

Conducting Factor Analysis in Educational Research

إجراء التحليل العاملي في الأبحاث التربوية

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Abstract:

Novice researchers sometimes select ready-made scales or rubrics and implement them to their studies. However, these tools are designed in certain contexts and to certain populations, which determine the variables that best fit the status quo. Yet, randomly selecting variables is not adequate in research, for they should be grouped according to their commonalities to avoid repetition, redundancy and inconsistency. A statistical technique that facilitates such grouping is Factor Analysis (FA). This paper, however, addresses exploratory FA, particularly Principal Components Analysis (PCA), which is widely used to dissect all variances between suggested variables and to reduce their huge number into factors. Thus, the present paper illustrates how to conduct PCA from (a) safety checks, to (b) constructing factors from variables, to finally (c) naming the factors.

Keywords: Factor analysis, PCA, research, variables.

الملخص:

يقع الباحثون المبتدئون أحيانا في فخ اختيار مقاييس جاهزة وتطبيقها في دراساتهم الخاصة. فهم لا يدركون أن هذه الأدوات مصممة في سياقات بحث وعلى عينات بحث مختلفة، التي تساهم بدورها في الاختيار الدقيق للمتغيرات التي تصف الوضع على أفضل وجه، والتي تمثل حقا المشكلة قيد البحث. ومع ذلك، فإن اختيار مجموعة من المتغيرات العشوائية غير كاف في البحث؛ إذ يجب تجميع المتغيرات وفقا لما تشترك فيه من أجل تجنب التكرار وعدم الاتساق. لذلك، أحد الأساليب الإحصائية التي تسهل هذا التجميع هو التحليل

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العاملية (FA) Factor Analysis. تتناول هذه الورقة البحثية التحليل العاملية الاستكشافية، وبالتحديد التحليل العاملية بتحليل المكون الرئيسي (PCA) Principal Component Analysis، الذي يسمح للباحث بالتحقيق في "مجموعات المتغيرات غير المعروفة سابقا" (Cohen et al., 2018). يستخدم PCA على نطاق واسع لتحليل الفروق بين المتغيرات المقترحة ولتقليل العدد الهائل من المتغيرات إلى عوامل. لذلك تهدف هذه الورقة إلى توضيح كيفية إجراء PCA من (أ) استيفاء جميع شروط FA، إلى (ب) استخراج العوامل، إلى (ج) تسميتها.

الكلمات المفتاحية: التحليل العاملية، التحليل العاملية بتحليل المكون الرئيسي، البحث، المتغيرات.

1. Introduction

The field of research is multifaceted and multidimensional. Indeed, researchers investigating research problems tend to opt for variegated approaches, methods, strategies and techniques that best answer and provide potential solutions to the problem under inquiry. For instance, in the doctoral program I underwent at the Department of English at Batna-2 University, we were asked to conduct experimental studies so that we can deal with as much research aspects as possible, and my study* is no exception. Since it is twofold (exploratory and explanatory), I had the opportunity to tackle several research strategies and techniques and to delve into the specificities of research.

One of these research aspects is designing rubrics used for assessment during the experiment. At the beginning of the doctoral journey, I, among many other researchers, thought that I can adopt any rubric from previous researches in my study. However, readings and guidance made me realise that the context in which those rubrics are designed and the population they are directed to are different from ours. Thus, I wondered how to make my own rubric.

Items of the rubric should reflect the context in which the study is carried out, and should stem from the population's interests. One way to do that is through FA to filter out irrelevant items and to group similar items into one factor. Therefore, in this paper, an account of how to conduct FA is explained throughout the different stages of FA.

* (Mizab, 2020) <http://eprints.univ-batna2.dz/id/eprint/1842>

2. Theoretical Considerations

2.1. Factor Analysis (FA)

FA started in psychology with the IQ test which was originated from a set of other tests. It was developed by Hotelling to “maximize the sum of squared loadings of each factor extracted in turn” (Kothari, 1990, p. 330). In other words, FA is a method of grouping common variables by reducing their number into smaller number of factors. The latter include as many variables as possible, and denote similarities in the relationships between grouped variables. Doing so allows researchers to detect variables addressing the same concept when researchers are actually thinking the variables measure different concepts. This can be likened to measurements. Cohen, Manion, and Morrison (2018) make reference to height which can be measured by a variable in meters and by another variable in inch. Since both variables measure height, they can be grouped into one factor being height. Cohen, Manion, and Morrison (2018) describe this factor as ‘latent’, for it cannot be noticed unless FA is conducted.

FA can be as advantageous as disadvantageous. It serves to simplify multivariate data, to elicit intangible relationships among data and “latent factors (i.e., underlying factors not directly observed)” as well (Kothari, 1990, p. 336), and to group related variables into one factor. However, results of factor analyses are pondered over as unreliable, but I deliberated to overcome this deficiency by conducting it twice in order to assure similarity of multiple factor analyses. Wells and Sheth (n.d. as cited in Kothari, 1990) posit that

when it works well, factor analysis helps the investigator make sense of large bodies of intertwined data. When it works unusually well, it also points out some interesting relationships that might not have been obvious from examination of the input data alone. (p. 337)

FA exists in two forms: confirmatory or exploratory. The former is strict as it derives from previous history, it tests “a found set of factors against a hypothesized model of groupings and relationships” (Cohen, Manion, & Morrison, 2018, p. 818). However, the latter, particularly

principal components analysis which is tackled in this paper, explores unknown relationships among variables, and extracts fewer factors (principal components) out of a set of variables.

This paper, indeed, explains and describes PCA as a widely used tool by researchers, particularly in designing scales and rubrics that dovetail with the research context and population.

2.2. Principal Components Analysis (PCA)

Briefly speaking, PCA is a statistical method that extracts common principal components (factors) out of a set of variables. This grouping process is based on the correlations between variables and between the principal components which should not be poorly correlated ($r > 0.5$), and on the factors' classification which is established through the sequence of variances that should account for as much variability as possible (Kothari, 1990).

3. Methodology :

3.1. Problem Statement:

Researchers in the humanities and social sciences tend to randomly select a list of variables that constitutes the evaluation rubrics or scales they use in their research works, and they even pick such instruments on the basis of previous studies (results from a pilot study). Alas, the population on whom ready-made rubrics/scales are implemented may not represent the items of analysis, and thus, results and findings would lack representativeness, validity, reliability, and credibility.

3.2. Research Objectives

This paper revolves around the following objectives:

- To raise researchers' awareness toward the unsuitability of adopting ready-made rubrics/scales in their studies.
- To build solid grounds upon the factors underpinning rubric/scale design.
- To master the steps of conducting factor analysis to construct one's rubric/scale

3.3. Research Purpose:

This paper falls within descriptive research as it attempts to give account of how to conduct FA, particularly PCA. The paper reports data collected from piloting the scale, but its essence lies in describing the steps of listing variables and clustering related ones into factors in order to design a rubric/scale.

3.4. Data Collection Tool

To conduct PCA, a scale (measuring Intercultural Communicative Competence) used in the doctoral thesis entitled “*The Need for Integrating the Intercultural Dimension to Develop Intercultural Communicative Competence: The Case of First Year Students of English at Batna-2 University*” (Mizab, 2020) is the subject of PCA.

At the beginning, an initial set of dimensions was put forth in the form of an analytic rating scale (Appendix A), reflecting the components of the overall competence. The scale is in the form of an exhaustive list of variables comprising 19 items, which are:

- Understanding;
- Explanation;
- Perspectives;
- Complexities;
- Worldview;
- Complexity ;
- Interpretation;
- Recognition;
- Challenges;
- Shared Understanding;
- Differences;
- Detect differences;
- Interest;
- Questioning;
- Answering;
- Interactions;
- Initiating interactions;

- Developing interactions;
- Judgement.

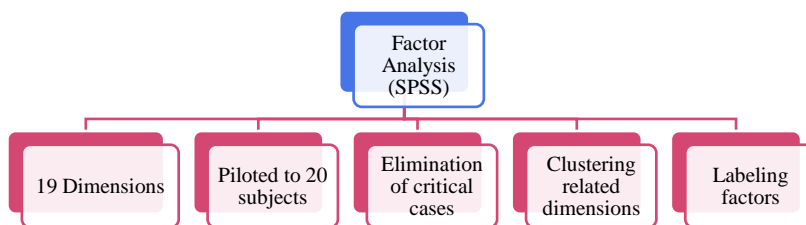
3.5. Piloting the Tool (Scale)

The analytic rating scale is piloted to 20 randomly selected 1st year students from the Department of English at Batna-2 University during the academic year 2016-2017.

3.6. Data Analysis Procedures

Data analysis is based upon FA, particularly PCA that reduces the variables into manageable factors. PCA undergoes four main stages through which researchers and rubric/scale designers come up with concise factors constituting the items of analysis. These stages are: (a) safety checks, (b) data processing and analysis, (c) constructing factors from variables, and (d) naming the factors. **Figure 1 represents the process of generating a holistic rating scale (Appendix B).**

Fig.1. Procedures of factor analysis



Source: (Mizab, 2020, p. 131)

4. Conducting PCA with Illustrations

4.1. Safety Checks

This stage stands for verifying certain assumptions underpinning FA, and upon which decisions are made as far as conducting PCA is concerned (Tabachnick & Fidell, 2012). Some of these assumptions include:

4.1.1. Number of variables

Variables should be neither too few nor too many in order to have ‘added value’ of the variables in each factor which are easy to identify “underlying latent factors” (Cohen, Manion, & Morrison, 2018, p. 819). Therefore, the first **analytic** scale set in the study consisted of **19 dimensions (Appendix A) on the basis of the ICC components I aimed at developing.**

4.1.2. Sample size

Sample size should not be too small and not too general, but it should be representative of the whole population under investigation. Most researchers and research methodologists agree that the minimum sample size should range between 30 and 300 (Cohen, Manion, & Morrison, 2018). However, ***I piloted the scale with only 20 subjects, which made me fall in the trap of FA rule that evinces: “there should be more subjects in the sample than there are variables”*** (Cohen, Manion, & Morrison, 2018, p. 819).

4.1.3. Intercorrelations between variables

PCA conducts correlations between variables in order to determine the cojoint variables underlying each factor, yet there are some critical cases which should be eliminated before constructing factors because (a) some cases might not be significant (sig. > 0.05), (b) some others might be highly correlated (multicollinearity: $r \geq 0.9$), and (c) some others might perfectly correlate (singularity: $r \geq 1$).

According to the correlation matrix from FA (Table 1), the dimensions that should be eliminated from the initial scale are: detect differences, interaction, initiating interactions, developing interactions, interpretation, complexities, judgement and questioning and answering.

Table 1. Correlation matrix

	Understanding	Explanation	Worldviews	Complexity	Interpretation	Shared Understanding	Differences	Detect Differences	Interest	Interaction	Initiating Interactions	Developing Interactions	Judgment	Recognition	Perspectives	Complexities	Challenges	Questioning	Answering
Understanding	1	,660	,690	,630	,666	,586	,729	,719	,476	,655	,567	,689	,770	,516	,319	,619	,525	,572	,535
Explanation	,660	1	,750	.436	,734	,520	,682	,534	,275	,567	,454	,545	,561	,479	,473	,627	,641	,362	,617
Worldviews	,690	,750	1	,637	,795	,554	,786	,826	,446	,698	,632	,707	,806	,758	,491	,737	,697	,766	,720
Complexity	,630	,436	,637	1	,641	,454	,694	,699	,420	,433	,346	,357	,429	,439	,542	,599	,490	,553	,589
Interpretation	,666	,734	,795	,641	1	,491	,667	,616	,471	,416	,277	,457	,567	,563	,520	,633	,588	,478	,453
Shared Understanding	,586	,520	,554	,454	,491	1	,665	,665	,747	,753	,694	,720	,596	,288	,464	,512	,686	,699	,722
Differences	,729	,682	,786	,694	,667	,665	1	,881	,421	,768	,748	,734	,645	,700	,599	,813	,784	,751	,736
Detect Differences	,719	,534	,826	,699	,616	,665	,881	1	,604	,841	,821	,730	,812	,694	,575	,842	,723	,933	,741
Interest	,476	,275	,446	,420	,471	,747	,421	,604	1	,606	,534	,566	,585	,205	,657	,487	,480	,635	,594
Interaction	,655	,567	,698	,433	,416	,753	,768	,841	,606	1	900	,859	,836	,423	,573	,692	,778	,831	,816
Initiating Interactions	,567	,454	,632	,346	,277	,694	,748	,821	,534	,900	1	,797	,706	,575	,417	,650	,735	,831	,816
Developing Interactions	,689	,545	,707	,357	,457	,720	,734	,730	,566	,859	,797	1	,791	,499	,458	,646	,738	,755	,757
Judgment	,770	,561	,806	,429	,567	,596	,645	,812	,585	,836	,706	,791	1	,502	,426	,629	,578	,795	,606
Recognition	,516	,479	,758	,439	,563	,288	,700	,694	,205	,423	,575	,499	,502	1	,247	,585	,478	,637	,518
Perspectives	,319	,473	,491	,542	,520	,464	,599	,575	,657	,573	,417	,458	,426	,247	1	,663	,649	,493	,638
Complexities	,619	,627	,737	,599	,633	,512	,813	,842	,487	,692	,650	,646	,629	,585	,663	1	,783	,765	,593
Challenges	,525	,641	,697	,490	,588	,686	,784	,723	,480	,778	,735	,738	,578	,478	,649	,783	1	,723	,779
Questioning	,572	,362	,766	,553	,478	,699	,751	,933	,635	,831	,831	,755	,795	,637	,493	,765	,723	1	,704
Answering	,535	,617	,720	,589	,453	,722	,736	,741	,594	,816	,816	,757	,606	,518	,638	,593	,779	,704	1

Source: (Mizab, 2020, p. 185)

Note. Insignificant cases singularity multicollinearity

4.1.4. Variance:

When processing data for initial analysis, one of the conditions that should be satisfied in conducting PCA is variance. From the correlational analysis, SPSS extracts the factors out of the variables. Table 2 shows that the 19 variables are grouped into three main factors.

Table 2. Total variance explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total
1	12,330	64,893	64,893	12,330	64,893	64,893	11,110
2	1,553	8,172	73,065	1,553	8,172	73,065	9,268
3	1,179	6,204	79,269	1,179	6,204	79,269	1,423
4	,859	4,521	83,790				
5	,809	4,256	88,046				
6	,542	2,854	90,901				
7	,468	2,465	93,365				
8	,373	1,964	95,329				
9	,278	1,461	96,790				
10	,219	1,154	97,944				
11	,156	,821	98,765				
12	,125	,658	99,423				
13	,056	,295	99,718				
14	,027	,142	99,860				
15	,019	,100	99,960				
16	,006	,034	99,993				
17	,001	,007	100,000				
18	3,732E-16	1,964E-15	100,000				
19	1,578E-16	8,303E-16	100,000				

Note. Extraction method: Principal Component Analysis.

As shown in Table 2, the focus is on the two first columns: Initial Eigen Values and Extraction Sums of Squared Loadings. Starting with the first column (which indicates the significant factors and the less important ones), we are interested in the total initial Eigen values that are higher than 1. These values account for as much variation explained by a single variable as possible, which are in this case the first three components.

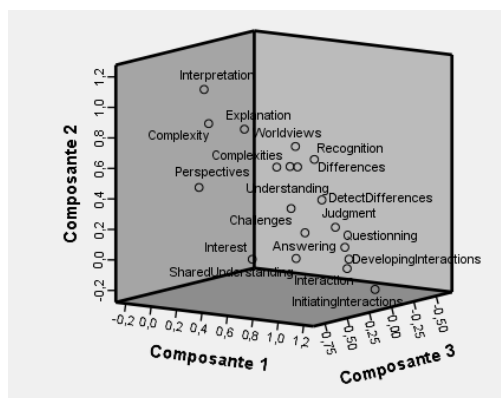
In the next column labeled Extraction Sums of Squared Loadings, the focus is on the percentage of variance which “tells us how much variance is explained by each of the factors identified” (Cohen, Manion, & Morrison, 2018, p. 822). Thus, in the case of my scale, the first factor

accounts for 64,893% of the variance in the total process. The second and third factors account for lower percentages of variance (8,172% and 6,204% respectively) which is described by Cohen, Manion, and Morrison (2018) as “a much lower amount of explanatory power” (p. 822). Therefore, these percentages indicate which factor has the most or the least explanatory power of the 19 factors. Moreover, it is worth referring to the cumulative amount of the explanatory power of the three extracted factors. It is evinced that 79,269% of the 19 variables is accounted for by the three extracted factors. Cohen, Manion, and Morrison (2018) posit that this is “a moderate amount of explanatory power” (p. 822).

4.1.5. Linearity:

Furthermore, the relationship between variables in PCA should be linear, and it can be seen in the screen plot of FA as points (correlations) all falling almost in a straight line.

Fig.1. 3D screen plot of FA



4.2. Constructing Factors from Variables:

At this stage, researchers should present a pattern matrix summarising the relevant variables in order to identify which variables are included in which factor. Table 3 shows how related dimensions are clustered into factors.

Table 3. Factor analysis of the analytic rating scale

Pattern Matrix ^a			
	Factor		
	1	2	3
Shared Understanding	,750	,033	,320
Challenges	,591	,320	,149
Interest	,582	,047	,572
Complexity	-,041	,815	,172
Explanation	,081	,759	-,053
Perspectives	,380	,655	-,201
Differences	,482	,548	-,079
Understanding	,374	,530	-,148
Recognition	,311	,518	-,512
Worldviews	,184	,482	,603

Extraction Method: Principal Components Analysis.
 Rotation Method: Oblimin with Kaiser normalisation.^a
 a. Convergence of rotation in 12 iterations.

Source: (Mizab, 2020, p. 132)

Therefore, there are three main factors specified according to the factor loadings; i.e., variables which have close high values should be grouped together (explained in the table by colours). This process is done with all variables by cutting them off at the closest high value. However, it is worth mentioning that not only statistical analyses determine variables groupings, but the researcher’s professional judgment also plays an important role in clustering variables that dovetail with each other (in terms of meaning) in one factor.

4.3. Naming the Factors:

As shown in Table 3, the dimensions (variables) are reduced into three factors. However, SPSS does not provide the factors names. Thus, it is up to the researcher to decide on the names according to what each factor represents and to the variables included in each one. The variables are named:

- (a) **Intercultural attitudes (cut-off value ,582) including** Shared Understanding, **Challenges**, and **Interest**.

- (b) **Skills of interpreting, relating and interaction (cut-off value ,518) including Complexity,** Explanation, Perspectives, Differences, Understanding, and Recognition.
- (c) **Knowledge of the self and the other (cut-off value ,603)** including worldview.

Doing so results into a holistic rating scale of ICC (Appendix B) on the basis of which students' ICCs are detected.

5. Conclusion

In brief, designing rubrics and scales for assessment purposes is not an ad hoc process. It is rather a careful process that requires careful attention to the context in which the study is conducted and to the population subjected to it. Indeed, coupling statistics and the researcher's professional knowledge eases the process. As far as statistics is concerned, FA, particularly PCA, helps construct factors out of a set of predefined variables. The latter might be repeated, redundant, or irrelevant. Thus, PCA is workable in this case to eliminate any irrelevant data and to cluster common variables together in one factor.

To guarantee accurate results of FA, safety checks are recommended. Therefore, researchers should make sure that the number of variables and the sample size are sufficient, variables are moderately correlated, factors account for as much variance as possible, and data are linear. Doing so paves the way for easily constructing the factors and for finally naming them, which totally depends on the researcher's acquaintance and knowledge of the specificities underlying the variables.

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7. Appendices

7.1. Appendix A: Analytic rating scale

	<i>Capstone 4</i>	<i>Milestone</i>		<i>Benchmark 1</i>	
	<i>3</i>	<i>2</i>			
Understanding	Skilfully understands own culturally determined identity, rules, and biases	Adequately understands own culturally determined identity, rules, and biases	Partially understands own culturally determined identity, rules, and biases	Ignores own cultural identity, rules, and biases	
Explanation	Articulates own cultural identity, rules, and biases	Clear but not well-articulated own cultural identity, rules, and biases	Partially articulates own cultural identity, rules, and biases	Ambiguous explanation of own cultural identity, rules, and biases	
Perspectives	Becoming more comfortable with new cultural perspectives	Comfortable with new cultural perspectives	Recognises others' cultural perspectives, but prefers own cultural view	Strongly preferring only your own cultural view	
Complexities	Seeking complexity based on cultural differences	Comfortable with complexities	Seeks simple own preferences	Looking for sameness	
	<i>Capstone 4</i>	<i>Milestone</i>		<i>Benchmark 1</i>	
	<i>3</i>	<i>2</i>			
Worldview	Demonstrates sophisticated understanding of the complexity of elements important to members of another culture.	Demonstrates adequate understanding of the complexity of elements important to members of another culture	Demonstrates partial understanding of the complexity of elements important to members of another culture	Demonstrates surface understanding of the complexity of elements important to members of another culture	
	<i>Capstone 4</i>	<i>Milestone</i>		<i>Benchmark 1</i>	
	<i>3</i>	<i>2</i>			
Complexity	Adequate understanding of the complexity of what can be important to persons from a different culture	Begins to understand the complexity of what can be important to persons from a different culture	Realises what can be important to persons from a different culture but does not understand its complexity	Inadequate understanding of the complexity of what can be important to persons from a different culture	
Interpretation	Can interpret experiences or perspectives from their own and more than one worldview	Sometimes uses more than one worldview in interactions	Identifies components of other cultural Perspectives but responds in all situations with own worldview.	Views the experience of others but does so through own cultural worldview	
Recognition	Recognises the feelings of a person with a different cultural perspective and different cultural values.	Recognises intellectual and emotional dimensions of more than one worldview	Recognises others' feelings but does not care	Does not care about others' emotions	

	<i>Capstone 4</i>	<i>Milestone</i>		<i>Benchmark 1</i>
		<i>3</i>	<i>2</i>	
Challenges	Easily overcomes challenges associated with language	Has the potential to deal with challenges associated with language	Struggles to deal with challenges associated with language	Has difficulties coping with challenges associated with language
Shared Understanding	Skillfully negotiates a shared understanding between different languages	begins to negotiate a shared understanding based on cultural differences in verbal and nonverbal communication	is still unable to negotiate a shared understanding of different languages	Is unable to negotiate a shared understanding
Differences	Is effective in a different cultural context	Recognizes and participates in verbal and nonverbal communication with cultural differences	Identifies some cultural differences in verbal and nonverbal communication	Has a minimal level of understanding of cultural differences in verbal and nonverbal communication
Detect differences	Can detect subtle differences in how people behave and the ways they interact.	Can detect complex differences in how people behave and the ways they interact.	Can't detect differences but misunderstands them, and is aware that misunderstandings can occur based on those differences	Can detect differences, but is unaware that misunderstanding them impedes communications
	<i>Capstone 4</i>	<i>Milestone</i>		<i>Benchmark 1</i>
		<i>3</i>	<i>2</i>	
Interest	Have a remarkable interest in learning more about other cultures,	Willing to learn more about other cultures	Have a minimal interest in learning more about other cultures	Not interested in learning more about other cultures
Questioning	Asking deeper questions	Asking significant questions	Asking surface questions	Asking simple questions
Answering	Articulate answers to questions reflecting multiple cultural perspectives.	Clear but not well-articulated answers to questions reflecting multiple cultural perspectives	Ambiguous answers to questions reflecting multiple cultural perspectives.	Providing answers just for the sake of answering questions reflecting multiple cultural perspectives
	<i>Capstone 4</i>	<i>Milestone</i>		<i>Benchmark 1</i>
		<i>3</i>	<i>2</i>	
Interactions	Open to interacting with other people who are culturally different.	Expresses openness to most, if not all, interactions with culturally different others	Shows openness to other people who are culturally different, but is unaware of not being open	Is confined to own cultural views
Initiating interactions	Initiate relationships with other people who come from a different culture	Begins to initiate relationships with other people who come from a different culture	Receptive to interacting with culturally different others	Avoids interactions with culturally different others

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Developing	Develop relationships with other people who come from a different culture	Begins to develop relationships with other people who come from a different culture	Show willingness to develop relationships with other people who come from a different culture	Reluctant to develop relationships with other people who come from a different culture
Judgement	Ability to suspend judgment when interacting with cultural differences	Begins to suspend judgment when interacting with cultural differences	Has difficulty suspending any judgment in her/ his interactions with culturally different others, and is aware of own judgment and expresses a willingness to change	Has difficulty suspending any judgment in her/ his interactions with culturally different others, but is unaware of own judgment.

Source: (Mizab, 2020, p. 319)

Appendix B: Holistic Rating Scale

<i>F</i>	<i>Components</i>	<i>Proficient 4</i>	<i>Emerging 3</i>	<i>Developing 2</i>	<i>Basic 1</i>
<i>Intercultural Knowledge</i>	Knowledge of cultural self	Articulates one’s own cultural rules insightfully showing awareness toward how their experiences shaped them	Recognises one’s own cultural rules and appreciate other perspectives as well	Identifies one’s own cultural rules, but seek sameness	Unaware of one’s own cultural rules and differences with other
	Knowledge of cultural others	Complex understanding of others’ cultural categories	Adequate understanding of others’ cultural categories	Partial understanding of others’ cultural categories	Surface understanding of others’ cultural categories
<i>Intercultural Skills</i>	Empathy	Articulates complex interpretation of experiences from different perspectives by taking into consideration others’ feeling, and by being supportive	Recognises and makes use of different perspectives in interactions with regard to others emotions and intellect	Identifies others’ perspectives, but makes use of one’s own worldview	Perceives others’ perspectives through one’s own worldviews
	Verbal and non-verbal communication	Complex understanding of differences as far as verbal and non-verbal communication is concerned	Recognises differences as far as verbal and non-verbal communication is concerned	Identifies differences as far as verbal and non-verbal communication is concerned realizing that they may result in misunderstandings	Lack of understanding of differences as far as verbal and non-verbal communication is concerned
<i>Intercultural Attitudes</i>	Curiosity and Openness	Articulates complex questions and answers that show multiple cultural understanding. Initiates and develops interactions without judgment	Deep interest in getting answers to one’s own question. Willingness to interact with culturally-distinct others and to avoid judgment	Seeks simple information. Open to otherness, but have difficulties avoiding judgment	Lack of interest in knowing the other. Receptive to interactions, but does not initiate them.

Source: (Mizab, 2020, p. 322)

Note. F: Factor