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Process in Developing an Instrument Gauging Levels of Thinking Skills in Reader-Text Transaction

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ABSTRACT

The purpose of this paper is to highlight the procedures involved in developing a valid instrument gauging the levels of thinking skills when readers engage in active interactions with the text. Rigorous qualitative and quantitative dimensions were undertaken to ensure high content validity of the instrument. Feedback and consensus based on consistency of judgment by reviewers were used to provide high reliability index onto content and construct validity. This paper discusses the pertinent concepts and issues that are involved in developing an instrument gauging the levels thinking skills in reader-text transaction. The underlying constructs of thinking skills of Lower Order Thinking skills (LOTS) and Higher Order Thinking skills (HOTs) were used as the basis of analysis. The underpinning theoretical constructs posited by Herber (1978), Ruddell (2001), Harvey (2001) and Gunning (2003) were triangulated and synthesised to elicit similarities which could be adapted to items extracted from Purpura's Cognitive Strategies Questionnaire (1999). Further descriptions depicting the interconnections among the items in the original questionnaire of Purpura's Cognitive Strategies Questionnaire were examined. This was to ensure that the items were adequately adapted in the newly developed instrument of gauging the appropriate domain of thinking skills. Essentially, the semantic and syntactic aspects of the qualitative as well as the quantitative dimensions were adopted to ensure that the developed instrument measures what it is purported to measure.

INTRODUCTION

In developing a valid and reliable instrument gauging the domain of thinking skills, appropriate and rigorous procedures should be followed. Although there are lots of questionnaires investigating cognitive strategies, the researchers were confronted with the predicament of obtaining a precise instrument which could gauge the appropriate levels of thinking skills when readers interact with the text. In fact, most of the questionnaires are involved with items reflecting information processing skills which are not relevant in gauging the various levels of thinking skills in reader-text transaction. Due to such constraint, there is a need to develop an appropriate instrument for such purposes.

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PROCEDURES INVOLVED IN DEVELOPING THE INSTRUMENT GAUGING THE DOMAIN OF THINKING SKILLS QUESTIONNAIRE (DTsQ) (See Appendix A)

After much search, the nearest available instruments that could be incorporated were those established by Pintrich et al. (1991) in Motivated Strategies for Learning Questionnaire (MSLQ) and Purpura (1999) identified as Cognitive Strategies Questionnaire (CSQ). The newly developed questionnaire of 59 items was initially developed by synthesising these two instruments reflecting models of human processing skills (**see Appendix A**) whereby 19 items were from MSLQ and 40 items from CSQ (**see Table 1**).

Table 1
Initial Stage of Developing Domain of Thinking skills Questionnaire (DTsQ)

Pintrich's MSLQ (19 items) +	Purpura's CSQ (40 items) =	Domain of Thinking skills Questionnaire(DTsQ) (59 items)

Initial Stage of Developing Domain of Thinking Skills Questionnaire (DTsQ).

After compiling the 59 items, the researchers had to qualitatively analyse those items to be replicated into the newly developed instrument. At the initial stage, the researchers were confronted with an uphill task of ascertaining the 59 items in accordance with the purpose of the study; such as assimilating them into thinking skills identified as Higher Order Thinking skills (HOTs) and Lower Order Thinking skills (LOTs). These thinking skills were ascertained based on the operational constructs of Bloom's Cognitive Taxonomy (1956), and Herber's Levels of Comprehension (1978).

1st Part of Pilot Testing : Ensuring Content and Construct Validity

The initial developed instrument of the 59 items was first pilot tested with a group of 12 respondents. The overall cronbach alpha of the assimilated questionnaire of 59 items was registered at 0.971. At the same time, cronbach alpha was also carried out separately for the 19 items (Pintrich's MSLQ) and 40 items (Purpura's MSLQ) with a loading of 0.914 and 0.965 respectively (**see Appendix B**).

After the initial pilot testing of reliability analysis, further justification and amendments were made onto the 59 items in the questionnaire. For example, a panel of reviewers (identified as reviewers I, II, III and IV) comprising of practitioners in the areas of cognitive sciences and field of education were engaged to review the newly developed instrument. The initial 59 items questionnaire was qualitatively reviewed in terms of the content, construct, semantic and syntactic aspects in the questionnaire.

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For example, among the significant aspects reviewed were the syntax and semantic items whereby the selection of the words and sentence structures were analysed. This was to ensure that the items in the questionnaire were appropriately worded so that those items were meant to measure what it is purported to measure (**see Appendix C** – review of the 40 items questionnaire).

Second Part of Pilot Testing and Factor Analysis

Subsequently, the amended instrument of 59 items was subject to further statistical procedure of exploratory factor analysis on 181 randomly selected respondents. The cronbach alpha for the 2nd pilot study was registered at 0.945 (**see Appendix D**). The procedure was undertaken to ensure that those emergent factors were appropriately clustered according to the required constructs. Such process is an essential pre-requisite of data reduction technique to verify that the items in the questionnaire have been statistically clustered according to its underlying factors (Gall, et al. 2003 and Coakes & Steed, 2003).

From the output of factor analysis, it was found that 16 factors were generated. Implicitly, there was a wide range in the loading of correlations among those 59 items. This implies that the 2 instruments could not be appropriately blended into the 6 levels of thinking skills as posited in Bloom's cognitive taxanomy. As there were too many constructs (factors) being generated, it may pose a threat to the construct validity of the instrument. Based on such premise, a decision was made to exclude all the 19 items from Pintrich's model of MSLQ.

Subsequently, another exploratory factor analysis was conducted solely on the 40 items as adapted from Purpura's model of CSQ. From the rotated factor analysis onto the 40 items, it was found that 10 factors were loaded. It means that 10 factors could be the contributing aspects of thinking skills that were exploited when readers interact with the text using procedure of questioning the text. To provide greater reliability onto the construct validity of the instrument, further enhancement of confirmatory factor analysis was conducted. In the process, those 10 factors were then collapsed into 6 factors.

Following the output generated from the 6 factors, further amendments were carried out whereby 17 items were deleted from the questionnaire. These 17 items were deleted as it was qualitatively found to be redundant, irrelevant and were not within the conceptual constructs and theoretical framework as required in the research. As such, only 23 items were shortlisted to be used.

Among the 17 items deleted were items 5, 9, 10, 12, 14, 16, 17, 19, 24, 26, 27, 29, 30, 32, 34, 35, and 38 (**see Appendix C**). For example, based on the loadings of confirmatory factor analysis, item 17 had loadings which were significantly similar with the other items in the questionnaire (**see Appendix E**). This was indicated in the loadings of 0.406 for factor 3, 0.437 (factor 5) and 0.230 (factor 6). Similarly in item 32, there

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were similar significant loadings of 0.300 for factor 1, 0.243 (factor 2), 0.242 (factor 3), 0.342 (factor 4), 0.157 (factor 5) and 0.224 (factor 6).

Based on the loading of factor analysis of 5, 9, 14, 19 and 34, a decision was made to delete those items as the content validity was disputable. For example, by scrutinising item 14 which states that 'I learn new ideas while reading by translating the ideas into my own language', it was noticed that it does not measure the thinking skills as required in the study. Similar justifications were executed for items 5, 9, 19 and 34.

The newly developed instrument of 23 items questionnaire was subject to another panel of 14 reviewers to review the items in terms of face, content and construct validity (**see Appendix F**). These reviewers were experts and practitioners in the areas of cognitive sciences and field of education. Among them were experienced researchers, senior lecturers and senior teachers with vast experience in the teaching of English. For example, the reviewers were requested to provide constructive feedback by reviewing and resolving some of the semantic and syntactic aspects of the questionnaire. It was conducted to ensure that the appropriate words and sentence structures in the items were used correctly to ascertain that the items were supposedly measuring what it is purported to measure. Besides the semantic and syntactic aspects, the reviewers were also required to review the ascertained coded domains of knowledge, comprehension, application, analysis, synthesis and evaluation as rated by the researchers. For example, the reviewers were given the option as 'if disagree or strongly disagree, they were request to cite the alternative thinking level deemed fit.

Based on the above-mentioned explanation, it should be noted that rigorous triangulation procedures had been adequately undertaken in ensuring consistency of judgment in establishing high index of content and construct validity. Thorkildsen (2005) augurs that high index in terms of the validity could be achieved as it involves ratings of the agreement among reviewers after judgement has been made on a set of categories. From such premise, it should be acknowledged that when high index is obtained, then accuracy is inferred (Brumfit & Roberts, 1983).

JUSTIFICATION OF CONTENT AND CONSTRUCT VALIDITY OF THE NEWLY DEVELOPED DTsQ (see Appendix G)

With the necessary statistical procedures of factor analysis undertaken and the trustworthiness of the reviews by experts, there is greater conviction that high reliability index for content and construct validity was established. Payne (1968) and Gay & Airasian (2003) argue that to establish claim for the validity of an instrument, it must be drawn upon professional judgment to adequately ensure the items are measuring what it is purported to measure.

In establishing the reliability of rating by reviewers, 14 reviewers were requested to scrutinise the option of the ascertained levels of thinking skills as accorded in the 23 items of the questionnaire. The issue of content and construct validity was resolved by

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adopting the procedure as suggested by Wood (2007). For example, in item number 2; 'I try to improve my reading (most of the time) by thinking of ways to organise the content information/ideas in my mind'. The reviewers were given the options of strongly disagree, disagree, agree or strong agree. After obtaining the input, the researchers proceeded to systematically recode the option of strong disagree and disagree as 'no' and agree and strong agree as 'yes'.

The following steps were used in calculating the percentage of agreement:

1. Count the total reviewers (Total Number)
2. Count all the ratings for which the reviewers agree (Number of Agreement of Yes)
3. Simply divide the Number of Agreements by the Total Number

Table 2
Percentage of Agreement (Reliability)

Q1	Synthesis	100%	**Q9**	Application	78.6%	**Q17**	Synthesis	71.4%
Q2	Synthesis	85.7%	**Q10**	Knowledge	78.6%	**Q18**	Application	92.8%
Q3	Comprehension	92.8%	**Q11**	Application	92.8%	**Q19**	Evaluation	100%
Q4	Comprehension	92.8%	**Q12**	Evaluation	92.8%	**Q20**	Analysis	100%
Q5	Application	78.6%	**Q13**	Knowledge	71.4%	**Q21**	Comprehension	92.8%
Q6	Evaluation	85.7%	**Q14**	Application	100%	**Q22**	Analysis	100%
Q7	Knowledge	92.8%	**Q15**	Synthesis	92.8%	**Q23**	Analysis	100%
Q8	Synthesis	92.8%	**Q16**	Application	85.7%			

The percentage of agreement reflecting reliability analysis was established as listed above (**see Table 2**). Based on the output, the reliability of the developed instrument is highly assured. Benard (2000) augurs that such dimension reflecting high reliability would provide the basis for the trustworthiness of the instrument. From the robustness in the triangulation procedures, the researchers can justify that the developed instrument has actually tapped into the appropriate domain of thinking skills that it is supposed to measure.

RATIONALE : ASSIMILATING PURPURA'S MODEL CSQ INTO THE NEWLY DEVELOPED DTsQ (See Appendix G)

In the model of human processing skills of Cognitive Strategies, Purpura has clearly identified cognitive strategies as Storing or Memory Processes (MEM), Comprehension Processes (COMP), and Using or Retrieval Processes (RET). These original components in the cognitive strategies questionnaire share similar key issues of inherent traits and variables which are within the constructs of the domain of thinking skills as used in this study **(see Table 3)**.

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It should be noted that in the newly developed DTsQ, the constructs of thinking skills are perceived within the Lower Order Thinking skills (LOTs) and the Higher Order Thinking skills (HOTs). The thinking skills of LOTs were perceived within the construct of Literal Thinkers and HOTs on the other hand were based on the construct of Interpretive and Applied Thinkers.

Before proceeding to explain how the 40 items from Purpura's CSQ were assimilated into the newly developed DTsQ, it is crucial to have a firm grasp of the key issues indicating the similarities underpinning constructs of Purpura's CSQ with the domain of thinking skills of LOTs and HOTs as used in this study. Such an understanding of theoretical understanding could provide the basis indicating the trustworthiness of adapting variables such as Sorting or Memory Process (MEM) into Literal Level; Comprehension Processes (COMP) as Interpretive Level; and Using or Retrieval Processes (RET) as Applied Level.

Table 3
Adapting Purpura's CSQ Model in DTsQ

Storing or Memory Process (MEM) = Literal level / Text Explicit (LOTs)
Comprehension Process (COMP) = Interpretive / Text Implicit (HOTs)
Using or Retrieval Processes (RET) = Applied level / Text Implicit (HOTs)

Theoretical Triangulations of the Variable MEM as Literal Level in the Developed DTsQ

One of the indicators of the trustworthiness adapting the variable of MEM as Literal Level (LOTs) was scrutinising the similar traits of the underpinning theoretical assumptions identified in them. According to Purpura, items in the questionnaire related to the variable of MEM are namely; associating, remembering content material by linking it to prior knowledge, repeating and summarising of content material explicitly stated in the text. Herber (1978), on the other hand, has identified that Literal Level of questioning involving the simulation of thinking skills associated with knowledge and comprehension levels. It is comparable to the ability of retrieving input based on content material in the text.

From the theoretical triangulation, similar inherent traits identified in the variable of MEM that was closely associated with Literal level of questioning were then assimilated into the construct of LOTs. The adaptation of MEM as LOTs of Literal level of questioning is further substantiated by Harvey (2001). He identified the definition 'Question of Facts' as the inherent quality of the readers to question the text in accordance the contents explicitly stated in the text.

In reference to the above-mentioned theoretical underpinnings, there are justifications to infer that MEM could be clustered as LOTs of Literal Level of thinking skills. The key issue is that readers are able to make use of the questioning techniques

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that focus on retrieving of content materials or facts that are directly stated in the text. Further justification is then substantiated by Gunning (2003) as he posited that under the construct of asking question involving the aspect of 'Right There', readers are expected to raise questions and the answers to it could be easily found in the content material of the text. This is in tandem with the concept of MEM which involves remembering, associating of content material as explicitly stated in the text (**see Table 4**).

Table 4
Implication and Resemblance of MEM to Literal Level

Variable of Storing or Memory (MEM) = Learning Outcomes of Knowledge & Comprehension
Ability of associating, remembering content material by linking it to prior knowledge, repeating and summarising of content material explicitly stated in the text.
Implicating LOTS or Question the Fact / Right There
Literal Questioning / Reading the lines.

In other words, the underlying theoretical underpinnings by Herber (1978), Harvey (2001) and Gunning (2003) were used as the basis to substantiate the calibration of LOTs of literal level of thinking skills reflected through the variable of MEM (**see Table 4**). This deployment is justified as there are similar characteristics in the underpinning theoretical assumptions; of having to remember content material, repeating and summarising of content material explicitly stated in the text.

Theoretical Triangulations of the Variable COMP as Interpretive Level in the Developed DTsQ

Similar deployment as mentioned above was used to assimilate the adapted items of COMP into HOTs of Interpretive Level. For example, in the variable identified as COMP, Purpura has defined it as the activation of cognitive skills such as analysing inductively, clarifying or verifying, making inferences and translating (**See Table 5)**.

Gunning (2003) posited that at the category of 'Think and Search', readers are expected to demonstrate the potential to capitalise the use of questioning techniques reflected as Interpretive Level. At such level, readers are expected to demonstrate the abililty of using interpretive questions to derive information not directly stated in the text. Further justification is substantiated by scrutinising the inherent qualities of interpretive level of questioning as posited by Ruddell (2001). Interpretive level is perceived as when readers are able to acquire the ability to capitalise on reading between the lines of interpretation skill. This is in tandem with the traits identified within the variable of COMP such as involving the analysis of input, making inferences and interpreting of content materials to comprehend the text.

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Table 5
Implication and Resemblance of COMP to Interpretive Level

Variable of Comprehension Process (COMP) = Learning Outcomes of Application & Analysis Ability to analyse input, clarifying information by verification, making inferences and interpretation of information. Implicating HOTS or Text Implicit Interpretive Questioning / Reading between the lines.

For example, students are required to make use of their working memory to 'read between the lines' which is akin to the concept 'text implicit' of analysing inductively and making inference of the content material of the text. Such ability is in line with the theoretical underpinnings of COMP as defined by Purpura. With careful consideration of these intertwining concepts, there is clear indication that the variable of COMP is theoretically triangulated with the Interpretive Level.

Theoretical Triangulations of the Variable RET as Applied level in the Developed DTsQ

Hadley (2000) in one of the models of interactive approach of 'Inner-Conversation Driven' posits that the significant interactions of inner conversation between the reader and the text involve the interactive process to integrate and transform evidence of the content material in the text. He also posited that readers may have to read for intrinsic meaning of drawing additional new insights and fresh ideas. For example, from the theoretical perspective, when readers exhibit the ability to synthesise and evaluate text, it is akin to making use of Applied Level of thinking skills.

At such level, the readers are expected to reach out to the creative and critical dimensions of 'text implicit' which share similar inherent traits associated to the theoretical definition of RET as postulated in Purpura's Model of CSQ. This implies that readers are expected to exhibit the inert ability to retrieve content material such as being able to transfer, practise and make evaluation of the content material **(see Table 6)**. On the basis of such similarities, it is thus theoretically triangulated the significant link between these constructs of the Applied Level and RET.

Apart from that, Harvey (2001) in his article 'Questioning the Text' could further be justified to indicate the trustworthiness of the close association of the variable of RET with the constructs of the Applied Level. In his article, he posits that readers who are able to operate at the construct of 'Questioning Beyond the Text' or Level Three Questioning would be able to integrate it as the variable of RET; which involves practising and application of rules.

Based on the justifications as posited by Hadley (2000) and Harvey (2001), there is evidence to infer that there are similar traits linking the Applied Level with the human

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information process of RET in Purpura's CSQ. As such, trustworthiness is achieved as the items from the variable of RET have been appropriately triangulated into the newly developed DTsQ as Applied Level.

Table 6
Implication and Resemblance of RET to Applied Level

Variable of Using or Retrieval Processes (RET) = Learning Outcomes of Synthesis and Evaluation
Ability of practising and transferring of content material.
Implicating HOTs or Text Implicit.
Applied Questioning/Reading beyond the text

PROFILING THE NEWLY DEVELOPED DOMAIN OF THINKING SKILLS QUESTIONNAIRE (DTsQ)

Even though the qualitative and quantitative dimensions were rigorously assessed, nonetheless, further triangulation of confirmatory factor analysis was undertaken in the actual study to ensure that the constructs of thinking skills had been appropriately ascertained and clustered (**see Table 7 & 8**).

For example, in the loading of factor analysis, the 23 items were statistically clustered into 6 different factors. The breakdown of items in the factors was based on empirical evidence as listed below (**see Table 7**). The procedure was undertaken to ensure that the loading of the emergent factors were appropriately ascertained in accordance to the 6 constructs of Bloom's Cognitive domain of learning outcomes; identified as knowledge, comprehension, application, analysis, synthesis and evaluation. For example, based on the loading generated from factor analysis, items 7, 10 and 13 were clustered as thinking skill reflecting the variable of knowledge level. The procedure was also statistically used for profiling the item into appropriate variables of thinking skills identified as comprehension, application, analysis, synthesis and evaluation.

Table 7
Calibration and Clustering of Items (Confirmatory Factor Analysis)

Factors and its cognitive domain of learning outcomes	**Thinking skills**	**Thinkers**
Factor Four : Items 7, 10 and 13 (Knowledge)		
Factor Six : Items 21, 3 and 6 (Comprehension)	LOTs	Literal
Factor One : Items 5, 16, 11, 9, 14 and 18 (Application)		
Factor Three : Items 22, 23, and 20 (Analysis)	HOTs	Interpretive
Factor Two : Items 15, 17, 2, 1 and 8 (Synthesis)		
Factor Five : Items 12, 6 and 19 (Evaluation)	HOTs	Applied

After acquiring the loadings for the profiling of the 6 identified domains, the researchers proceeded to profile them into thinking skills identified as Literal levels of

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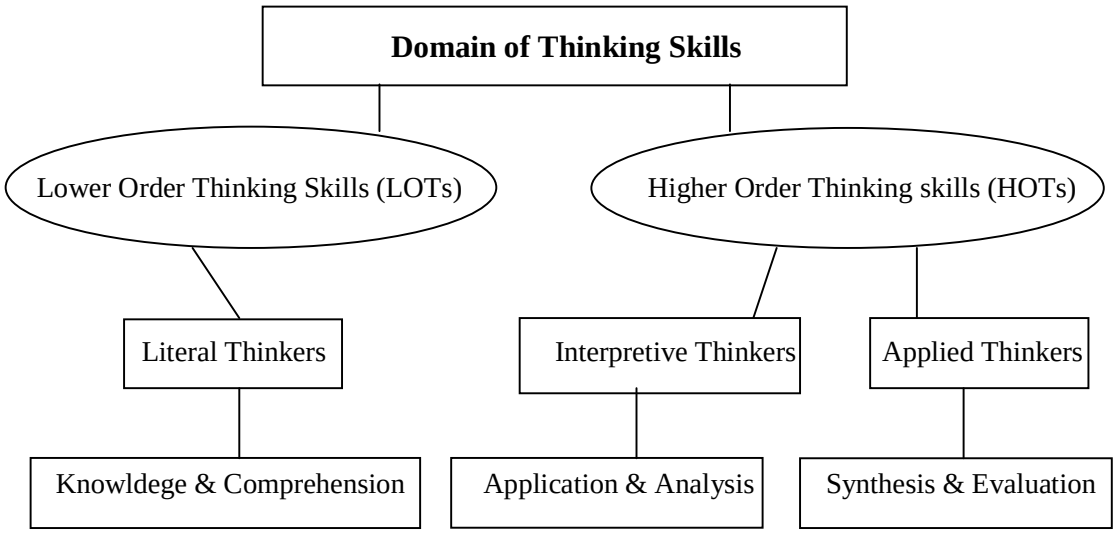
LOTs and Interpretive and Applied Levels of HOTs. For example, the variables of knowledge and comprehension were integrated into the construct of Literal Thinking skills of LOTs while levels of thinking such as application, analysis, synthesis and evaluation were clustered as Interpretive and Applied Thinkers of HOTs. It has to be reiterated that the above mentioned thinking skills were integrated from the incorporated theoretical underpinnings as posited by Herber (1978), Ruddell (2001), Harvey (2001) and Gunning (2003).

From the explanation of integrated theoretical underpinnings, it is explicitly recognised that Literal thinkers exhibit thinking ability reflecting LOTs which focuses on retrieving of content materials directly stated in the text. This implicitly reflects learning outcomes based on levels of knowledge and comprehension. As such, with the integration of empirical evidences and the cross examination of theoretical underpinnings, the researchers were able to cluster items for the Knowledge and Comprehension levels as Literal Thinkers of LOTs (**see Table 8**).

Table 8
Domain of Thinking Skills Relationships



As for the Interpretive and Applied Thinkers, items loaded from factor analysis were used to ascertain them as HOTs. Essentially, Interpretive Thinkers are those thinkers exhibiting qualities of learning outcomes of application and analysis levels. In contrast, Applied Thinkers were reflected as learning domain of synthesis and evaluation levels (**see Table 8**). With the triangulation of the theoretical underpinnings posited by Herber (1978), Ruddell (2001), Harvey (2001) and Gunning (2003), there is strong evidence to indicate trustworthiness that those items of application and analysis could be clustered as Interpretive Thinkers. With the same contention, Applied Thinkers were clustered in items loaded in synthesis and evaluation levels.

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Therefore, with the justification of inherent theoretical underpinnings and cross examination of factor analysis, there is significant evidence to establish the variables of knowledge, comprehension, application, analysis, synthesis and evaluation into its respective components of Literal, Interpretive and Applied Thinkers.

CONCLUSION

Based on the above descriptions, it can be concluded that the newly developed instrument gauging the domain of thinking skills has undergone rigorousness of qualitative and quantitative dimensions. It was conducted to ensure that the items in the questionnaire were appropriately adapted into the content and construct of the domain of thinking skills. This is in tandem with the definition on the concept of the validity of the test as defined by Narenda (1991), Alderson et al. (1995) and Nadi (2003). They posited that the quality of a valid test is to ensure that the instrument measures what it is supposed to measure. With the justifications as listed above, there is basis to infer trustworthiness that the instrument has been appropriately developed through authentic approaches.

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APPENDIX A

Original Instrument : Cognitive Strategy Questionnaire
(Motivated Strategies for Learning Questionnaire. Pintrich et al., 1991)
(Cognitive Strategy Questionnaire. Purpura, J.E. 1998)

Section I COGNITIVE STRATEGY QUESTIONNAIRE (Adapted from Motivated Strategies for Learning Questionnaire Pintrich et al., 1991)

Instructions: Put a tick (√) in the appropriate boxes provided.

1	2	3	4	5
Never	Sometimes	Often	Usually	Always

1	When I read the passages, I outline the material to help me organise my thoughts	
2	I often find myself questioning things I hear or read in the reading passages to decide if I find them convincing.	
3	When reading the passages, I practice saying the contents in the passages to myself over and over.	
4	When I am reading, I go through the reading passages and try to find the most important ideas.	
5	When reading the passages, I go through the passages several times.	
6	When a theory, interpretation, or conclusion is presented in the reading passages, I try to decide if there is good supporting evidence.	
7	I make simple charts, diagrams, or tables to help me organise contents in the reading passages.	
8	I use the contents in the reading passages as a starting point and try to develop my own ideas about it.	
9	When I read the reading passages, I pull together information from different sources, such as lectures, readings and discussions.	
10	I memorise key words to remind me of important concepts in the reading passages.	
11	I try to relate ideas in the reading passages to those in other ideas whenever possible.	
12	When I read the passages, I go over the contents and make an outline of important concepts.	
13	When reading the passages, I try to relate the material to what I already know.	
14	I try to play around with ideas of my own related to what I am reading in the passage.	

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15	When reading the passages, I write brief summaries of the main ideas from the readings.	
16	I try to understand the material in the reading passage by making connections between the reading and the concepts from my real life experience.	
17	Whenever I read or understand an assertion or conclusion in the reading passages, I think about possible alternatives.	
18	I make lists of important items in the reading passages and memorise the lists.	
19	I try to apply ideas from the reading passages in other class activities such as lecture and discussion.	

Section III COGNITIVE STRATEGY QUESTIONNAIRE (Purpura, J.E. 1998)
Literal/Interpretive/Applied Level

1	2	3	4	5
Never	Sometimes	Often	Usually	Always

When I am reading new material in English……		
1.	I think of ways to connect what I am reading with I already know.	
2.	I somehow think of ways to organise the material in my mind.	
3.	I think of examples of how to use a word or expression.	
4.	I think of the words to make sure that I have understood them correctly.	
5.	I think of the similarities and differences between English and my own language.	
6.	I think of my past experiences to help me learn more.	
7.	I try making summary of information that I hear or read in the text that I am reading.	
8.	I learn best when I am able to think about the contents.	
9.	I translate the content into my own native language.	
I learn new ideas while reading by……		
10.	Relating the new ideas to the familiar ideas that I have learnt.	
11.	Remembering where the ideas were located on the page, or where I first saw it or heard it.	
12.	Associating them with how they look, feel, smell, sound or taste.	
13.	Thinking of ideas I know that are similar to the new ideas.	
14.	Translating the ideas into my own language.	
I learn the meaning of the contents of the text by……		
15.	Using the meaning of the content of my own language to help me	

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	understand the text.	
16.	Comparing meaning of the contents in my own language with the contents of the current text.	
17.	Think of similarities in different sentences	
18.	Memorising the contents in the text and applying them to new situations.	
I think of ways to understand the meaning of the contents by ……		
19.	Looking for meaning of the contents in my own language that are similar to the contents of the current text.	
20.	Asking questions in order to understand the contents in the text.	
21.	Spending time understanding the contents of the text.	
22.	Applying what I have learned to new situations.	
23.	Looking for opportunities to think of the contents as much as possible while reading the text.	
24.	Identifying and using meaning of the contents that are similar to meanings in my own language.	
25.	Linking ideas to past experiences.	
26.	Listening to programmes in English on the radio.	
27.	Repeating the contents that I've learned out loud.	
28.	Thinking of the new ideas until I understand them well.	
29.	Repeating the contents in the text until I can understand easily.	
30.	Repeating the contents as what I hear native speakers say.	
31.	Using familiar contents in the text in different combinations to understanding the text.	
32.	Using my other knowledge to help understanding of new ideas as indicated in the text..	
I try to improve my reading in English by …..		
33.	Summarising new information to remember it.	
34.	Trying to understand without looking up every new word.	
35.	Reading English books and magazines.	
36.	Looking for the ways that writers show relationships between ideas.	
37.	Guessing the meaning of new words from context.	
I try to improve my reading in English by ….		
38.	Relating the ideas to another person.	
39.	Analysing how materials are organised in the passage.	
40.	Analysing the relationships between ideas in the passage.	

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APPENDIX B CRONBACH ALPHA FOR PILOT TESTINGS

Reliability
[DataSet1] C:\Documents and Settings\WinXP\Desktop\New Folder (2)\PilotTestingCognitive.sav
Scale: ALL VARIABLES (Items from Instruments of Pintrich & Purpura)

Case Processing Summary

		N	%
Cases	Valid	12	100.0
	Excluded(a)	0	.0
	Total	12	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.971	59

Reliability
[DataSet1] C:\Documents and Settings\WinXP\Desktop\New Folder (2)\PilotTestingCognitive.sav
Scale: ALL VARIABLES (Items adapted from the Instrument of Pintrich)

Case Processing Summary

		N	%
Cases	Valid	12	100.0
	Excluded(a)	0	.0
	Total	12	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.914	19

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Reliability
[DataSet1] C:\Documents and Settings\WinXP\Desktop\New Folder (2)\PilotTestingCognitive.sav
Scale: ALL VARIABLES (Items adapted from the Instrument of Purpura)

Case Processing Summary

		N	%
Cases	Valid	12	100.0
	Excluded(a)	0	.0
	Total	12	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.965	40

APPENDIX C
COGNITIVE STRATEGY QUESTIONNAIRE (CSQ – Purpura, J.E. Purpura, 1998)

0	1	2	3	4	5
Never	Rarely	Sometimes	Often	Usually	Always

When I am reading new material in English……		
1.	I try to connect what I am reading with I already know.	
2.	I try to somehow organise the material in my mind.	
3.	I think for examples of how to use a word or expression.	
4.	I think of the words to make sure that I have understood them correctly.	
5.	I think of the similarities and differences between English and my own language.	
6.	I think of my past experiences to help me learn more.	
7.	I try to make summary of information that I hear or read in the text that I am reading.	

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8.	I learn best when I am able to think of the contents.	
9.	I translate the content into my own native language.	
I learn new words while reading by……		
10.	Relating the meaning of the new word to the meaning of a familiar word.	
11.	Remembering where the new word was located on the page, or where I first saw it or heard it.	
12.	Associating them with how they look, feel, smell, sound or taste.	
13.	Thinking of words I know that sound like the new word.	
14.	Think of the words in my own language.	
I learn meaning of the contents while reading by……		
15.	Using the meaning of the content of my own language to help me understand the text.	
16.	Comparing meaning of the content in my own language with the content in the text in English.	
17.	Think of similarities in different sentences	
18.	Memorising the meaning of the content and applying them to new situations.	
I try to understand the meaning of the contents while reading by ……		
19.	Looking for meaning of the content in my own language that are similar to meaning of the content in English.	
20.	Asking other people to tell me if I have understood or said something about the content correctly.	
21.	Spending time with understanding the content of the text.	
I try to understand the meaning of the contents while reading by …….		
22.	Applying what I have learned to new situations.	
23.	Looking for opportunities to speak understand the text as much as possible.	
24.	Identifying and using meaning of the content that are similar to the meaning of the content in my own language.	
I try to improve my understanding of the text by ….		
25.	Watching TV programmes in English.	
26.	Listening to programmes in English on the radio.	
I try to improve my understanding of the text by ……..		
27.	Repeating the content that I've learned out loud.	

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28.	Pronouncing the content until I understand them well.	
29.	Repeating content in the text until I can say them easily.	
30.	Repeating content in the text in the writing and speaking.	
31.	Using familiar content in the text in different combinations to make create undersanding to the text.	
32.	Using my knowledge of of the content to help form understanding of the text.	
I try to improve my reading in English by …..		
33.	Summarising new information to remember it.	
34.	Trying to understand without looking up every new word.	
35.	Reading English books and magazines.	
36.	Looking for the ways that writers show relationships between ideas.	
37.	Guessing the meaning of new words from context.	
I try to improve my understanding of the text by ….		
38.	Telling to another person about the content in the text.	
39.	Analysing how other writers organise their paragraphs.	
40.	Analysing the ways that other writers show relationships between ideas.	

APPENDIX D Cronbach Alpha: 59 items (181 respondents)

Reliability

Case Processing Summary

		N	%
Cases	Valid	181	100.0
	Excluded(a)	0	.0
	Total	181	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.945	59

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APPENDIX E Factor Analysis based on 40 items

Factor Analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.878
Bartlett's Test of Sphericity	Approx. Chi-Square	3304.884
	df	780
	Sig.	.000

Rotated Component Matrix(a)

	Component					
	1	2	3	4	5	6
Using meaning of ideas in native language to understandP15	.871					
Translating new ideas into native languageP14	.803				.100	.106
Translate ideas into native languageP9	.755	.156	.105			-.104
Associating ideas in own language with currrent ideas in textP19	.724	.103		.133	-.107	.108
Comparing meaning of ideas in native language with current ideaP16	.699	.189			.126	
Identifying ideas that are similar to meanings in own languageP24	.672			.114	.159	
Think of similarities and differences native and EnglishP5	.527	.137	.141	.104		.277
Associate new ideas with look, feel, smell, sound or tasteP12		.698		.211		.161
Making connection with background ideasP1		.621	.244	.202		.100
Linking ideas to past experiencesP25		.611	.126	.294	.173	
Think of past experiences to help understandingP6	.213	.559	.363			.172
Learn best think about contentsP8	.143	.555	.347		.251	
Remember ideas located in the passageP11	.243	.452			.420	-.151

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Applying ideas learnt to new situationsP22	.167	.443		.422	.256	.207
Memorising ideas in the text and applying them to new situationP18	.114	.435		.265	.187	.175
Reading English books and magazinesP35			.747	.292	.129	
Guessing the new meanign of new words from contextP37	.234		.729	.123	.156	.141
Asking questions to help understanding of ideas in textP20	.127	.205	.602			
Think of examples to use the word or expressionP3	.166	.225	.591	.316		.103
Looking for ways to show relationships between ideasP36		.114	.527		.424	.381
Think of words to ensure understanding of itP4	.349	.315	.442	.194		
Think of ways to organise ideas in mindP2		.392	.436		.146	.142
Repeating aloud ideas that already learnt aloudP27		.150		.742		
Listening to programmes in English on radioP26			.344	.575		
Repeating ideas with what native speakers sayP30	.214	.212	.178	.532	.193	.200
Thinking of new ideas until I understand it wellP28	.106	.251		.525	.366	.161
Relating ideas to another personP38		.275	.267	.460	.281	
Repeating ideas in the text until I understand easilyP29		.199	.131	.447	.434	
Relate new ideas to familiar ideas already leantP10	.178	.385	.156	.424	.107	.184
Using my other knowledge to help understanding of new ideasP32	.300	.243	.242	.342	.157	.224
Analysing relationships between ideas in the passageP40		.113	.223	.151	.752	.327

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Analysing materials are organised in the passageP39	.132		.120	.231	.729	.231
Spending time understanding ideas in the textP21	.171	.205		.228	.467	-.177
Think of similarities in different sentencesP17	.109	.184	.406	-.236	.437	.230
Trying to understand without looking up new word in dictionaryP34				.113		.670
Summarising new ideas to remember itP33		.165	.210	.180		.621
Making summary of information in the text for understandingP7		.501				.530
Use opportunity to think of ideas while reading textP23	.163	.114	.109	.293	.277	.468
Using familiar ideas in text in different combinations for understandingP31	.172	.212	.224	.368	.169	.420
Thinking of ideas that are similar to new ideasP13	.252	.379	.198		.236	.403

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 8 iterations.

APPENDIX F. Letter to Reviewers

Dear

I am currently trying to develop a questionnaire gauging the use of Thinking Processes in text comprehension among undergraduates in an institution of higher learning.

I am in the midst of getting **experts or practitioners to review** the questionnaire gauging thinking skills which I have adapted from the original Cognitive Strategy questionnaire (Purpura, J.E. 1998).

I would really appreciate your help in **reviewing/validating** the adapted questionnaire.

1. Please go through the ascertained domain thinking skills (identified as knowledge, comprehension, application, analysis, synthesis and evaluation) based on the items in the questionnaire and **indicate** the appropriate response.
2. Do provide any relevant information on the semantic and syntactic aspects of the ascertained cognitive skills.

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Thank you very much for your cooperation and contribution.

Researcher,

Mak Kem Seng

email : mkseng88@streamyx.com

Enclosed are the files:

1. Bloom's Cognitive Taxonomy (as a guide to ascertain cognitive skills)
2. Questionnaire of Domain of Thinking Skills (to be reviewed/provide appropriate response)

Name of Reviewer : …….

Years of teaching experience : ……..

Questionnaire : Domain of Thinking Skills in Text Comprehension

Please **review the items** in the instrument by indicating Strongly Disagree (1), Disagree (2), Agree (3) or Strongly Agree (4) by going through the ascertained cognitive level in each of the statements.

If you select Strongly Disagree (1) or Disagree (2), please indicate the most appropriate alternative cognitive level and provide any relevant information/input.

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree

I try to improve my reading (***most of the time***) by ……			*If Disagree or Strongly Disagree,* ***please cite the alternative cognitive level.***
1.	thinking of ways to connect what I am reading with content information/ideas in the text that are already known. ***(Synthesis)***		
2.	thinking of ways to organise the content information/ideas in my mind. ***(Synthesis)***		

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3.	thinking of examples of how to use a word or an expression. ***(Comprehension)***		
4.	thinking of the content information/ideas as I connect words to make sure that I have understood them correctly. ***(Comprehension)***		
5.	thinking of my past experiences to see if they match with the text to help me learn more. ***(Application)***		
6.	summarising the content information in the text that I am reading. **(Evaluation)**		
7.	thinking about the content information//ideas as indicated in the text. ***(Knowledge)***		
8.	remembering where the content information/ideas were located on the page, or where I first saw it or heard it. ***(Synthesis)***		
9.	thinking of content information/ideas I know that are similar to the new ideas in the text. ***(Application)***		
10.	using the meaning of the content information/ideas of my own language to help me understand the text. ***(Knowledge)***		
11.	memorising the content information/ideas in the text and applying them to new situations. ***(Application)***		
12.	asking questions in order to understand the content information/ideas in the text. ***(Evaluation)***		
13.	spending time understanding the content information/ideas of the text.		

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	(Knowledge)		
14.	applying what I have learned in the text to new situations. ***(Application)***		
15.	looking for opportunities to think of the content information/ideas as much as possible while reading the text. ***(Synthesis)***		
16.	linking content information/ideas in the text to my past experiences. ***(Application)***		
17.	thinking of the new content information/ideas in the text until I understand them well. ***(Synthesis)***		
18.	using familiar content information/ideas in the text in different combinations to help understanding of new ideas as indicated in the text. ***(Application)***		
19.	summarising new content information/ideas in the text to remember it. ***(Evaluation)***		
20.	looking for the ways that writers show relationships between content information/ideas. ***(Analysis)***		
21.	guessing the meaning of new words from context. ***(Comprehension)***		
22.	analysing how content information/ideas are organised in the text. ***(Analysis)***		
23.	analysing the relationships between content information/ideas in the text. **(Analysis)**		

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THANK YOU FOR YOUR COOPERATION

Name of Reviewer: ……

