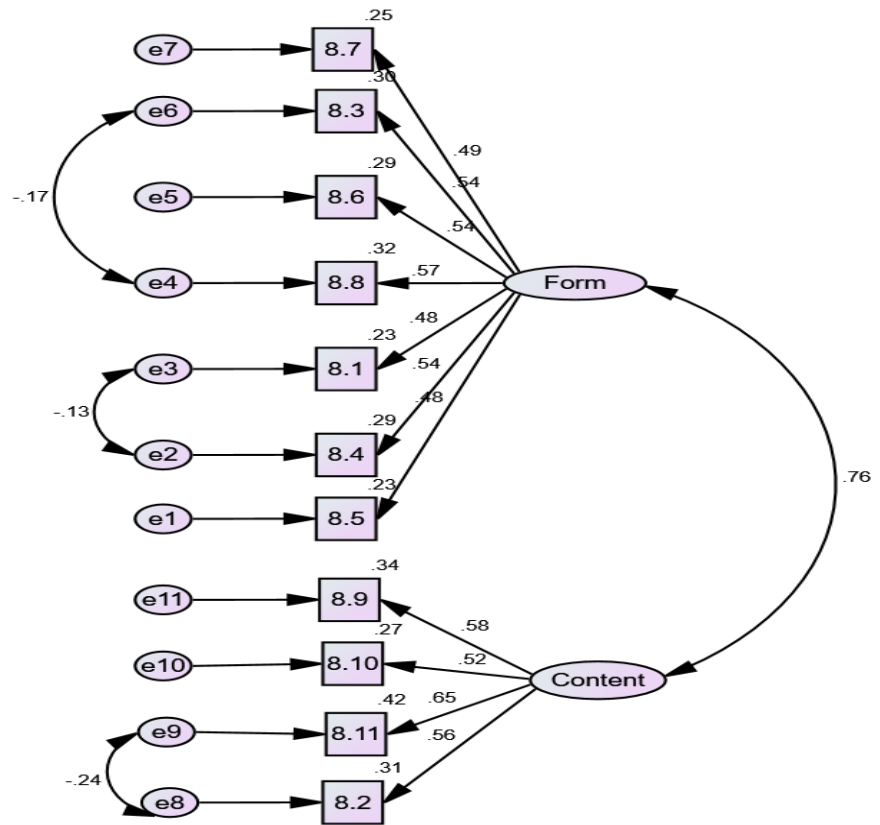
Figure 3. CFA reading: Two-dimension model. Source: Primary data, 2020.

Table 12. Rotation matrix: Loadings for writing.

Items	Factor 1	Factor 2	Factor 3
Confidence in writing ability	.85		
Comfortability with English grammar, punctuation and spelling	.81		
Having ability to express thoughts in writing	.68		
Use of correct grammar	.67		
Review of written essay for grammatical errors	.48		
Use of well-defined structure while writing an essay	.44		
Provision of reference list		.85	
Making sure both in-text and end referencing are there		.81	
Provision of in-text referencing when writing an essay		.80	
Comfortability using library resources for research			.75
Allowing sufficient time for information collection			.70
Having a clear idea for writing assignment			.58
Comfortability using electronic resources for research			.54
Giving the written work to someone else for proof reading			.50

Source: Primary data, 2020.

Table 13. The three-factor model for writing.

| Factor 1: Writing proficiency	Regression weights
Qn9.14 Confidence in writing ability	.66
Qn9.13 Comfortability with English grammar, punctuation and spelling	.71
Qn9.12 Having ability to express thoughts in writing	.63
Qn9.5 Use of correct grammar	.70
Qn9.10 Review of written essay for grammatical errors	.61
Qn9.6 Use of well-defined structure while writing an essay	.63
Factor 2: Referencing skills	**Regression weights**
Qn9.8 Provision of reference list	.79
Qn9.9 Making sure both in-text and end referencing are there	.80
Qn9.7 Provision of in-text referencing when writing an essay	.79
Factor 3: Information gathering abilities	**Regression weights**
Qn9.2 Comfortability using library resources for research	.56
Qn9.4 Allowing sufficient time for information collection	.56
Qn9.1 Having a clear idea for writing assignment	.69
Qn9.3 Comfortability using electronic resources for research	.52
Qn9.11 Giving the written work to someone else for proof reading	.50

Source: Primary data, 2020.
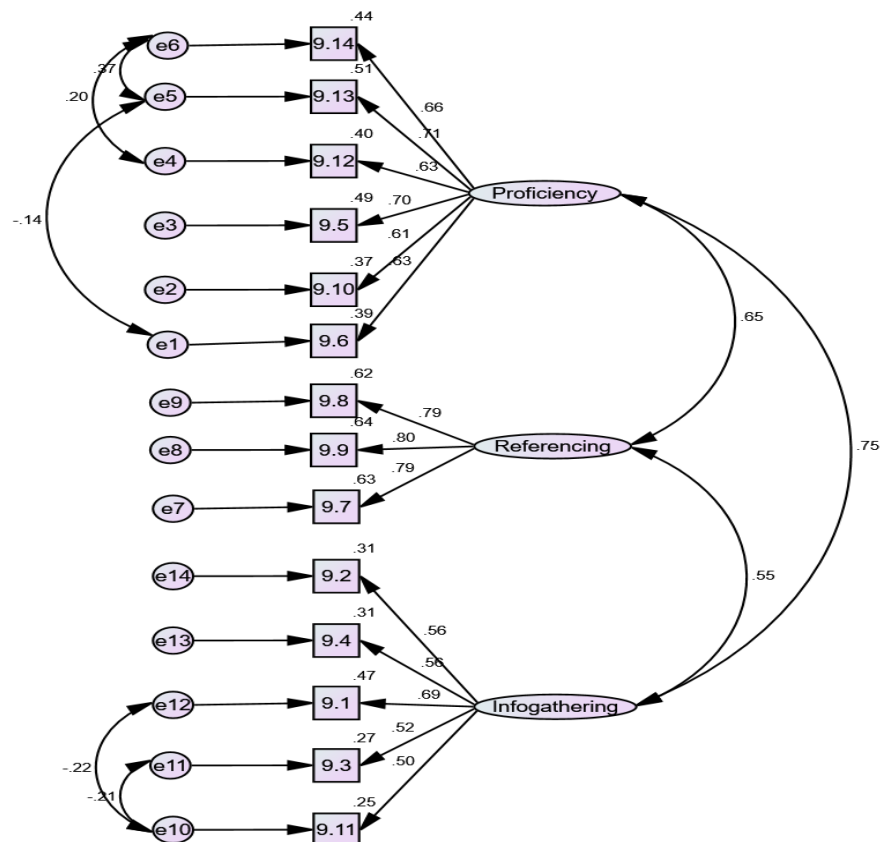
Figure 4. CFA writing: Tri-dimension model. Source: Primary data, 2020.

5) Test preparation study skills

The rotation matrix in Table 14 proves that the study skills test preparation has two factors with 6 and 3 respective items as supported by the two-dimension model in Figure 5 and the two-factor model for test preparation in Table 15.

Table 14. Rotation matrix: Loadings for test preparation.

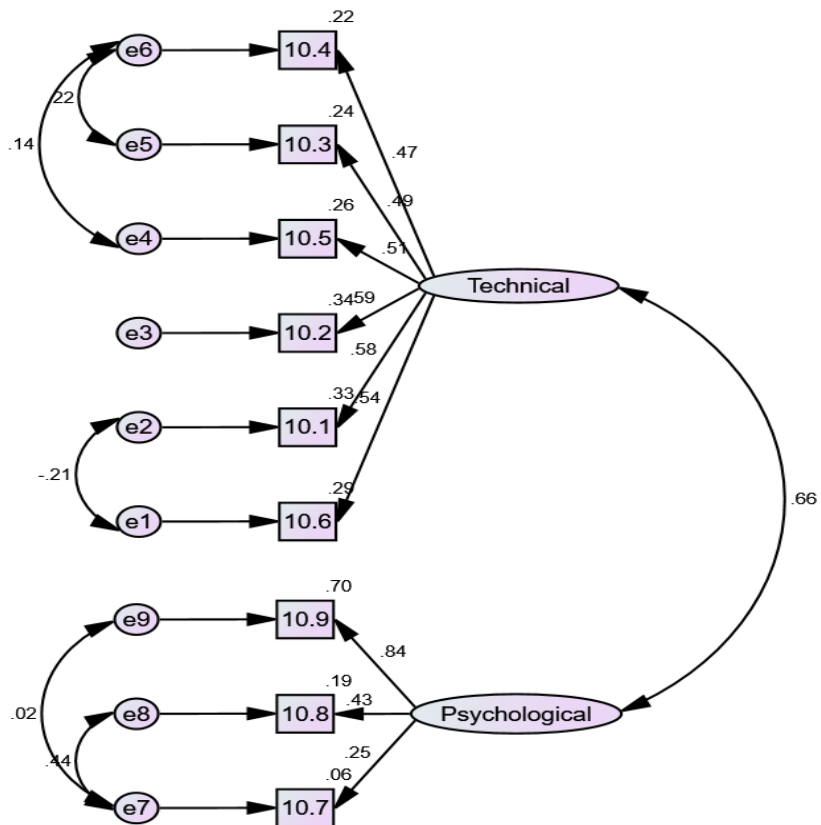| Items	Factor 1	Factor 2
Finding out the coverage of the exam	.68	
Understanding the structure of types of tests	.67	
Anticipating possible test questions	.67	
Striving to understand the material	.66	
Studying for an exam several days	.56	
Identifying learned and not learned material	.51	
Feeling confident of being prepared for an exam		.49
Getting a good night's rest prior to an exam		.85
Avoiding study hard the night before the exam		.81

Source: Primary data, 2020.

Figure 5. CFA test preparation: Two-dimension model. Source: Primary data, 2020.

Table 15. The two-factor model for test preparation.

Factor 1: Technical abilities	Regression weights
Qn10.4 Finding out the coverage of the exam	.47
Qn10.3 Understanding the structure of types of tests	.49
Qn10.5 Anticipating possible test questions	.51
Qn10.2 Striving to understand the material	.59
Qn10.1 Studying for an exam several days	.58
Qn10.6 Identifying learned and not learned material	.54
Factor 2: Psychological abilities	**Regression weights**
Qn10.9 Feeling confident of being prepared for an exam	.84
Qn10.8 Getting a good night's rest prior to an exam	.43
Qn10.7 Avoiding study hard the night before the exam	.25

Source: Primary data, 2020.

6) Test taking study skills

Table 16 exemplifies two factors for the study skills test taking with 7 items for the 1st factor and 5 items for the second factor. This is confirmed by its two dimension model in Figure 6 and two factor model in Table 17 below.

4.2. Levels of Students' Study Skills in Identified Subscales

In order to determine levels of students' study skills in identified subscales, descriptive statistics were used including minimum, maximum, mean and standard deviation. Sub-scales were named considering the nature of their items. Descriptive statistics for each study skills subscale are presented in different tables below.

As Table 18 shows, students fare better in time-punctuality (M = 21.02; SD = 2.75) and time-allocation (M = 17.51; SD = 3.78). But problems are rife with time-planning (M = 11.37; SD = 2.36). Time-planning involves study skills such as respecting planned activities, planning academic and personal activities, and setting goals. In the questionnaire, items related to time-planning read as follows: (6.1) I make a daily plan of academic and personal activities; (6.2) I avoid activities which tend to interfere with my planned schedule; and (6.3) I daily set goals for the amount of work I want to complete.

Table 19 indicates that, students are ready for taking notes (M = 18.71; SD = 3.64). But notes wording (M = 10.71; SD = 2.40) and notes polishing (M = 9.11; SD = 2.76) present problems. Notes wording involves study skills such as putting notes in own words, use of abbreviations and symbols as well as identification of important points while taking notes. In the questionnaire, items related to notes wording read as follows: (7.7) when taking notes, I put concepts in my own words (7.8) I use abbreviations and symbols when taking notes; and (7.5) when taking notes, I am able to identify and write down important points. Moreover,

items related to notes polishing are: (7.10) after taking notes, I check them against other students' notes to make sure I didn't miss any important details (7.9)after each class, I review and edit my notes systematically, (7.11) I have binder or folder where I organize my notes or any handout received during class.

Table 16. Rotation matrix: Loadings for test taking.

Items	Factor 1	Factor 2
Following exam directions carefully	.64	
Answering according to marks allocated to each question	.63	
Answering from simple to difficult	.63	
Surveying the test before beginning	.60	
Reading exam directions	.55	
Taking time to understand exam questions	.51	
Ability to recall knowledge during the exam	.45	
Satisfaction with the way of answering questions		.69
Provision of grammatically correct answers		.65
Completing the exam on time		.62
Reviewing answers and checking mistakes		.52
Avoiding looking toward other students papers		.46

Source: Primary data, 2020.

Table 17. The two-factor model for test taking.

| Factor 1: Technical skills	Regression weights
Qn11.5 Following exam directions carefully	.61
Qn11.4 Answering according to marks allocated to each question	.51
Qn11.3 Answering from simple to difficult	.21
Qn11.1 Surveying the test before beginning	.44
Qn11.2 Reading exam directions	.41
Qn11.6 Taking time to understand exam questions	.66
Qn11.7 Ability to recall knowledge during the exam	.62
Factor 2: Checking attitudes before exam submission	**Regression weights**
Qn11.11 Satisfaction with the way of answering questions	.62
Qn11.8 Provision of grammatically correct answers	.67
Qn11.12 Completing the exam on time	.45
Qn11.10 Reviewing answers and checking mistakes	.54
Qn11.9 Avoiding looking toward other students papers	.30

Source: Primary data, 2020.
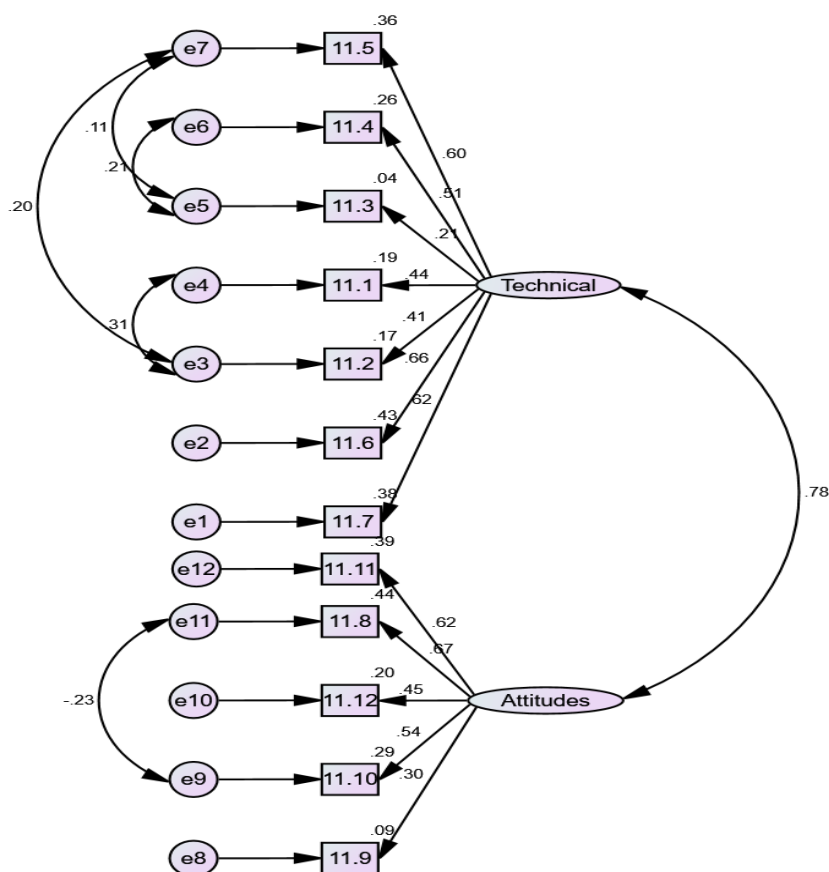
Figure 6. CFA test taking: Two-dimension model. Source: Primary data, 2020.

Table 18. Time management study skills subscales.

Subscales	Min.	Max	Mean	SD
Time-punctuality	12	25	21.02	2.75
Time-allocation	6	25	17.51	3.78
Time-planning	3	15	11.37	2.36

Source: Primary data, 2020.

Table 19. Notes taking study skills subscales.

Subscales	Min.	Max.	Mean	SD
Notes taking-readiness	9	25	18.71	3.64
Notes-wording	5	15	10.72	2.40
Notes-polishing	3	15	9.11	2.76

Source: Primary data, 2020.

Referring to Table 20, students are good in form related strategies (M = 26.48, SD = 4.25. But problems are rampant in content-reading strategies (M = 13.35; SD = 2.97). In fact, content-reading strategies involves study skills such as frequent review of the reading material, summary of the reading material, satisfac-

tion with the reading ability and formulation of questions. In the questionnaire, items related to content-reading strategies stand out as follows: (8.9) I review reading material several times during a semester; (8.10) I summarize the reading material in my own words and take brief notes; (8.11) I am satisfied with my reading ability and (8.2) while reading, I formulate important questions and try to answer them.

Table 21 displays that students fare better in writing proficiency (M = 21.20; SD = 4.23) and info-gathering skills (M = 17.04; SD = 3.23). But difficulties are predominant in referencing skills (M = 11.28; SD = 2.98). Referencing skills include study skills such as provision of reference list, making sure both in-text and reference list are there and provision of in-text referencing when writing an essay. In the questionnaire, items related to referencing skills read as follows: (9.8) when writing an essay, I provide a reference list at the end of the work; (9.9) when writing an essay, I make sure that all referenced materials at the end of the work or footnotes are cited in the text and vice versa; and (9.7) when writing an essay, I provide in-text citations in the body of the work (sources of ideas and information).

Table 22 clarifies that students fare better in technical abilities (M = 22.84; SD = 3.50). But difficulties are found in their psychological abilities (M = 10.26; SD = 2.54). Indeed, psychological abilities comprise study skills such as feeling confident of being prepared for an exam, getting a good night's rest prior to an exam and avoiding study hard the night before the exam. In the questionnaire, items related to psychological abilities read as follows: (10.9) I feel confident that I am prepared for the exam; (10.8) I get a good night's rest prior to a scheduled exam; and (10.7) I do not study hard the night before the exam.

As Table 23 shows, students seem to do better in their technical skills (M = 26.46, SD = 3.95 than their attitudes before submitting scripts (M = 18.67; SD = 3.13). Actually, attitudes before submission contains study skills such as satisfaction with the way of answering questions, provision of grammatically correct answers, completing the exam on time, reviewing answers and checking mistakes and avoiding looking toward other students' papers. In the questionnaire, items related to attitudes before submission of exams are: (11.11) I am satisfied with the way I answer questions; (11.8) I provide grammatically correct answers with good punctuation and spelling; (11.12) I complete the exam on time, (11.10) I review my answers and check my work to spot mistakes or questions overlooked and (11.9) when taking an exam, I don't look toward other students' papers.

Table 20. Reading study skills subscales.

Subscales	Min.	Max	Mean	SD
Form-reading strategies	14	35	26.48	4.25
Content-reading strategies	4	20	13.35	2.97

Source: Primary data, 2020.

Table 21. Writing study skills subscales.

Subscales	Min.	Max	Mean	SD
Writing proficiency	9	30	21.20	4.23
Info-gathering skills	9	25	17.04	3.29
Referencing skills	3	15	11.28	2.98

Source: Primary data, 2020.

Table 22. Test preparation study skills subscales.

Subscales	Min.	Max	Mean	SD
Technical abilities	13	30	22.84	3.50
Psychological abilities	3	15	10.26	2.54

Source: Primary data, 2020.

Table 23. Test taking study skills subscales.

Subscales	Min.	Max	Mean	SD
Technical skills	10	35	26.46	3.95
Attitudes before submission	9	25	18.67	3.13

Source: Primary data, 2020.

5. Discussion

This study aimed at determining dimensions and dynamics within the study skills questionnaire administered to UR undergraduate students at NPC. Findings reveal that the study skills questionnaire is multidimensional with time management, notes taking and writing study skills registering three factors while reading, test preparation and test taking study skills record two dimensions. These findings were supported by Britton and Tesser (1991); Macan et al. (1990); Rao and Azmi (2018) as well as Razali et al. (2018) for time management study skills and Biçak (2013), Doreen (2008) and Zhang et al. (2011) for test preparation and taking study skills. Besides, descriptive statistics demonstrated that, for time management, students fare better in time punctuality and time allocation but have deficiencies in time-planning. For notes taking, students are ready for taking notes, but present problems in notes wording and polishing. For reading study skills, students are good in form-related strategies, but issues are rampant in content-reading strategies. For writing study skills, students fare better in writing proficiency and info-gathering skills, but have difficulties in referencing skills. For test preparation skills, students are good in technical abilities with challenges in psychological abilities. Finally, for test taking study skills, students do better in their technical skills than their attitudes before submitting scripts.

These findings demonstrate that students are strong in some specific aspects of study skills but also experience important difficulties in other particular aspects of the same study skills. This implies that while improving the quality of

learning in higher education, attention should not be only put on study skills categories in general but should go further to focus on specific aspects of each type of study skills.

In the view of the above findings, it is evident that NPC students need to be empowered in some important aspects of study skills. These include effective time planning with a particular emphasis on making a daily plan of academic and personal activities, respecting planned schedule, and setting daily goals. This is very important for students' success at university and in every day life because, as we know, failing to plan is planning to fail. Moreover, students need to be helped in notes wording and notes polishing especially in putting notes in their own words, using abbreviations and symbols as well as in identifying important points while taking notes; in checking notes taken against other students' notes, in reviewing and editing their notes and in organizing their notes. Indeed, all these skills facilitate the process of notes taking and make easy notes revision. Equally, there is a need to encourage students to regularly review their reading materials, to summarize them in their own words, to develop the reading culture so as to help them be self-confident. It is also necessary to motivate them to always formulate important questions and try to answer them while reading notes. Moreover, NPC students need to be helped to reference their academic works both within and at the end of the text and make sure that the in-text referencing is fully provided at the end of the work and vice versa. This is because quality academic works must be well referenced for academic integrity respect. Likewise, inspiring students to be mentally and emotionally well prepared to sit for tests can be impressively appreciated because this greatly impacts on their academic achievement. Finally, NPC students need to be supported but also be reminded to provide grammatically correct answers, to always review answers and check mistakes so as to increase the quality of their answers; to avoid malpractices, which undermine personal and institutional integrity and reputation, and do tests taking into consideration the time allowed so as to end on time.

The findings of this study contribute to literature on study skills questionnaire analysis in higher education and on students' levels in different aspects of study skills. Particularly, the study enriches the literature as far as the questionnaire analysis of time management, test preparation and test taking study skills is concerned. Besides, to the the researchers' knowledge, it is the 1st comprehensive questionnaire analysis for notes taking, reading, writing study skills questionnaire. In other words, this study brings new knowledge to the literature about the multidimensionality of reading, test preparation and test taking study skills. The study shed light on students' strengths and difficulties in different aspects of study skills, which have to be taken into consideration by all concerned stakeholders in charge of improving the quality of learning and teaching in Rwandan higher education and beyond.

The findings could be used by UR to elaborate the study skills handbook as a guide to students by taking into consideration the identified difficulties and

strengths in different aspects of study skills. University counselors could base on the findings to provide appropriate guidance and counselling services on the use of proper study skills. Teachers and parents or guardians could use the findings to design appropriate intervention to support students improve various aspects of study skills. Students could utilize the findings to take adequate strategies for optimizing their academic outcomes through improvement in their way of studying. Correspondingly, other researchers could use the reliable and valid study skills research tool and related findings in similar studies.

6. Conclusion

This study achieved its aims of determining possible dimensions within the study skills questionnaire administered to UR undergraduate students at NPC and unpacking dynamics within study skills identified factors for the six investigated study skills. It provides a reliable and valid study skill research tool that can be used by other researchers in similar studies. It demonstrates that students are not good in some important aspects of study skills. Thus, UR, teachers, students, parents or guardians and other education stakeholders are called up to refer to the findings in taking adequate strategies to address the identified gaps for academic outcomes improvement. In line with this, the study recommends UR to elaborate the study skills handbook to be used as a common guide for students. It also recommends the provision of guidance and counselling services to undergraduate students on the formation of good study skills at the start and during their studies.

As the study did not explore possible reasons behind the identified students' strengths and weaknesses in some aspects of study skills; further researches can focus on this unexplored area. Investigation into the relationship between dimensions of study skills subscales and demographic factors can also be another area of interest for researchers. Besides, the generalization of the findings to other UR colleges and universities should be done with caution because the study is limited to police officer students living in particular conditions and having a particular status among university of Rwanda undergraduate students. A bigger sample from university of Rwanda or other universities through the country is vital for generalization purposes.

Informed Consent

All study participants were given the opportunity to give their informed consent.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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