Using Principal Components Analysis in Designing Academic Writing Scoring Rubrics

Dr. Manel MIZAB

Eshahid Sheikh Larbi Tbessi, Tebessa University, (Algeria)

manel.mizab@univ-tebessa.dz

Abstract	Article info
Academic writing assessment is pivotal in university career. Some teachers tend to assign holistic marks to written compositions, ignoring assessment criteria. However, this paper highlights the importance of systematicity in assessment using scoring rubrics that are designed according to the context and population they are directed to. This paper suggests a paragraph scoring rubric after performing exploratory Principal Components Analysis (PCA). A set of 19 evaluation criteria is suggested and piloted on 51 paragraphs written by first-year university students from the Department of English at Tebessa University. After setting oblique rotation, PCA indicates that the variables are correlated (sig. > 0.001 in Bartlett's test), and are extracted into five factors that are correlated as well (r >0.32). The PCA pattern matrix indicates that some variables have cross-loadings, so they should be deleted. Therefore, the initial variables are extracted into four factors, named academic writing style, paragraph structure, lexis, and writing mechanics. These components constitute the holistic scoring rubric, which is recommended in scoring paragraphs, and which is tested to validate its groupings and psychometric properties.	

1.*Introduction*

Academic writing often seems tricky as it abides by specific standards and rules that are different from speaking and even from other types of writing. Indeed, the way we speak includes certain forms and tone that reflect the communicative nature of the language. Besides, writing for personal purposes, such as thoughts and chats, or for aesthetic reasons like poems and prose, or for journalistic intentions, is divergent.

Academic writing is governed by certain features that make it distinguishable. It is needed in college as almost every correspondence, assignment and test are pursued in the written mode. It is also required when writing essays, dissertations and theses. Therefore, students should be acquainted with what is expected from them by teaching them the basics of academic writing and by drawing their attention to scoring criteria of academic compositions.Interestingly, some teachers only read globally the written compositions and assign them random approximate marks, which may or may not reflect the work in question, and which engenders lack of assessment credibility. Therefore, analytical or holistic scoring rubrics are essential, for they govern assessment, establish consensus among assessors, and determine the deficiencies upon which feedback is provided to students.

This paper aims at raising awareness of the importance of unanimity of operationalising assessment criteria among assessors at the Department of English at Tebessa University. Indeed, students would have equal chances of being assessed almost similarly.

This work also grapples to suggest a holistic rubric to assess first year paragraph writing at the Department of English at Tebessa University. Thus, it tries to answer the following questions:

• How many factors (assessment criteria) are extracted out of the 19 suggested variables?

• What do the extracted factors reflect?

2. *Requirements for Paragraph Writing*

As a first stage before designing the rubric, some characteristics that make paragraph writing academic are set as they are the basis of rubric design. These features are the specificities that bring a paragraph to the standards of academic writing. In this section, they are explained according to the researcher's conceptualisation.

However, aspects related to paper format, including indentation, margins, neatness, and handwriting, are not included in the rubric as they are organisational, yet they can definitely be considered in scoring.

2.1. Relevance

It refers to the extent to which the ideas used in a paragraph are relevant, related and connected to each other and to the main topic discussed in the paragraph. Relevance denotes the usefulness of ideas in depicting the overall topic.

2.2. Evidence

It refers to the content and information used to present a topic and to clarify the idea to the readers. In-depth coverage of the topic is needed instead of simply reporting superficial ideas.

2.3. Details and Examples

They are illustrations and elaborations on the supporting ideas to give the writing style more vividness and to root it in the writer's knowledge and experiences.

2.4. Lexis

It refers to the vocabulary used and its relevance to the topic discussed in the paragraph, for each topic has its jargon. Besides, lexis is about the correct choice of words.

2.5. Spelling

It stands for the correct writing of words and for spelling them adequately. It also refers to one consistent spelling, either British or American.

2.6. Punctuation

It refers to the correct use of punctuation marks, including periods, commas, colons, semi-colons, question marks, exclamation marks, quotation marks …etc. Indeed, misusing these marks would result into writing problems, such as choppy sentences, stringy sentences, comma splices, run-ons …etc.

2.7. Capitalisation

It refers to the correct use of upper-case and lower-case letters, for there are words that are always capitalized; e.g., I, Internet (n), proper nouns, and words that need capitalisation when they are at the beginning of the sentence.

2.8. Grammatical Structures

This aspect refers to the grammar rules that contribute to the correctness of the language. They include all word classes and their appropriate use in sentences. For instance, different types of adverbs are placed differently within sentences. Another example includes the appropriate use of quantifiers in accordance with the noun type.

2.9. Subject-verb Agreement

Though a grammatical structure, agreement between the subject and the verb is considered a separate item in assessing paragraphs, for EFL students find it difficult to use some verb forms as they are not transferrable from their native language. For instance, third person singular "-s" is a common error that most students fail to realize in spite of knowing the rule.

2.10. Varied Sentence Structures

This feature refers to simple, compound, complex, and compound-complex sentences. The varied use of these structures denotes the writer's sophisticated style and his/her transcendence of merely putting simple sentences in subsequence.

2.11. Topic Sentence

It is, in most cases, the first sentence in the paragraph that sketches the general topic of the paragraph and the controlling idea that guides discussion within the paragraph.

2.12. Concluding Sentence

It is the last sentence in the paragraph that indicates the end of writing. It can summarise the paragraph, or reformulate the topic sentence, or leave a comment, advice, moral …etc.

2.13. Supporting Sentences

Supporting sentences stem from the controlling idea, and they represent the sub-ideas of the topic.

2.14. Logical Order

There are several patterns of logical order, such as cause and effect, comparison and contrast, chronological order …etc., that indicate how the ideas are organised in a way that appeals to the readers' interest in following the smoothness and flow of ideas.

2.15. Transition Signals

They are sequencers used between sentences to indicate the relationship between them, including cause, effect, contrast, conclusion …etc. These words and expressions contribute to paragraph coherence and the harmony of ideas.

2.16. College Style

Writing for college purposes differs from writing for leisure or for other non-academic purposes. College style is academic and formal, and colloquialism is not appreciated.

2.17. Formal Style

Formal writing stands for the use of language forms that are compatible with the written mode. For instance, it is advisable to avoid using contracted forms in writing, but it is acceptable to use them in speaking.

2.18. Reasoning

It refers to logical thinking in presenting ideas and opinions, in relating them to each other, and in having them rooted in evidence.

2.19. Conciseness

It stands for presenting the message in precise and concise language without falling in the trap of wordiness.

3. Research Method

Assessing paragraphs on the basis of the 19 aforementioned criteria is tiring and time-consuming especially in the case of overcrowded classes. Indeed, PCA is a statistical method that allows to reduce the number of replicated variables (criteria), and it helps to group the related ones together into factors (Cohen, Manion, & Morrison, 2018). Mizab (2022) explained the stages of PCA to design a scoring rubric, and she summarised its requirements as follows:

1. A set of 19 variables is set into an analytical scoring rubric.

2. The analytical rubric is piloted on 51 paragraphs written by first-year university students from the Department of English at Tebessa University.

3. Data is entered on SPSS

4. PCA is calculated

5. PCA safety measures are checked

6. Factors are extracted

7. Factors are named

8. The holistic rubric is designed.

3.1 Analytical Scoring Rubric

The analytical scoring rubric consists of the 19 aforementioned writing criteria and three (3) scales: 1 for inexistent, 2 for basic, and 3 for existent. Each criterion is operationalised and described within these three levels to ease the assessment task (Table 1).

Table 1. Analytical scoring rubric

N	Criteria	1 Inexistent	2 Basic	3 Existent
1.	Relevance	Ideas are **irrelevant** and **useless**.	Ideas are **partially relevant** to the topic and to each other, and they **partially depict** the topic.	All ideas are **relevant** and **useful** to the topic and to each other.
2.	Evidence	**Superficial** ideas are reported.	**Subtle** use of information is depicted in clarifying the topic.	**In-depth** information that clarify the topic.
3.	Details and examples	There are **no details and examples** and **no reference** to the writer's knowledge and **experiences**.	Some **general examples** are used, and **experiences** are **seldom** referred to.	Illustrations and elaborations give the writing style more **vividness**, and the writer's knowledge and **experiences** are **prevalent**.
4.	Lexis	Vocabulary **does not reflect** the jargon of the topic.	Vocabulary is **partially relevant** to the topic and some words are **misused**.	Vocabulary is **relevant** to the topic and **well chosen.**
5.	Spelling	**Major mistakes** in spelling words, and **mixed use** of British and American spellings.	**Minor mistakes** in spelling words, and **minor inconsistencies** (very few British spellings permeating American English, or vice versa).	Words are written **correctly**, and they are **consistent** (only British English or American English).
6.	Punctuation	Full of **writing problems** due to the **misuse** of punctuation marks.	**Some mistakes** in using punctuation marks, but it does not harm the writing overall.	**Correct use** of punctuation marks.
7.	Capitalisation	**Misuse** of upper-case and lower-case letters in all positions.	**Some mistakes** in upper-case and lower-case letters.	**Correct use** of upper-case and lower-case letters in all positions.
8.	Grammatical structures	**Misuse** of grammatical structures.	**Some mistakes** in grammatical structures.	**Correct use** of grammatical structures.
9.	Subject-verb agreement	**Misuse** of subject-verb agreement.	**Some** verbs do not agree with their subjects.	**Correct use** of subject-verb agreement.
10.	Varied sentence structures	Only **simple** sentences are used.	**Simple and compound** sentences are used.	The use of a variety of sentence **four types**.
11.	Topic sentence	There is **no** topic sentence.	The topic sentence is **too general**, including the topic only.	The topic sentence is written, comprising the **topic** and the **controlling idea**.
12.	Concluding sentence	There is **no** concluding sentence.	The concluding sentence is **too general**,	The concluding sentence is written to **summarise the**

		or it **introduces something new.**	**paragraph**, or to **reformulate the topic sentence**, or to **leave a general comment, advice, moral** …etc.
13. Supporting sentences	**No** supporting sentences	Supporting sentences **do not comply with the controlling idea**	Supporting sentences **stem from the controlling idea**, and they represent the sub-ideas of the topic.
14. Logical order	Ideas are **haphazardly** presented.	Ideas are **mostly organised**, but **not within an apparent pattern** of organisation.	Ideas are **well-organised according to a pattern** of paragraph organisation.
15. Transition signals	Sequencers are **not used**, which denotes **no relationship** between sentences.	**Some** sequencers are used, but more could have been used to improve paragraph coherence.	The paragraph is **coherent**, and the **relationships between sentences are clear** owing to the **use of sequencers.**
16. College style	**Non-academic** and **informal** writing, and full of **colloquialism**.	**Both formal and informal** writing and **some colloquialism**.	**Academic and formal writing**, and **no colloquialism.**
17. Formal style	The use of **informal forms** that are not compatible with the written mode.	The use of **some informal forms** that are not compatible with the written mode.	The use of **formal forms** that are compatible with the written mode.
18. Reasoning	Ideas and opinions are **random** and **not well supported**.	Ideas and opinions are **presented logically** but **not well elaborated**.	Ideas and opinions are **presented logically** and are **rooted in evidence**.
19. Conciseness	**Wordiness**.	**Some passages are wordy** and could have been written concisely.	The use of **precise** and **concise** language

3.2 Piloting the Rubric

The analytical rubric is used to score 51 test written compositions, and data are entered on SPSS (Table 2).

Table 2. Scoring students' writings using the analytical rubric

N of written …	Relevance	Evidence	Lexis	Punctuation	Capitalisation	Spelling	Grammar structure	Subject-verb	Varied sentences	Topic sentence	Concluding sentence	Supporting sentences	Details and examples	Logical order	Transition signals	College style	Formal style	Reasoning	Conciseness
	3	3	3	1	1	3	2	3	2	3	3	3	3	3	2	2	2	3	2
	2	1	1	1	1	3	2	3	2	2	2	2	2	2	2	2	2	3	2
	3	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	2
	1	1	3	1	1	3	1	1	2	2	2	1	1	1	2	1	1	1	1
	2	1	3	1	1	3	3	3	2	3	3	1	2	2	1	2	2	2	1
	2	1	3	1	1	3	2	2	2	2	1	1	2	2	2	2	2	2	1
	3	3	3	1	1	3	1	3	2	3	3	2	2	3	3	2	2	3	2
	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
	3	3	1	1	1	3	2	3	2	3	3	2	3	2	2	2	2	3	2
.	3	3	3	1	1	3	2	3	2	3	3	2	2	2	1	2	2	2	2
.	3	3	3	1	1	3	2	3	3	3	1	3	2	3	1	2	3	3	3
.	2	3	3	1	1	3	1	1	2	3	3	3	3	2	2	1	1	2	1
.	2	3	3	1	1	3	1	2	2	3	3	1	2	2	1	1	1	2	1
.	3	3	3	1	1	3	3	3	3	3	3	3	3	3	3	2	2	2	3
.	3	3	3	1	1	3	3	3	3	3	3	3	3	3	2	3	3	3	3
.	3	3	1	1	1	1	1	1	2	3	3	1	2	1	1	1	2	1	1
.	3	3	3	1	1	3	2	3	3	3	3	3	3	2	2	2	3	2
.	3	3	3	1	1	3	3	3	3	3	3	3	2	3	2	2	3	3
.	3	3	1	1	1	1	2	2	2	3	2	3	2	3	3	1	1	2	2
.	3	3	3	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
.	3	3	3	1	1	3	2	3	2	3	3	3	3	3	2	2	2	3	3
.	3	3	3	1	1	3	2	2	2	3	2	3	3	3	2	2	2	3	3
.	3	3	3	1	1	3	2	3	3	3	3	3	3	3	3	3	2	3	3
.	2	1	3	1	1	3	1	1	2	3	2	1	1	1	1	1	1	1	3
.	2	1	3	1	1	3	1	1	2	2	2	2	3	3	1	1	2	2	2
.	3	1	3	1	1	3	3	3	2	2	2	2	1	1	1	1	1	1	3
.	3	3	3	1	2	3	2	3	3	3	3	3	3	3	3	3	2	2	3
.	3	3	3	1	1	3	2	2	2	3	3	3	3	3	2	2	2	2	3
.	3	3	3	1	1	3	2	3	3	3	3	3	2	3	2	2	3	2	3
.	3	3	3	1	1	3	2	3	3	3	3	3	3	3	3	2	2	3	2
.	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	3	3	3	3
.	3	3	3	1	2	3	2	3	3	3	3	3	3	3	2	1	2	3	3
.	3	3	3	2	1	3	2	3	3	3	3	3	3	3	3	2	2	3	3
.	3	3	3	1	2	3	2	3	3	3	3	3	3	3	2	2	3	3	3
.	3	3	3	1	1	3	2	3	3	3	3	3	3	3	1	2	2	3	3
.	3	3	3	1	2	3	2	3	3	3	3	2	2	2	1	3	3	3	3
.	3	3	3	1	1	1	1	3	3	3	3	3	3	2	1	3	3	3	3
.	3	3	3	3	3	3	2	3	3	3	3	3	2	3	1	3	3	3	3
.	3	3	3	1	2	3	3	2	3	3	3	3	3	3	2	3	2	3	3
.	3	3	3	1	2	3	2	3	2	3	3	3	2	3	2	2	3	2	3
.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

.	3	3	3	1	1	3	2	3	3	3	3	3	3	3	3	3	3	3	3
.	3	3	3	1	1	3	1	3	2	3	3	3	3	3	2	2	2	2	2
.	3	3	3	2	2	3	3	3	3	3	3	3	2	3	3	3	3	3	3
.	3	3	3	1	1	3	2	3	3	3	3	3	3	3	3	3	3	3	3
.	3	3	3	1	1	3	1	3	2	3	3	2	3	2	3	2	2	3	2
.	3	3	3	1	1	3	1	3	3	3	3	3	3	3	3	3	3	3	2
.	3	3	3	1	1	3	2	3	3	3	3	3	2	3	3	3	3	3	3
.	3	3	3	1	1	3	2	3	3	3	3	3	3	3	2	3	3	3	3
.	3	3	3	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
.	3	1	3	1	1	3	3	3	3	3	3	3	3	3	2	2	2	3	2

3.3. Calculating PCA

On SPSS, the command "factor analysis" is performed to reduce variables. Since we are using exploratory PCA, SPSS is responsible for determining the number of factors on the basis of Eigenvalue, which is set at 1. Besides, in social sciences, poor coefficients that are less than 0.30 are deleted.

Moreover, according to Tabachnick and Fiddell (2007), it is advisable to use oblique rotation first (direct oblimin or promax), and after that, they argue to look at the correlations among factors…if factor correlations are not driven by the data, the solution remains nearly orthogonal. Look at the factor correlation matrix for correlations around .32 and above. If correlations exceed .32, then there is 10% (or more) overlap in variance among factors, enough variance to warrant oblique rotation unless there are compelling reasons for orthogonal rotation. (p. 646)

3.4. PCA Safety Checks

3.4.1. Correlations among factors

After checking the matrix of correlation among the extracted factors (Table 3), it is clear that the factors are correlated since there are *r* values that are higher than 0.32.

Table 3. Components correlation matrix

Components	1	2	3	4	5
1	1,000	,279	,191	,385	,406
2	,279	1,000	,139	,048	,103
3	,191	,139	1,000	,068	,079
4	,385	,048	,068	1,000	,348
5	,406	,103	,079	,348	1,000

Extraction method: Principal Components Analysis.

Rotation method: Oblimin with Kaiser normalisation.

3.4.2. KMO and Bartlett's test

Both requirements of KMO and Bartlett's test are met (Table 4).

Table 4. KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy.		,814
Bartlett's Test of sphericity	Approx. Chi-square	617,756
	df	171
	Sig.	,000

According to Table 4, KMO is 0.814 which is higher than 0.5. This value indicates that SPSS is highly able to find underlying dimensions (factors), and that sampling adequacy is met. Besides, the sig. level in Bartlett's test is smaller than 0.001, which denotes that the variables constituting the factors are correlated, and that the correlation matrix is different from an identity matrix.

3.4.3. Representation quality

According to Table 5, all extraction values are higher than 0.5, which indicates that all variables contribute to the factors they construct.

Table 5. Communalities

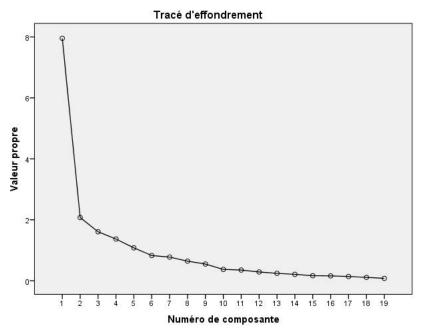|	Extraction
Relevance	,817
Evidence	,823
Details and examples	,703
Lexis	,781
Spelling	,861
Punctuation	,880
Capitalisation	,886
Grammar structures	,524
Subject-verb agreement	,642
Varied sentences	,677
Topic sentence	,836
Concluding sentence	,706
Supporting sentences	,730
Logical order	,769
Transition signals	,624
College style	,760
Formal style	,656
Reasoning	,689
Conciseness	,725
Extraction method: Principal Components Analysis	

.4.4. Variance

According to the scree plot (Figure 1), PCA extracted five (5) factors, represented by five values that are higher than 1 (Eigenvalue). The steep between these five values (7,956, 2,074, 1,608, 1,369, and 1,080 as shown in Table 7) is high. In contrast, the other variables start to gradually fall almost at the same level, which makes them excluded from factor extraction.

Fig. 1. Scree plot

Therefore, these five values, representing the five extracted factors, "account for as much variation explained by these variables as possible" (Mizab, 2022). Besides, Table 6 also "tells us how much variance is explained by each of the factors identified" (Cohen, Manion, & Morrison, 2018, p. 822) and their explanatory power of the factors extracted.

Table 6. Total variance explained

Factors	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of variance	Cumulative %	Total
1	7,956	41,876	41,876	6,378
2	2,074	10,915	52,791	2,554
3	1,608	8,461	61,252	2,155
4	1,369	7,203	68,455	4,485
5	1,080	5,686	74,142	4,368
Extraction method: Principal Components Analysis.				
When components are correlated, sums of squared loadings cannot be added to obtain a total variance				

According to the Extraction Sums of Squared Loadings, the percentage of variance shows that the first factor accounts for 41,876% of the variance. The remaining factors account for lower percentages ranging between 5.686-10.915% of variance. In other words, the first factor has the most explanatory power of the 19 variables, but the other four factors have a lower explanatory power (Cohen, Manion, & Morrison, 2018). Besides, it is clear that 74.142% of the 19 variables are accounted for by the five extracted factors, which is "a moderate amount of explanatory power" (Cohen, Manion, & Morrison, 2018, p. 822).

3.5. Extracting Factors

PCA extracted five factors based on the loadings of variables. Table 7 indicates that there are some variables that have cross-loadings. To correct this PCA error, such variables should be omitted.

Table 7. Pattern Matrix

	Factors				
	1	2	3	4	5
Conciseness	,878				
Formal style	,682				
Varied sentences	,673				
Relevance	,660		-,336	,402	
Subject-verb agreement	,636				
College style	,616				
Grammar structures	,606				
Supporting sentences	,506				,395
Punctuation		,932			
Capitalisation		,901			
Spelling			,914		
Lexis			,822		
Topic sentence				,893	
Concluding sentence				,811	
Evidence				,809	
Transition signals					,833
Details and examples				,343	,672
Logical order					,640
Reasoning	,452				,544

Extraction method: Principal Components Analysis.

Rotation method : Oblimin with Kaiser normalisation.[a]

a. Rotation converged in 9 iterations.

After deleting the variables loading in more than one factor (relevance, supporting sentences, details and examples, and reasoning), Table 8 shows the variables grouped together according to their loadings within factors.

Table 8. Pattern matrix after deleting items

	Factors			
	1	2	3	4
College style	,785			
Formal style	,727			
Logical order	,689			
Transition signals	,687			
Varied sentences	,651			
Conciseness	,604			
Subject-verb agreement	,603			
Grammar structures	,588			

Topic sentence	-,896		
Evidence	-,842		
Concluding sentence	-,811		
Spelling		,905	
Lexis		,852	
Capitalisation			,930
Punctuation			,898

Extraction method: Principal Components Analysis.
Rotation method : Oblimin with Kaiser normalisation.[a]
a. Rotation converged in 10 iterations.

The factors are reduced into four factors, including Factor 1 that consists of eight variables, Factor 2 that encompasses three variables, and Factors 3 and 4 containing two variables each.

3.6. Naming the Factors

The factors are named (1) academic writing style at a cut-off value of 0.588, (2) paragraph structure at a cut-off value of -0.811, (3) lexis at a cut-off value of 0.582, and (4) writing mechanics at a cut-off value of 0.898.

3.7. Designing the Rubric

The final rubric (Table 9) that can be used in assessing writing consists of the extracted factors, and their descriptions account for the constructs constituting them.

Table 9. Paragraph scoring rubric

Criteria	1 Inexistent	2 Basic	3 Existent
Academic writing style	› **Non-academic** and **informal** writing, and full of **colloquialism**. › Ideas are **haphazard** › Sequencers are **not used**, which denotes **no relationship** between sentences. › Only **simple** sentences are used. › **Wordiness**. › **Misuse** of grammatical structures, including subject-verb agreement.	• **Both formal and informal** writing and **some colloquialism**. • Ideas are **mostly organised**, but **not within a pattern** of organisation. • **Some** sequencers are used • **Simple and compound** sentences are used. • **Some passages are wordy**. • **Some mistakes** in grammatical structures, including subject-verb agreement.	• **Academic and formal writing**, and **no colloquialism.** • Ideas are **well-organised in to a pattern** of paragraph organisation. • The paragraph is **coherent**, and **sequencers** are used to show the **relationships between sentences.** • The use of a variety of sentence **four types**. • The use of **precise** and **concise** language • **Correct use** of grammatical structures, including subject-verb agreement.
Paragraph structure	› There is **no** topic sentence. › **Superficial** ideas are reported. › There is **no** concluding sentence.	• The topic sentence is **too general**, including the topic only. • **Subtle** use of information is depicted in clarifying the topic. • The concluding sentence is **too general**, or it **introduces something new.**	• The topic sentence is written, comprising the **topic** and the **controlling idea**. • **In-depth** information that clarify the topic. • The concluding sentence is written to **summarise the paragraph**, or to **reformulate the topic sentence**, or to **leave a general comment, advice, moral** …etc.
Lexis	› Vocabulary **does not reflect** the jargon of the topic. › **Major mistakes** in spelling words, and **mixed use** of British and American spellings.	• Vocabulary is **partially relevant** to the topic and some words are **misused**. • **Minor mistakes** in spelling words, and **minor inconsistencies** (very few British spellings permeating American English, or vice versa).	• Vocabulary is **relevant** to the topic and **well chosen.** • Words are written **correctly**, and they are **consistent** (only British English or American English).
Writing mechanics	› Full of **writing problems** **M**isuse of punctuation marks. › **Misuse** of upper-case and lower-case letters in all positions.	• Overall, **acceptable** writing. • **Some mistakes** in punctuation marks. • **Some mistakes** in upper-case and lower-case letters.	• **Correct use** of punctuation marks. • **Correct use** of upper-case and lower-case letters in all positions.

4. *CONCLUSION*

The findings from exploratory PCA allow to draw conclusions about the correlated constructs that measure the same factor. Indeed, in response to Research Question 1, four (4) factors have been extracted, representing four major assessment criteria of written compositions.

Based on results from the pattern matrix, the first factor consists of eight variables, the second factor comprises three variables, and the third and fourth variables consist of two variables each. Interestingly, four variables have been excluded, which improved factor loadings. Considering the variables constituting the factors, Research Question 2 can be answered. First, the variables constituting the first factor reflect the writing style that can be distinguished on the basis of college and formal writing, coherence-related aspects and the variety of sentence types and grammatical structures. Second, the variables forming the second factor reflect the main structural components of a paragraph. Third, the variables in the third factor reflect the importance of vocabulary. Finally, the variables constituting the fourth factor reflect the mechanics of writing.

These factors are the basis of the suggested holistic scoring rubric (Table 10). Thus, it is recommended to use it in assessing first-year university written compositions at the Department of English at Tebessa University

For further research, confirmatory PCA can be conducted with the suggested rubric to confirm the conformity of the variables within the factors extracted in this study. Furthermore, the rubric is used in an ongoing research work to assess first-year university students' portfolios in learning how to write through the process approach.

5. *Bibliography List*:

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge: London and New York.

Mizab, M. (2022, December). Conducting factor analysis in educational research. *Social Sciences and Humans Review, 15*(3), 296 – 312. doi:1112-685X

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Pearson Allyn & Bacon: Upper Saddle River, NJ.

Acknowledgments