

Exploratory Factor Analysis and Confirmatory Factor Analysis of Historical Thinking Skills (HTS) Component: Determining Dimensionality, Validity, and Reliability of HTS Items Among Islamic Education Teachers

Hartini Husain¹, Hamdan Aziz¹, Alias Hussain², Asyraf Afthanorhan^{3*}, Zamri Bin Chik⁴

¹Department of Nationhood and Civilization, Centre for Foundation and Continuing Education, University Malaysia Terengganu (UMT) 21300 Kuala Terengganu, Terengganu, Malaysia. ²Department of Science, Technology and Mathematics Institute of Training Education Kota Bharu Campus Kota Bharu, Kelantan, Malaysia. ³Operation Research & Management Sciences Research Group, Faculty of Business and Management, University Sultan Zainal Abidin (UniSZA), 21300 Kuala Nerus, Terengganu, Malaysia. ⁴Faculty of Contemporary Islamic Studies University Sultan Zainal Abidin (UniSZA), 21300 Kuala Nerus, Terengganu, Malaysia. *Corresponding Author's Email: asyrafafthanorhan@unisza.edu.my

Abstract

Historical Thinking Skills (HTS) constitute a cognitive process encompassing five sub-dimensions, namely Chronology, Rationalization, Interpretation, Imagination, and Evidence Exploration. These dimensions within HTS are not only applied in History Subject but also universally applicable across subjects to aid educators in instilling valuable learning values, including within the realm of Islamic Education (IE). Hence, this research aims to determine the effectively integrate HTS during IHC instruction and identify the number of dimensions represented by the 18 items constituting the HTS component using Exploratory Factor Analysis(EFA) and subsequently assess the unidimensionality, validity, and reliability of the HTS sub-components formed by these items by using Confirmatory Factor Analysis (CFA). The research sample comprises to two types of data set, 100 and 300 of different Islamic Education Teachers from Upper Secondary Schools in the state of Kelantan, encompassing 10 districts. There are 300 samples used for field work while 100 samples for pilot study. Data analysis for this study is conducted using IBM SPSS AMOS Graphics Version 25 software. The results of the CFA show that items adhere to the criterion of unidimensionality. Validity and Reliability criteria are met for HTS. In conclusion, this study contributes theoretical insight by illuminating the nature of HTS, particularly for IETs, which are assessed through a sole dimension rather than being evaluated individually according to the sub-dimensions of Chronology, Rationalization, Interpretation, Imagination, and Evidence Exploration.

Keywords: IHC (Islamic history and civilization), IET (Islamic education teacher), HTS (Historical thinking skills), EFA (Exploratory factor analysis), CFA (Confirmatory factor analysis).

Introduction

History is a core subject in the Secondary School Standard Curriculum (KSSM) introduced in 2017 with the objective of cultivating students' in-depth understanding and appreciation of both Malaysian national history and world history in general (1). The proper impartation of knowledge about Malaysian and global history is a crucial task for educators during the teaching and learning process. Educators serve as pivotal intermediaries, responsible for effectively conveying historical elements to students. The understanding of these historical elements is of paramount importance to facilitate students'

comprehension of historical concepts through a structured and sequential approach.

Historys' teacher need to possess a specific skill set known as Historical Thinking Skills (HTS) in order to effectively convey historical elements to students. HTS represents a form of thinking that should be universally embraced by nearly all educators, as it plays a pivotal role in nurturing creative and critical thinking skills within students. HTS comprises five essential components: (i) understanding chronology, (ii) fostering imagination, (iii) exploring evidence, (iv) making interpretations, and (v) offering

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rationales. The amalgamation of these HTS components can be integrated into each teaching and learning session, enabling educators to facilitate an interactive cognitive process between themselves and students. This cognitive process involves educators establishing connections between past and present, analyzing, investigating, and processing evidence, formulating hypotheses, comprehending and explaining, as well as deliberating (2, 3).

Grounded in the five components of HTS, educators are encouraged to incorporate HTS within the teaching and learning process to foster students' creative and critical thinking abilities and position them as historians while studying history (4).

Through the integration of HTS, students are empowered to think rationally when making decisions, thereby producing individuals capable of empathizing with various issues. Furthermore, they can interpret evidence effectively, thereby enabling them to state chronologies accurately. The implementation of HTS components is anticipated to generate a dynamic new generation (4). The overall implementation of HTS components is expected to cultivate Malaysian citizens who are aligned with the nation's aspirations, i.e., individuals who love their country.

In the school context, historical elements are not confined solely to the history subject but are also present in other subjects such as Islamic Studies (IS). Within IS, there exists a segment dedicated to the Prophet's Biography and Islamic Civilization (PBIC), which entails instructing students about the history of the prophets and Islamic civilization. The instruction of this segment requires Islamic Education Teachers (IETs) to master the components of historical thinking to effectively incorporate HTS when teaching the PBIC segment (5). Consequently, the primary challenge for IETs is their ability to effectively teach PBIC while concurrently integrating HTS into the teaching process. If IETs can successfully infuse HTS during PBIC instruction, students will be able to internalize and better comprehend the biographies of the prophets and Islamic civilization (6). As a result, an understanding of the struggles and sacrifices made by these prophets can lead to the development of students who possess faith and affection for these revered figures.

Thus, the role of IETs is increasingly demanding today due to the broader and more challenging scope of responsibilities, aiming to fulfill the MoE's aspirations of producing competent and forward-thinking students (3). To meet these expectations, educators, particularly IETs, must excel in both skills and high-level thinking. Prioritizing exposure to and knowledge of HTS is imperative to ensure that IETs master these skills. Numerous instruments have been developed to assess HTS components among history educators, such as those by (1-3, 4, 6-8). Some of these instruments have been adapted to suit current research needs, as indicated by (9-11) recommended that these adapted items undergo exploratory factor analysis (EFA) and subsequently confirmatory factor analysis (CFA). The EFA aims to identify the components formed by the questionnaire items. The CFA assesses the extent to which the dimensions derived from EFA significantly relate to their respective components.

Consequently, this study aims to determine the number of dimensions that arise when using HTS items for Islamic Education Teachers (IETs) during the instruction of the PBIC segment. This study also investigates whether IETs' perceptions and understandings of the HTS components align with those of history teachers.

In general, the objective of this study is designed to identify and validate the number of dimensions for the items within the Historical Thinking Skills (HTS) component implemented among Islamic Education Teachers (IETs) instructing the Prophet's Biography and Islamic Civilization (PBIC) by using Exploratory Factor Analysis (EFA). After that do the Confirmatory Factor Analysis (CFA) to the component that form by items from EFA (12, 13). Historical Thinking Skills (HTS) represent a skill set that must be acquired by educators teaching history. The five HTS components that educators should master include: (i) understanding chronology, (ii) fostering imagination, (iii) exploring evidence, (iv) making interpretations, and (v) providing rationales (14). Prior studies have indicated that history educators assess HTS as comprising these five components (15, 16). Considering that the PBIC segment taught in Islamic Education subjects encompasses historical elements, IETs should equally possess proficiency in HTS.

Therefore, this study seeks to determine whether the perceptions of Islamic Education Teachers (IETs) regarding the five HTS components are consistent with those of history educators or if they differ. Furthermore, the study will ascertain whether the position of the developed items for each HTS component remains within their original dimension or shifts to another dimension. Ultimately, at the conclusion of the study, validity and reliability criteria for each HTS component will be determined through Confirmatory Factor Analysis (CFA).

Methodology

Research Design

The research design for this study adopts a survey approach and employs a quantitative methodology. The quantitative approach involves systematic, empirical, and logical utilization of data to explore phenomena through data collection (17-19). The quantitative data collected is analyzed and generalized to provide deeper insights.

Given the quantitative nature of this study through a survey method, several crucial steps were undertaken during the research process. Firstly, formulating anticipated issues that might arise, such as respondent reactions and survey administration challenges. Secondly, selecting suitable sampling techniques and data collection methods, targeting the population to determine the required sample size. The third step involves implementing procedures to construct or adapt the instrument (items) for data collection. All items within this research instrument have been derived from those used by prior researchers. The fourth step entails conducting Exploratory Factor Analysis (EFA) for pilot data and Confirmatory Factor Analysis (CFA) for the field work (13). EFA analysis is performed to establish dimensions formed by sets of items, while CFA confirms these dimensions post-EFA by using different data set. During the CFA analysis, validity and reliability criteria are established for each dimension and its corresponding items (12, 19-21). Finally, meticulous planning is crucial for the administration, analysis, and interpretation of data.

Samples

The study's population comprises Islamic Education Teachers (IETs) who teach at the upper secondary level in National Secondary Schools across 10 districts in Kelantan. These districts are Kota Bharu, Pasir Puteh, Bachok, Tumpat, Pasir Mas, Tanah Merah, Machang, Jeli, Kuala Krai, and Gua Musang. The total number of IETs in this population is 1400 individuals. For Exploratory Factor Analysis (EFA), A samples size 100 respondents were selected from 10 district randomly, which is 10 respondents for each district. These respondents will consider again for sampling process for Confirmatory Factor Analysis (CFA) (20). When EFA finish, a sample size of 300 respondents was selected for CFA using a stratified random sampling technique with proportional allocation, determined using the Krejcie and Morgan formula (1970) (22). The stratified random sampling technique was chosen due to the nature of the study's data, which categorizes educators based on gender, urban and rural school settings, and teaching experience of less than or more than five years. This sampling method is suitable for the heterogeneous nature of the population under investigation. The study population was divided into several subgroups, such as male and female, urban and rural, and different levels of teaching experience and educational qualifications (23).

Data was collected using a structured questionnaire designed specifically for this study, and it was distributed to all selected teachers.

The sample size taken to represent the entire population is determined based on the following formula:

Sample size of sub group

$$= \frac{\text{Total of sample size}}{\text{Total of population}} \times \text{Population size of sub group}$$

There are two categories of schools represented by the District Education Office (PPD), namely Urban Schools and Rural Schools. The stratified random sampling data for this study can be referred to in Table 1 and Table 2.

Referring to Table 1 and Table 2, the total sample from urban schools is 253, and the sample from rural schools is 47 teachers. The overall study sample size from both urban and rural areas is 300 individuals.

Table 1: Stratified Random Sampling Data for Urban Schools

District (Total teachers)	Gender	No. of teachers	Teaching Experience on MPPI	No. of teachers	Sample Size Ratio Calculation	Sample Size
Kota Bharu (355)	Male	165	Less than 5 years	45	$(300/1400) \times 45$	10
			5 years and above	120	$(300/1400) \times 120$	26
	Female	190	Less than 5 years	58	$(300/1400) \times 58$	12
			5 years and above	132	$(300/1400) \times 132$	28
Pasir Putih (129)	Male	65	Less than 5 years	23	$(300/1400) \times 23$	5
			5 years and above	42	$(300/1400) \times 42$	9
	Female	64	Less than 5 years	28	$(300/1400) \times 28$	6
			5 years and above	36	$(300/1400) \times 36$	8
Bachok (177)	Male	96	Less than 5 years	39	$(300/1400) \times 39$	8
			5 years and above	57	$(300/1400) \times 57$	12
	Female	81	Less than 5 years	44	$(300/1400) \times 44$	9
			5 years and above	37	$(300/1400) \times 37$	8
Machang (89)	Male	47	Less than 5 years	23	$(300/1400) \times 23$	5
			5 years and above	24	$(300/1400) \times 24$	5
	Female	42	Less than 5 years	18	$(300/1400) \times 18$	3
			5 years and above	24	$(300/1400) \times 24$	5
Tumpat (124)	Male	76	Less than 5 years	19	$(300/1400) \times 19$	4
			5 years and above	57	$(300/1400) \times 57$	12
	Female	48	Less than 5 years	13	$(300/1400) \times 13$	3
			5 years and above	35	$(300/1400) \times 35$	8
Tanah Merah (125)	Male	63	Less than 5 years	28	$(300/1400) \times 28$	6
			5 years and above	35	$(300/1400) \times 35$	8
	Female	62	Less than 5 years	21	$(300/1400) \times 21$	5

Pasir Mas (181)	Male	88	5 years and above	41	(300/1400)X41	9
			Less than 5 years	18	(300/1400)X18	2
			5 years and above	70	(300/1400)X70	15
	Female	93	Less than 5 years	19	(300/1400)X19	3
			5 years and above	64	(300/1400)X74	16
			610	Less than 5 years	44	131
Male	580	5 years and above	87			
		Less than 5 years	41	122		
		5 years and above	81			
Total		1190			253	

Table 2: Stratified Random Sampling Data for Urban Schools

District (Total Teahers)	Gender	No. of Teachers	Teaching Experience on MPPI	No. of Teachers	Sample Size Ratio Calculation	Sample Size
Gua Musang (70)	Male	48	Less than 5 years	22	(300/1400)X22	5
			5 years and above	26	(300/1400)X26	6
	Female	22	Less than 5 years	12	(300/1400)X12	3
Kuala Krai (82)	Male	49	5 years and above	10	(300/1400)X10	3
			Less than 5 years	25	(300/1400)X25	5
	Female	23	5 years and above	12	(300/1400)X12	3
Jeli (68)	Male	30	Less than 5 years	10	(300/1400)X10	2
			5 years and above	20	(300/1400)X20	4
	Female	38	Less than 5 years	12	(300/1400)X12	3
Male	127	5 years and above	26	(300/1400)X26	6	
		Less than 5 years	12	27		
		5 years and above	15	20		
Female	83	Less than 5 years	8			
Total		210	5 years and above	12		

Questionnaire Items: Historical Thinking Skills (HTS)

The questionnaire items for the Historical Thinking Skills (HTS) component consist of 18 items, distributed among the following dimensions: Understanding Chronology (4 items), Making Rationalizations (4 items), Making

Interpretations (4 items), Fostering Imagination (3 items), and Exploring Evidence (3 items). The questionnaire employs a five-point Likert scale with scale values ranging from 1 (strongly disagree) to 5 (strongly agree). The list of items and their source references for construction are presented in Table 3.

Table 3: Items for Historical Thinking Skills (HTS) Component

Items/Statement	Component
HTS1: Indicate your level of proficiency in understanding the concept and application of Historical Thinking Skills (HTS) (24)	Chronology
HTS2: I am proficient in establishing connections between past, present, and future events logically to explain facts during the teaching and learning sessions of the Prophet's Biography and Islamic Civilization (PBIC) (24)	Chronology
HTS3: I am capable of comparing the roles of primary sources with secondary sources during the teaching and learning sessions of the Prophet's Biography and Islamic Civilization (PBIC) (24)	Chronology
HTS4: I am skilled in evaluating facts from various source materials in the teaching of the Prophet's Biography and Islamic Civilization (PBIC) (24)	Chronology
HTS5: I am proficient in interpreting significant facts within the content of teaching the Prophet's Biography and Islamic Civilization (PBIC) (25)	Rationalization
HTS6: I am skilled in creating mind maps to effectively explain events of the Prophet's Biography and Islamic Civilization (PBIC) (25)	Rationalization
HTS7: I am knowledgeable about the rationale for teaching the Prophet's Biography and Islamic Civilization (PBIC) in the subject of Islamic Education (24)	Rationalization
HTS8: I am skilled in using timelines to explain chronological events in the Prophet's Biography (25)	Rationalization
HTS9: I am skilled in interpreting facts effectively to enhance students' imaginative understanding (25)	Interpretation
HTS10: Imagination and empathy can be enhanced through effective narrative (storytelling) logic (24)	Interpretation
HTS11: I am skilled in distinguishing between facts and explanations of facts for teaching the Prophet's Biography and Islamic Civilization (PBIC) (16)	Interpretation
HTS12: I am proficient in drawing logical conclusions about specific facts in the Prophet's Biography and Islamic Civilization (PBIC) based on understanding (16)	Interpretation
HTS14: I am skilled in guiding my students to imagine past events (24)	Imagination
HTS15: I am proficient in guiding students to use Quranic and Hadith sources during the teaching and learning sessions of the Prophet's Biography and Islamic Civilization (PBIC) (24)	Imagination
HTS13: I am skilled in creating iThink maps and Mind Maps from historical facts during the teaching and learning sessions of the Prophet's Biography and Islamic Civilization (PBIC) (24)	Imagination

HTS16: I am skilled and knowledgeable about the process of interpretation in teaching the Prophet's Biography and Islamic Civilization (PBIC) (24)	Evidence Exploration
HTS17: I am skilled and knowledgeable about the concept of rationalization in the teaching and learning process of the Prophet's Biography and Islamic Civilization (PBIC) (25)	Evidence Exploration
HTS18: I am skilled and knowledgeable about the use of chronological elements as a time reference in teaching the Prophet's Biography and Islamic Civilization (PBIC) (25)	Evidence Exploration

Table 3 refers to the set of items used to measure the Historical Thinking Skills (HTS) component. This component comprises five sub-dimensions, namely Chronology, Rationalization, Interpretation, Imagination, and Evidence Exploration Skills. A total of 18 items are involved. All these items have been adapted from previous research by scholars.

Exploratory Factor Analysis (EFA)

In this study, a total of 100 Islamic Education Teachers (IETs) has been selected from 10 district, which is 10 respondents for each district for the purpose of identifying the item dimensions of the Historical Thinking Skills (HTS) component (18). The selection of 100 IETs for the pilot study was based on recommendations from (18-20). An EFA will be conducted on the 18 items used to measure the HTS component to determine whether the dimensions of these items consistently align with their respective HTS components as found in the existing literature, or if there is any item transfer between the HTS components. Several steps are involved in the EFA procedure. During the factor analysis, each item in the questionnaire is treated as a separate factor. The factor analysis procedure involves three stages: (i) Identifying Item Correlations: Items with high correlations are placed within the same construct as they measure the same concept (18),

(19 ,20). Therefore, the correlation between two items is low if they belong to different constructs. (ii) Extracting Items: This step involves selecting a combination of highly correlated items to form the first construct. This combination of items contributes the most to the changes in variance among the constructs. All extracted items are arranged based on their contribution to the overall changes within the constructs (13). Rotating Items: By rotating the factors, items with high correlations are aligned along the same axis. Through the IBM SPSS software, items that meet the minimum rotated factor loading of +0.33 are placed under each factor in the Rotated Component Matrix table. The procedure for conducting EFA through factor analysis becomes significant after satisfying the goodness-of-fit index criteria, as shown in Table 4.

Kaiser-Meyer-Olkin (KMO) Indicator: The Kaiser-Meyer-Olkin value is assessed to determine the suitability of the data in this study for exploratory factor analysis. The Kaiser-Meyer-Olkin (KMO) test examines the adequacy of sample data with a minimum value of 0.60 as a benchmark for a robust factor analysis (13, 17). According to Tabachnick and Fidell, a KMO value approaching 1.0 suggests that the exploratory factor analysis can generate reliable and distinct factors.

Table 4: Goodness-of-Fit Indices for Exploratory Factor Analysis (EFA)

Criteria	Suggested Value
UjianKeseferaanBarlett (Barlett"s Test of Sphericity)/ χ^2 (Sig. < 0.05)	< 0.05
Kecukupan sampel/ Kaiser- eyer-Olkin (KMO)	≥ 0.60
Nilai faktor pemberat (<i>factor loading</i>)	≥ 0.50
Keseragaman (communalities)	≥ 0.30
Nilai Eigen (Eigen value)	≥ 1.0
Peratus sumbangan varians terhadap faktor	≥ 3.0

Bartlett's Test of Sphericity

The Bartlett's Test of Sphericity assesses whether the correlation matrix in the population is an identity matrix, and a significance value ($\text{sig} < 0.05$) is used as a criterion. This statistical test examines whether the factors in the population are not intercorrelated. The result of Bartlett's Test of Sphericity is also checked to confirm the presence of relationships among the variables under study (13). If both of these tests adhere to the predefined criteria, the sample data is deemed suitable for factor analysis. (a) Factor Loading: Factor Loading describes the extent to which an item contributes to a specific factor. A significant Factor Loading value is generally considered to be greater than 0.50. (b) Communalities: Communalities represent the percentage of variance in each item that contributes to the formation of factors. Generally, Communalities values greater than 0.30 are acceptable. (c) Eigen Value: indicates the proportion of variance explained by each factor. Eigen Values greater than 1.0 are considered significant. After discussing the exploratory factor analysis (EFA) methodology in detail, the subsequent step involves conducting Principal Component Analysis to confirm the identified dimensions of the KPS construct. This process aims to validate the dimensions further (18-20).

Confirmatory Factor Analysis

The validation of the instrument can be determined through the method of Confirmatory Factor Analysis (CFA). The CFA will be run on the data set with 300 respondents. CFA is an approach used to identify or determine the significant indicator variables that contribute to latent variables and subsequently assess the dominant indicators in forming the studied latent variables. In this study, CFA will be

conducted on the components of Historical Thinking Skills (KPS), namely Chronology, Rationalization, Imagination, Interpretation, and Evidence Exploration. CFA, when implemented, will verify the significance of the items contributing to these components and adhere to the three main criteria of CFA: Unidimensionality, Validity, and Reliability. (i) Unidimensionality: This fundamental assumption posits that all items within a given variable measure the same construct (11, 12). This requirement can be fulfilled through item deletion procedures involving items with low Factor Loadings, until the model achieves the predefined level of Fit Indexes. (ii) Validity: The instrument's ability to measure what is intended by the construct. The criteria for Fit Indexes can be referred to in Table 5. There are three types of validity that must be achieved by a measurement model: Construct Validity, Convergent Validity, and Discriminant Validity (iii) Reliability: Refers to the extent to which the survey item consistently measures the study's variables. Reliability can be defined as the consistency in measurement (20). There are three reliability criteria that need to be adhered to: internal reliability, construct reliability, and Average Variance Extracted (AVE). Thus, this approach was implemented to all HTS components using IBM SPSS AMOS software.

Result

Table 6 presents the descriptive analysis of the HTS construct. The analysis findings indicate that the items for HTS code 13 have the highest minimum score with a value of 4.46 and a standard deviation of 1.312. On the other hand, the items for HTS code 3 have the lowest minimum score, which is 4.03, with a standard deviation of 1.348. Specifically, items within the

Table 5: Three Categories of Fit Indexes and Recognized Index Types

Category	Index Name	Level of satisfactory
Absolute Fit Index	RMSEA	RMSEA < 0.08
	GFI	GFI > 0.90
	AGFI	AGFI > 0.90
Incremental Fit Index	CFI	CFI > 0.90
	TLI	TLI > 0.90
	NFI	NFI > 0.90
Parsimonious Fit Index	Chisq/df	Chi-Square/ df < 3.0

Table 6: Descriptive Analysis of HTS Components

Component	Code of Items	Item of statement	Min	Std. Deviation
Chronology	HTS1	Indicate your level of proficiency in understanding the concept and application of Historical Thinking Skills (HTS).	4.22	1.06
	HTS2	I am proficient in establishing connections between past, present, and future events logically to explain facts during the teaching and learning sessions of the Prophet's Biography and Islamic Civilization (PBIC).	4.10	1.076
	HTS3	I am capable of comparing the roles of primary sources with secondary sources during the teaching and learning sessions of the Prophet's Biography and Islamic Civilization (PBIC).	4.03	1.348
	HTS4	I am skilled in evaluating facts from various source materials in the teaching of the Prophet's Biography and Islamic Civilization (PBIC).	4.22	1.078
Rationalization	HTS5	I am proficient in interpreting significant facts within the content of teaching the Prophet's Biography and Islamic Civilization (PBIC).	4.07	0.966
	HTS6	I am skilled in creating mind maps to effectively explain events of the Prophet's Biography and Islamic Civilization (PBIC).	4.13	1.130
	HTS7	I am knowledgeable about the rationale for teaching the Prophet's Biography and Islamic Civilization (PBIC) in the subject of Islamic Education.	4.18	0.978
	HTS8	I am skilled in using timelines to explain chronological events in the Prophet's Biography.	4.08	1.458
Interpretation	HTS9	I am skilled in interpreting facts effectively to enhance students' imaginative understanding.	4.25	0.896
	HTS10	Imagination and empathy can be enhanced through effective narrative (storytelling) logic.	4.23	1.076
	HTS11	I am skilled in distinguishing between facts and explanations of facts for teaching the Prophet's Biography and Islamic Civilization (PBIC).	4.17	0.671
	HTS12	I am proficient in drawing logical conclusions about specific facts in the Prophet's Biography and Islamic Civilization (PBIC) based on understanding.	4.10	1.078
Imagination	HTS13	I am skilled in creating iThink maps and Mind Maps from historical facts during the teaching and learning sessions of the Prophet's Biography and Islamic Civilization (PBIC).	4.46	1.312
	HTS14	I am skilled in guiding my students to imagine past events.	4.22	1.066
	HTS15	I am proficient in guiding students to use Quranic and Hadith sources during the teaching and learning sessions of the Prophet's Biography and Islamic Civilization (PBIC).	4.11	1.079
Evidence Exploration	HTS16	I am skilled and knowledgeable about the process of interpretation in teaching the Prophet's Biography and Islamic Civilization (PBIC).	4.22	1.176

HTS17 I am skilled and knowledgeable about the concept of rationalization in the teaching and learning process of the Prophet's Biography and Islamic Civilization (PBIC).	4.21	1.224
HTS18 I am skilled and knowledgeable about the use of chronological elements as a time reference in teaching the Prophet's Biography and Islamic Civilization (PBIC).	4.08	1.045

Chronology component {HTS1, HTS2, HTS3, HTS4} have minimum scores ranging from 4.03 to 4.22. This suggests that IRTs teachers possess a high skill level in understanding Chronology. For the Rationalization component, items {HTS5, HTS6, HTS7, HTS8} have minimum scores between 4.07 and 4.18. These high minimum scores indicate that IETs teachers have a high level of skill in providing rationales while teaching PBIC to students. In the Interpretation component, items {HTS9, HTS10, HTS11, HTS12} have minimum scores ranging from 4.10 to 4.25. These high minimum scores indicate that IETs teachers are skilled in interpreting historical elements while teaching PBIC to students. In the Imagination component, items {HTS13, HTS14, HTS15} have minimum scores between 4.11 and 4.46. These high minimum scores suggest that IETs teachers are adept at fostering imagination while teaching PBIC to students. Finally, for the Evidence Exploration component, items {HTS16, HTS17, HTS18} have minimum scores ranging from 4.08 to 4.21. These high minimum scores indicate that IETs teachers possess a high level of skill in presenting relevant evidence related to the PBIC while teaching students. Overall, all the minimum score values for the HTS items are at a level of strong agreement. Therefore, this

descriptive finding can be interpreted to indicate that all IETs teachers possess a high level of knowledge and competence in the elements of HTS while teaching PBIC.

The Exploratory Factor Analysis (EFA) Result of the HTS Components

The EFA procedure was conducted using the Principal Component Analysis (PCA) method on the HTS components. PCA was applied to the HTS using the Varimax rotation method on the 18 items contributing to the formation of the five HTS sub-components. These five HTS sub-components are Chronology (4 items), Rationalization (4 items), Interpretation (4 items), Imagination (3 items), and Evidence Exploration (3 items).

Table 7 demonstrates that the Bartlett's Test of Sphericity yielded a significant result (P-value = 0.00 < 0.05). The Sample Size Adequacy measured by the Kaiser-Meyer-Olkin (KMO) statistic is 0.955, which surpasses the minimum threshold of 0.6 (12, 13). Both achievements - significance in the Bartlett's Test and a KMO value exceeding 0.6 - indicate that the observed data is suitable for subsequent procedures during Exploratory Factor Analysis (EFA) (Awang, 2010; 2012,2015,2023).

Table 7: KMO and Bartlett's Test

Kaiser-Meyer-Olkin (KMO)	Sample size adequacy	0.955
Barlett's Test of Sphericity	Estimation of Chi-Square Sphericity	3753.983
	df	153
	Sig	0.000

Table 8: Total Variance Explained

Component	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.014	77.856	77.856	14.014	77.856	77.856
2	0.782	4.347	82.202			

Extraction Method: Principal Component Analysis.

The significant result in the Bartlett's Test of Sphericity confirms the existence of factor relationships among the studied variables. Meanwhile, the KMO value of 0.955, approaching 1, suggests that EFA conducted on the HTS items will yield factors that are credible and distinct from one another. With both tests satisfying the established criteria, the HTS sample data is deemed appropriate for factor analysis. The overall explained Variance value is important for researchers to determine the percentage of variability captured by the constructed items for the intended study. Table 8 presents the total estimated Variance values accounted for by the items used to measure the HTS component. Referring to Table 8, the HTS sub-components, initially consisting of 18 items with 5 sub-components, have formed a single dimension. These items collectively measure the HTS component at 77.856%. This value is sufficient as it surpasses the minimum requirement of 60% (9, 10). Furthermore, the percentage of variance contribution to the formed factor components is 77.856%. This value exceeds the minimum threshold of 3% set to meet the

goodness-of-fit index for Exploratory Factor Analysis (EFA). Moreover, the eigenvalue of 14.014 exceeds the value of 1 for the HTS factor, indicating a substantial contribution to the variance of the extracted factor.

The findings from Table 9 indicate that the HTS construct is measured by only one component. The items involved in each component remain consistent with the original suggestion, but have transitioned from five dimensions to a single dimension. The details of component formation can be referred to in Table 7, which shows the distribution of accepted items for the HTS component along with the communalities for each item.

All items have factor loadings exceeding the minimum threshold of 0.6, as recommended by Awang (9) Items with factor loadings below 0.6 should be excluded as they do not contribute to construct formation. Items with factor loadings below 0.6 will not be included in the questionnaire for further study. The communalities for all items exceed 0.30, indicating that all items make a significant contribution to the overall variance.

Table 9: Component Matrix and Communalities

	Component Matrix		Communalities	
	Component	1	Initial	Extraction
HTS11		0.923	1.000	.852
HTS15		0.923	1.000	00.852
HTS8		0.918	1.000	0.842
HTS13		0.915	1.000	0.837
HTS16		0.904	1.000	0.817
HTS18		0.899	1.000	0.797
HTS17		0.893	1.000	0.797
HTS10		0.893	1.000	0.797
HTS14		0.880	1.000	0.775
HTS9		0.879	1.000	0.773
HTS12		0.875	1.000	0.766
HTS7		0.875	1.000	0.765
HTS3		0.872	1.000	0.761
HTS1		0.868	1.000	0.754
HTS4		0.859	1.000	0.737
HTS5		0.842	1.000	0.709
HTS6		0.840	1.000	0.706
HTS2		0.815	1.000	0.664

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Referring to Table 7, the component matrix has formed only one dimension. It was found that the EFA analysis of the HTS items did not eliminate any items, as all items have factor loadings exceeding 0.60. Based on the findings of the principal component analysis (PCA), all six goodness-of-fit indices of EFA have been met. These six goodness-of-fit indices are: i) Barlett’s Test of Sphericity, $p\text{-value} = 0.000 < 0.05$ (Significant), ii) KMO = $0.955 > 0.60$ (Significant), iii) All items have factor loadings > 0.60 (Significant), iv) All items have communalities > 0.30 (Significant), v) Eigenvalue = $14.014 > 1$ (Significant), and vi) Percentage of variance explained = $77.865\% > 60\%$ (Significant). Therefore, the findings of the EFA analysis have validated that the 18 items of the KPS construct are valid to be considered as an instrument list for the research construct.

Confirmatory Factor Analysis (CFA) Result

The CFA was conducted on the HTS components to determine the unidimensionality, validity, and reliability. A total of 18 items were combined into a single component known as the measurement

model for the HTS construct. This HTS measurement model was constructed using AMOS Graphic software and generated to obtain the output results. These output results will be analysed to assess the criteria of unidimensionality, validity, and reliability. The constructed and generated HTS measurement model is depicted in Figure 1.

Referring to Figure 1, all the goodness-of-fit indices of the model do not meet the established criteria: i) Absolute Fit; RMSEA = $0.174 > 0.08$ (not met), ii) Incremental Fit; CFI = $0.839 < 0.90$ (not met), iii) Parsimonious Fit; Chi/df = 8.554 (not met). Despite all item factor loadings exceeding 0.60, none of the model fit criteria are satisfied. This situation arises due to an overlap between two items. To address this issue of item overlap, one of the items should be removed, or a correlated relationship needs to be established between the two items. The overlapping of these two items can be detected by referring to the Modification Indices' values between these items, which exceed 15. Table 8 displays the Modification Indices' values for the HTS measurement model

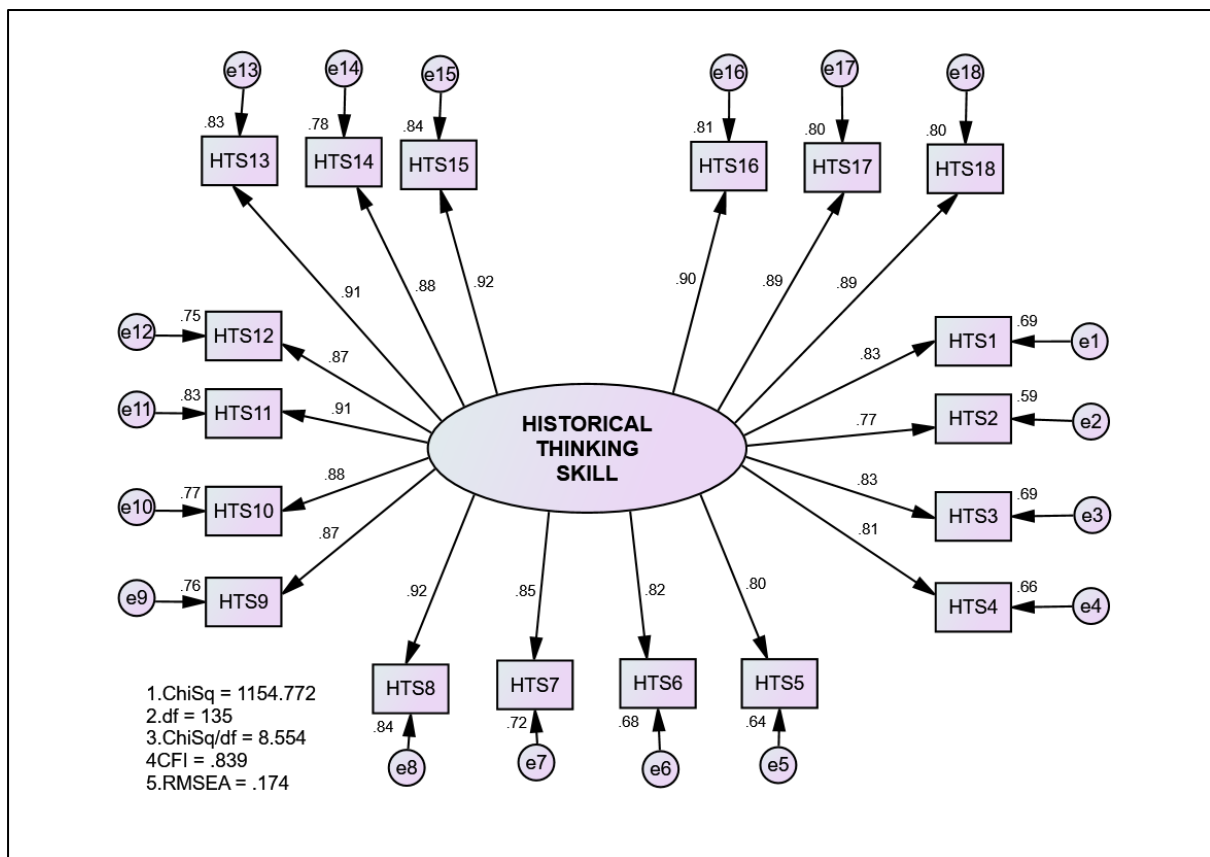


Figure 1: First HTS Measurement Model

Table 10: Modification Index

Item	Item	MI	Comment
e8	↔	e12	25.536
e14	↔	e16	18.224
e2	↔	e6	45.32`

Table 10 illustrates the Modification Indices (MI) values for item pairs that exceed 15. All these item pairs are correlated. However, it is important to address this issue by either removing or correlating the pair of items with the highest MI value first. In this case, the pair of items e2 and e6 will be removed first. After these two items are correlated, the measurement model will be generated again to obtain its output. This process is repeated iteratively until all three criteria for model fit are met.

Figure 2 above confirms that after conducting multiple rounds of restructuring the Measurement Model for HTS, all criteria for model fit have reached the predetermined thresholds: i) Absolute Fit; RMSEA = 0.060 < 0.08 (meets criteria), ii) Incremental Fit; CFI = 0.917 > 0.971 (meets criteria), iii) Parsimonious Fit; Chi/df = 2.361 (meets criteria). With all model fit criteria being met, the next step involves assessing the

unidimensionality, validity, and reliability of the Historical Thinking Skills (HTS) component. To assess these criteria, the values of Average Variance Extracted (AVE) and Composite Reliability (CR) need to be calculated first. The AVE and CR values need to meet the predetermined thresholds before determining the unidimensionality, validity, and reliability of the HTS component.

Based on the CFA results presented in Table 11, the criteria for unidimensionality, validity, and reliability of the Historical Thinking Skills (HTS) component are as follows:

i) Unidimensionality: The HTS component comprising items HTS1 to HTS18 has very high factor loadings greater than 0.60. Therefore, all of these items are significant indicators of the HTS component and contribute significantly to the HTS dimension. These items only measure a single HTS dimension.

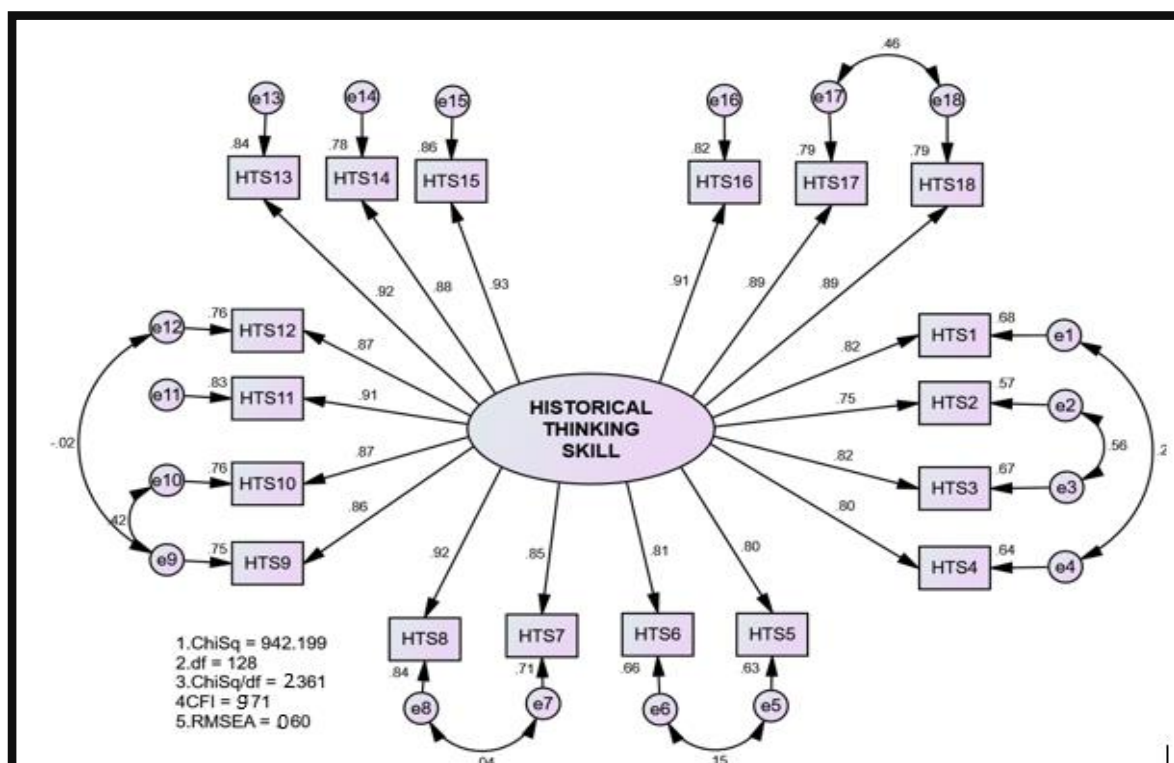


Figure 2: Second HTS Measurement Model

Table 11: Results of CFA for the Measurement Model of HTS

Component	Items	Factor Loading	Alpha Cronbach's >0.70	CR >0.60	AVE >0.50
Historical Thinking Skills (HTS)	HTS1	0.82	0.982	0.981	0.744
	HTS2	0.75			
	HTS3	0.82			
	HTS4	0.80			
	HTS5	0.80			
	HTS6	0.81			
	HTS7	0.85			
	HTS8	0.92			
	HTS9	0.86			
	HTS10	0.87			
	HTS11	0.91			
	HTS12	0.87			
	HTS13	0.92			
	HTS14	0.88			
	HTS15	0.93			
	HTS16	0.91			
	HTS17	0.89			
	HTS18	0.89			

ii) Reliability: (a) Internal reliability - The Cronbach's Alpha coefficient for the HTS items is 0.982, exceeding the threshold of 0.70. Hence, the HTS component satisfies the criterion for internal reliability. (b) Composite Reliability - The assessment of reliability and internal consistency for the HTS items meets this criterion, as the CR value is 0.981, which is greater than 0.60. Items HTS1 to HTS18 fulfil the composite reliability criterion. (c) Average Variance Extracted (AVE) - This criterion reflects the proportion of total variance explained by the items in the HTS component. The AVE criterion is satisfied by all the HTS items (HTS1 to HTS18) with an AVE value of 0.744, exceeding the threshold of 0.50.

Next is the final criterion, iii) Validity; The validity of the component contributed by HTS1 to HTS18 will be assessed based on three validity criteria:

a) Convergent Validity; Convergent validity relates the contribution of items to the component. This validity is achieved when all items within the component are significant, meaning their factor loadings exceed 0.6, and the AVE value is greater than 0.50 (18-20). Referring to Table 9, all factor loadings for the HTS items exceed 0.60, and the AVE value also surpasses 0.50. Thus, the HTS component with items HTS1 to HTS18 satisfies the Convergent Validity criterion. (b) Construct Validity; Construct validity explains how well a

statement within the used items can measure the construct (18-20). This validity is achieved when all fit index criteria reach the specified thresholds. Referring to Figure 1, the index categories: i) Absolute fit; RMSEA=0.062<0.08 (satisfies), ii) Incremental Fit; CFI=0.917>0.90 (satisfies), iii) Parsimonious Fit; Chi/df=3.132<5 (satisfies). Thus, the Construct Validity criterion for the HTS component is achieved. (c) Discriminant Validity; This validity is achieved since all pairs of correlated items are linked through a "two-headed arrow" in Figure 1. The findings from EFA and CFA confirm the actual number of dimensions that can be formed by HTS1 to HTS18 items. Through CFA analysis as well, the criteria of Unidimensionality, Validity, and Reliability of the construct can be determined.

Discussion

The findings from the Exploratory Factor Analysis (EFA) have demonstrated that the component of Historical Thinking Skills (HTS), consisting of five sub-components: Chronology, Rationalization, Interpretation, Imagination, and Evidence Exploration, is effectively measured by a single dimension, HTS. Islamic Education Teachers (IETs) have assessed the HTS component to be unidimensional rather than consisting of five separate dimensions. Additionally, the items HTS1

to HTS18 exhibit high minimum scores, averaging 4.15. These high scores indicate that IETs Teachers possess advanced skills in aspects related to Chronology, Rationalization, Interpretation, Imagination, and Evidence Exploration. They exhibit strong confidence and proficiency in HTS.

The Confirmatory Factor Analysis (CFA) results have shown that the items used to measure the HTS skills of IETs Teachers conform to the unidimensionality criteria. Items HTS1 to HTS18 solely measure the Chronology, Rationalization, Interpretation, Imagination, and Evidence Exploration aspects within a single HTS dimension. The CFA findings indicate that all the items HTS1 to HTS18 significantly contribute to the Historical Thinking Skills (HTS) component. The factor loadings for these items are notably high, ranging from 0.76 to 0.92. All these items hold significant relevance to the HTS component, illustrating the high proficiency of Islamic Education Teachers (IETs) in HTS.

Findings from the EFA and CFA analysis have refuted the theory of HTS which consists of five sub-components namely rationalization, chronology, interpretation, Imagination and exploring the evidence that needs to be carried out separately is inaccurate and contrary to actual practice. This finding shows that Islamic Education Teachers in practices, evaluate historical thinking skills for the teaching of Islamic education subjects especially for the topic of Sirah and Islamic civilization should be implemented simultaneously and not separately.

Conclusion

The CFA outcomes have successfully established that the HTS component, as measured among Islamic Education Teachers (IETs), meets the three criteria of Unidimensionality, Validity, and Reliability. Overall, the results of both the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) substantiate that the dimension of Historical Thinking Skills (HTS) is indeed unidimensional. Items HTS1 to HTS18, used to assess HTS among Islamic Education Teachers (IETs), are valid and significant.

Abbreviations

Nil

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Authors contributions

Hartini Hussin writing for the concept and design, Alias Hussin and Zamri Chik focuses on data acquisition, data analysis and interpretation, Hamdan Aziz and Asyraf Afthanorhan addressing on critical revision of manuscript, statistical analysis, supervision, and final approval.

Conflict of interest

There is no conflict of interest in relation to this study from either parties involved.

Ethics approval

The research presented in this paper was conducted in compliance with ethical principles and guidelines. All procedures involving human participants were conducted in accordance with the ethical standards of the Universiti Malaysia Terengganu (UMT), and informed consent was obtained from all participants.

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