THE IMPACT OF MULTIMODAL TEXTS ON THE DEVELOPMENT OF ENGLISH LANGUAGE PROFICIENCY

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Appendix 1.1

Malaysian University Entrance Test (MUET) Proficiency Descriptors

NOTE:
This table is included on page 261 of the print copy of the thesis held in the University of Adelaide Library.

(Ministry of Education, 2008)

Appendix 1.2

Communicative English One (CE1) Proficiency Levels

Grade	Mark Range	Band
A	80-100	6
A-	75-79	5
B+	70-74	
B	65-69	4
B-	60-64	
C+	55-59	
C	50-54	3
C-	45-49	
D+	40-44	
D	35-39	2
F	0-34	1

Appendix 2.1

Wisconsin Administrative Rule Proficiency Descriptors

NOTE:
This table is included on page 263 of the print copy of the thesis held in the University of Adelaide Library.

Wisconsin Administrative Rule (2002, p. 3)

ACT COMPAS (2008, p.1) lists the following descriptors to identify with the various levels of proficiency.

ACT COMPAS Proficiency Descriptors

(ACT COMPAS, 2008, p. 3)

ACT COMPAS does not list proficiency descriptors for writing skills.

Appendix 3.1

NOTE:
This appendix is included on page 268 of the print copy of the thesis held in the University of Adelaide Library.

Appendix 3.2

NOTE:
This appendix is included on page 269 of the print copy of the thesis held in the University of Adelaide Library.

THE UNIVERSITY
OF ADELAIDE
AUSTRALIA

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5 October 2007

Dr S Alagumalai
School of Education

Dear Dr Alagumalai

PROJECT NO: H-130-2007 *The impact of multimodal texts on the development of english language proficiency: a case study of pre-service teachers enrolled in a proficiency course in Malaysia*

I write to advise you that I have approved the above project on behalf of the the Human Research Ethics Committee. Please refer to the enclosed endorsement sheet for further details and conditions that may be applicable to this approval.

Approval is current for one year. The expiry date for this project is: 31 October 2008

Where possible, participants taking part in the study should be given a copy of the Information Sheet and the signed Consent Form to retain.

Please note that any changes to the project which might affect its continued ethical acceptability will invalidate the project's approval. In such cases an amended protocol must be submitted to the Committee for further approval. It is a condition of approval that you immediately report anything which might warrant review of ethical approval including (a) serious or unexpected adverse effects on participants (b) proposed changes in the protocol; and (c) unforeseen events that might affect continued ethical acceptability of the project. It is also a condition of approval that you inform the Committee, giving reasons, if the project is discontinued before the expected date of completion.

A reporting form is available from the Committee's website. This may be used to renew ethical approval or report on project status including completion.

Yours sincerely

pp Professor Garrett Cullity
Convenor
Human Research Ethics Committee

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

RESEARCH BRANCH
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Applicant: Dr S Alagumalai

Department: School of Education

Project Title: *The impact of multimodal texts on the development of english language proficiency: a case study of pre-service teachers enrolled in a proficiency course in Malaysia*

THE UNIVERSITY OF ADELAIDE HUMAN RESEARCH ETHICS COMMITTEE

Project No: **H-130-2007** RM No: 0000007985

APPROVED for the period until: 31 October 2008

It is noted that this study will be conducted by Sasikala Nallaya, PhD candidate.

Refer also to the accompanying letter setting out requirements applying to approval.

Professor Garrett Cullity
Convenor
Human Research Ethics Committee

Date: 5 OCT 2007

Appendix 5.1

The Impact of multimodal Texts on the Development of English Language Proficiency: A Case Study of Pre-Service Teachers Enrolled in a Proficiency Course in Malaysia

Needs Analysis Questionnaire

Instruction: The purpose of this questionnaire is to identify learner needs in regard to the course that you are enrolled in. Please read and respond to the statements as honestly as possible. Your responses will be treated confidentially. They will be used solely for data collection purposes and will not affect your performance in the course. There are no right or wrong answers. This usually takes about 30 minutes.

SECTION A: Personal Information

Name : ……..

Age : …….

Program : …….

Faculty : …….

Student ID : …….

Address : ……

(on campus) …….

Address : ……

(hometown) ……

H/P No : …….. Email: ……..

SECTION B: Academic and Professional Qualifications

Name of Institution	Qualification Obtained	Year Obtained

SPM English language Grade: ……..

MUET Band : …….

Section C: (Author: Dr. Lixin Xia, Nankai University, Tianjin, China, Year: 2006)

NOTE:
This appendix is included on pages 273-277 of the print copy of the thesis held in the University of Adelaide Library.

SECTION D: Language Skills and Learner Needs (Author: LTCFIT, Hong Kong University of Science and Technology, Year: 2006, Title: The Needs Analysis Questionnaire)

NOTE:
This appendix is included on pages 278-279 of the print copy of the thesis held in the University of Adelaide Library.

Appendix 5.2

The Impact of multimodal Texts on the Development of English Language Proficiency: A Case Study of Pre-Service Teachers Enrolled in a Proficiency Course in Malaysia

Multimodal and Language Proficiency

Instruction: The purpose of this questionnaire is to identify the impact of multimodal texts on the development of English language proficiency. Please read and respond to the statements as honestly as possible. Your responses will be treated confidentially. They will be used solely for data collection purposes and will not affect your performance in the course.

SECTION A: Personal Information

Name : ……..

Age : …….

Program : …….

Faculty : …….

Student ID : …….

Address : ……

(on campus) …….

Address : ……

(hometown) ……

H/P No : …….. Email: ……..

For the two (2) statements below, circle one option and specify where necessary

Ethnicity : Malay Chinese Indian Others: …….

Background : English-speaking Non-English-speaking

Please specify the language/s which you are able to speak:

…….

Please specify the language/s which you are able to understand:

…….

Please specify the language/s which you are able to read:

……

Please specify the language/s which you are able to write:

…….

SECTION B: Academic and Professional Qualifications

Name of Institution	Qualification Obtained	Year Obtained	Achievement in English language

SECTION C: Use of Technology
For the following statements circle one of the options.

1. I have a computer at home.	Yes	No
2. I have a laptop / notebook.	Yes	No
3. I have access to a computer at the university.	Yes	No
4. I have Internet at home.	Yes	No
5. I am able to access the Internet at the university.	Yes	No
6. I have a cell phone. (If the response is no, skip the next two statements)	Yes	No
7. I use my cell phone to make calls more than to text messages.	Yes	No
8. I use my cell phone to text messages more than to make calls.	Yes	No
9. I have a television at home.	Yes	No
10. I have DVD player at home.	Yes	No

SECTION D: Multimodal and English language Proficiency (Author: LTCFIT, Hong Kong University of Science and Technology, Year: 2006, Title: The Needs Analysis Questionnaire)

English Proficiency Test

Appendix 5.3

SECTION ONE

Listening comprehension

In this section of the test, you will have the chance to show how well you understand spoken English. There are four parts to this section, with special directions for each part.

PART I: Photographs

Directions: For each question, you will see a picture and you will hear four short statements. When you hear the statements, look at the picture and choose the statement that best describes what you see in the picture.

Example:

NOTE:
These photos are included on page 288 of the print copy of the thesis held in the University of Adelaide Library.

Correct answer: Statement (B): “They’re having a meeting” best describes what you see in the picture.

Question 1

O A

O B

O C

O D

Question 2

NOTE:
These photos are included on page 289 of the print copy of the thesis held in the University of Adelaide Library.

O A

O B

O C

O D

Question 3

O A

O B

O C

O D

Question 4

NOTE:
This photo is included on page 290 of the print copy of the thesis held in the University of Adelaide Library.

O A

O B

O C

O D

Next

PART II: Question-response

Directions: You will hear a question or statement, followed by three responses. You are to choose the best response to each question or statement.

Example:

Correct answer: The best answer to the question “How are you?” is response (A), “I am fine, thank you.”

Question 5:

O A

O B

O C

Question 6:

O A

O B

O C

Question 7:

O A

O B

O C

Question 8:

O A

O B

O C

Question 9:

O A

O B

O C

Next

PART III: Short conversations

Directions: You will hear a short conversation between two people. You will then read a question about each conversation. The question will be followed by four answers. You are to choose the best answer to each question.

Example:

Question: When do they plan to meet?

(A) At 1:30pm
(B) At 3:00 pm
(C) At 4:30pm
(D) After work

Correct answer: (C)

Question 10: Who is leaving for lunch now?

O A) Kumiko

O B) John

O C) Yoshi

O D) The Head of Department

Question 11: Where are the speakers?

O A) In a furniture store.

O B) In an airport.

O C) In a movie theatre.

O D) In a hardware store.

Question 12: How does Henrik feel about his new job?

O A) He does not like the location.

O B) He is happy he has been transferred.

O C) He would rather work in London.

O D) He does not want a promotion.

Question 13: What is Ms. Weiss doing?

O A) Typing a memorandum.

O B) Sending invoices.

O C) Selling stationery.

O D) Ordering supplies.

Question 14: Why was Mr. Romano delayed?

O A) He was waiting for the trustees.

O B) He was completing some forms.

O C) He was making calls.

O D) He was buying luggage.

Next

PART IV: Short talks

Directions: You will hear a short talk. You will then read two or more questions about each short talk. The questions will be followed by four answers. You are to choose the best answer to each question.

Example:

Question: What is the expected arrival time?
(A) 1:30
(B) 2:00
(C) 3:30
(D) 4:20

Correct answer: (B)

Question: What do passengers taking domestic flights have to do?
(A) Notify the flight attendants
(B) Show their passports
(C) Go immediately to Gates 30-36
(D) Transfer to a different terminal

Correct answer: (B)

Questions 15 and 16 are based on this audio clip.

Question 15: What is the occasion?

- **O** A) At a birthday party
- **O** B) A graduation ceremony
- **O** C) A retirement party
- **O** D) A wedding anniversary

Question 16: What does Mrs. Barrett plan to do?

- **O** A) Visit Manchester and Liverpool
- **O** B) Start a fruit farm
- **O** C) Give her son a gold watch
- **O** D) Spend time with her grandchildren

Questions 17 and 18 are based on this audio clip.

Question 17: What is being advertised?

- **O** A) Houses for sale
- **O** B) Apartments for tent
- **O** C) A new furniture store
- **O** D) A motel in the mountains

Question 18: What reduction is being offered?

- **O** A) 2.5%
- **O** B) 3.0%
- **O** C) 5.0%
- **O** D) 32.0%

Questions 19, 20 and 21 are based on this audio clip.

Question 19: According to the speaker, what is the most surprising fact about movies today?

O A) The film quality is greatly improved.

O B) Sound recordings are used extensively.

O C) Their basic appeal to audiences are relatively unchanged.

O D) their production and distribution costs are still reasonable.

Question 20: According to the speaker, why do audiences like the film Winner?

O A) They think it is very funny.

O B) They believe it is a major work of art.

O C) They can describe it to their friends easily.

O D) They can identify with the characters.

Question 21: According to the speaker, how do today's movie audiences differ from earlier ones?

O A) They tend to be younger.

O B) They consist primarily of women.

O C) They are wealthier.

O D) They are less prejudiced.

SECTION TWO

Reading

In this section of the test, you will have the chance to show how well you understand written English. There are three parts to this section, with special directions for each part.

PART I: Incomplete sentences

Directions: The questions consist of incomplete sentences. Four words or phrases, marked (A), (B), (C) and (D), are given beneath each sentence. You are to choose one word or phrase that best completes the sentence.

Example:

Because the equipment is very delicate, it must be handled with _____.

(A) caring
(B) careful
(C) care
(D) carefully

Correct answer: (C)

Question 1: To report lost or stolen traveller's check, contact the institution _____ issued the checks.

O A) whose

O B) that

O C) it

O D) where

Question 2: For even _____ convenience, our customer service department has added ten new telephone lines.

O A) whose

O B) that

O C) it

O D) where

Question 3: Ms. Caldegren had _____ finished checking the report when she noticed an error.

O A) nearly

O B) ready

O C) anymore

O D) immediately

Question 4: Desktop publishing software _____ produce documents cheaply and quickly.

O A) helps

O B) to help

O C) helping

O D) helper

Question 5: A spokesperson for the research division announced an important _____ in the field of biotechnology.

O A) restoration

O B) adherence

O C) knowledge

O D) breakthrough

Question 6: The merchandise _____ from the warehouse on Wednesday.

O A) shipment

O B) shipping

O C) to be shipped

O D) will be shipped

Question 7: The current marketing campaign is one of the most _____ we have launched in years.

O A) aggression

O B) aggressively

O C) aggressive

O D) aggressions

PART II: Error recognition

Directions: Each question in this section consists of a sentence that has four words or phrases underlined. The four underlined parts of the sentence are marked (A), (B), (C) and (D). You are to identify one underlined word or phrase that should be corrected or rewritten.

Example:

All employee are required to wear their identification badges while at work.

(A) (B) (C) (D)

Correct answer: (A)

The sentence should read: “All employee**s** are required to wear their identification badges while at work.”

Question 8

A number of the files were ruined of water dripping onto the filing cabinet.

A B C D

O A)

O B)

O C)

O D)

Question 9

The furniture we sell is shipped from abroad, ready to be assembling.

(A) (B) (C) (D)

O A)

O B)

O C)

O D)

Question 10

The conference was held at the city's exhibition hall, where opened just last month.

A B C D

O A)

O B)

O C)

O D)

Question 11

The soccer games to be playing in the World Cup series will be televised internationally.

A B C D

O A)

O B)

O C)

O D)

Question 12

The marketing manager is now responsible of the entire British sales office.

(A) (B) (C) (D)

O A)

O B)

O C)

O D)

Question 13

Please could you make a reservation for four people during 12:30pm?

(A) (B) (C) (D)

O A)

O B)

O C)

O D)

Question 14

The contractor studied a design make popular by the recently established French

A B C

architectural firm.

D

O A)

O B)

O C)

O D)

Part III: Reading comprehension

Directions: The questions are based on a selection of reading materials, such as notices, letters, forms, newspaper and magazine articles, and advertisements. You are to choose the one best answer, (A), (B), (C) or (D), to each question. Answer all questions following each reading selection on the basis of what is stated or implied in that selection.

Example:

The Museum of Technology is a "hands-on" museum, designed for people to experience science at work. Visitors are encouraged to use, test and handle the objects on display. Special demonstrations are scheduled for the first and second Wednesdays of each month at 13:30. Open Tuesday – Friday 12:00 – 16:30, Saturday 10:00 – 17:30, and Sunday 11:00 – 16:30.

Question: When during the month can visitors see special demonstrations?

(A) Every weekend
(B) The first two Wednesdays
(C) One afternoon a week
(D) Every other Wednesday

Correct answer: (B)

MINING INDUSTRY REPORT

Investment and growth in the mining industry far surpassed projected levels for the year, a government spokesperson announced yesterday. The strong performance in one of the country's most important sectors was attributed to a series of changes instituted by the government to make the mining industry more attractive to both foreign and domestic investors. These changes include last year's liberalization of the country's mining regulations, the elimination of a long-maligned mining tax, and the government's decision to relinquish vast tracts of national mining reserve land for use by private sector mining concerns. The new regulations also make the country's mining sector far more accessible to foreign mining companies.

Question 15: What is the main point of the press release?

O A) Tax code changes have benefited the mining industry.

O B) Mining industry regulations have become more rigid.

O C) the government is more deeply involved in the mining industry than before.

O D) The mining industry is doing better than had been predicted.

Question 16: What is one thing that the government did NOT do?

O A) Project investment levels for the mining industry

O B) Allow private mining on government land

O C) Ban mining by foreign firms

O D) Abolish the mining tax

Question 17: In what way has the government attempted to change the mining industry?

O A) It has encouraged deposits for new ore deposits.

O B) It has made mining more appealing to investors.

O C) It has nationalised the mining reserve lands.

O D) It has prohibited certain types of mining.

Dear Patient:

Welcome to our first edition of *Healthy Living.* We hope you will find the topics beneficial. The newsletter will be sent every two months with the latest health-care updates, articles of special interest, and a schedule of free classes.

Our first class, entitled "How to Prevent Lower-Back Pain," will be held on Wednesday evening, September 15, at our clinic and will last one hour. If you would like to attend or need more information, please call the receptionist between 8:30 a.m. and 12:00 noon, Monday to Friday. Seating is limited so you will need to call. If you would like friends or family members to receiver our newsletter, please send us their names and addresses.

Sincerely,

Dr. H. Tanaka and Dr. T. Kojima

Question 18: Why is this letter being sent to patients?

O A) To introduce new services

O B) To ask for articles for a new publication

O C) To provide information for a new office space

O D) To announce new cures for lower back pain

Question 19: How often will the patients receive Healthy Living?

O A) Every year

O B) Every other month

O C) Every week

O D) Every day

Question 20: Who will have to pay for the class?

O A) Friends and family members

O B) Patients and guests

O C) Magazine editors

O D) No one

Question 21: What is the duration of the class?

O A) Two months

O B) One morning

O C) Two hours

O D) One hour

Official data released last week indicated that retail prices fell for the second straight month in December, bringing inflation for the twelve-month period to 9.3 percent from an eight-year high of 10.9 percent in September and October. The Central Statistical Office attributed the decline in December mainly to lower gasoline prices. The retail price index in November was 9.7 percent.

Question 22: How long have prices been decreasing?

O A) For eight years

O B) For two years

O C) For twelve months

O D) For two consecutive months

Question 23: Why did retail prices drop in December?

O A) The price of gasoline decreased.

O B) Fuel supplies were low.

O C) The retail price index went down 9.7%.

O D) Unemployment decreased in November.

Part IV: Written production

Fill in what is missing in the dialogue below. It is a discussion about a film. Before you write anything, read the whole dialogue and study carefully what is written before and after each line. When there are words printed in brackets, you must use them.

Jean: I went to the cinema yesterday.

Robert: (24) _____?

Jean: I saw "Mrs. Doubtfire".

Robert: Did you like it?

Jean: Yes. (I/very much) (25) _____

Robert: Did you really?

Jean: Yes, I did.

Robert: Personally, I (26) _____ that sort of film.

Jean: O.K! That's why I (not ask) (27) _____ to come.

Robert: I see. Who did you go with, then?

Jean: I (28) _____

Directions: Read the text in which there are gaps for words that are missing. Fill in the word that you think best fits in the context. Usually only one word fits, but sometimes there are several possibilities.

Example: In the sentence "You must come and _____ us soon", you can write either "see" or "visit".

Write only ONE word in each gap.

Working in a Family

One possibility to go abroad is to work as an au pair that is helping with everyday things in a family, looking after the children, etc. In this sort of job you get full board and pocket _____ (29). The chance of working as an au pair has been welcomed _____ (30) thousands of young people. They come from many different _____ (31) outside Britain, for instance Holland, Sweden and France.

After maybe ten years at school many of them want to _____ (32) their English. But young people cannot usually afford to live away from home _____ (33) having some kind of work which can provide them with _____ (34) least the necessities of life. For a lot of these young people the chance to practise the language is not as important _____ (35) the wish to enjoy the freedom of being _____ (36) from home. The excitement of living in a large city like London is also a big attraction. Usually, the relationship _____ (37) the au pair and the family they work for develops into warm and lasting friendship.

To avoid problems, it is extremely _____ (38) that those who take jobs of this kind should have reached the _____ (39) of eighteen and should be well able to look _____ (40) themselves. If possible, they should stay with a family that has a good reputation and that they _____ (41) something about, perhaps through a friend who _____ (42) already worked there. Then living as an ordinary _____ (43) of the family and studying part-time will result in both a deeper understanding of the British _____ (44) of life and a better knowledge of the English language.

Validation Of Xiao's (2003) Needs Analysis Questionnaire Through Confirmatory Factor Analysis

Vast literature exists on the importance of needs assessment in language programs. There appears to be a common consensus between scholars that needs analysis should be the basis of course planning. Researchers suggested that needs analysis could be conducted through various techniques such as surveys, interviews or observations. A needs analysis among others, should aspire to locate background information about learners, their English language status, lacks and needs as well as expectations of the course (Gao, 2007).

Needs were classified by Hutchinson and Waters (1987) into target needs and learning needs. Target needs were made up of necessities, lacks and wants. 'Necessity' was the knowledge that individuals were required of in order to function in a target situation. 'Lacks' consisted of the actual level and potential level of proficiency. 'Wants' could be described in regard to how learners perceived their needs. Hutchinson and Waters used the label 'learning needs' as a general term encompassing all factors that influenced language learning such as attitude and motivation. Hutchinson and Waters argued that "the needs, potential and constraints of the learning situation must be taken into account" (1978, p. 61) if the process of needs assessment was going to beneficial.

The Needs Analysis questionnaire is categorised into different components to investigate among others the following information: (a) Who are the learners? (b) Why are the learners taking the course? (c) How do the learners learn? and (d) What are the difficulties encountered in the learning process? Learning needs of the respondents of this study are identified through factors such as 'group work and communication', 'learning strategies', 'nature and strength of motivation', teacher-centred approach', 'student-centred approach', 'culture learning in ESL' as well as 'difficulties encountered in the learning process'. These factors are given acronyms to facilitate the analysis of the data. The following abbreviations are employed when referring to the factors in future discussion:

1) [GRWKCM] : group work and communication
2) [LRNST] : learning strategies
3) [MOTSTR] : nature and strength of motivation

4) [TCCAP] : teacher-centred approach
5) [STCAP] : student-centred approach
6) [CULLNG] : culture learning in EFL
7) [DIFLNP] : difficulties encountered in the learning process

A needs analysis is conducted in the present research study through the administration of a questionnaire on 316 samples enrolled in the Communicative English One (CE1), a core university English language course in *Universiti Pendidikan Sultan Idris* (UPSI), Malaysia. UPSI offers pre-service teacher education program in Malaysia. Xiao's (2003) Needs Analysis Questionnaire is employed in the present study. This chapter examines on the validation procedures carried out with Confirmatory Factor Analysis (CFA) using the LISREL8.0 program.

The rationale for conducting CFA in this study is grounded in previous empirical research. Researchers indicated that CFA allowed the comparison of several alternatives as well as identified if one or more of these alternative structures were compatible with the measurement (Byrne, 1998). Byrne (1998, p. 4) advocated that when researchers embarked on CFA they had "some knowledge of the underlying latent variable structure. This knowledge was based on theory, empirical research, or some combination of both"

Confirmatory Factor Analysis (CFA)

Mueller (1996) claimed that unlike other statistical procedures, the CFA approach to multivariate data analysis "does not let a particular data set dictate, identify or discover underlying dimensions…rather it requires the researcher to theorise an underlying structure and assess whether the observed data 'fits' this priori model" (p. 62). Mueller also made two important observations about the CFA when he suggested: "a) that the collected data can be evaluated to examine if it is consistent with a priori specified model and b) based on an identification of possible model misspecifications from data model fit results, an initially hypothesized CFA model may be modified to improve overall data-model fit" (p. 63).

Researchers suggested that after a particular CFA model had been specified, it must be ascertained "if the collected data provide indications whether the hypothesized structure should be rejected or if there is evidence suggesting that the model might be a viable representation of the true relationships between observed and latent variables" (Byrne, 1998;

Diamantopoulos and Siguaw 2000, p. 80; Mueller, 1996). Mueller (1996, p. 80) advocateed that although,

> there are many overall measures of data-model fit that have been suggested in the literature in an attempt to give the user a single criterion by which to judge whether or not a particular data set is consistent with a priori hypothesized model…the most commonly used indices are the chi-square statistic, the goodness-of-fit and adjusted goodness-of-fit indices, the normed and non-normed fit indices, the normed comparative fit index and the non-normed comparative fit index as well as the parsimonious goodness-of-fit and parsimonious normed fit indices

Byrne (1998) cited Joreskog (1993) to expound on three frameworks for testing and they are: strictly confirmatory (SC), alternative models (AM) as well as model generating (MG). In the SC instance, "the researcher postulates a single model based on theory, collects the appropriate data and then tests the fit of the hypothesized model to the sample data" (Byrne, 1998, p. 8). In the context of the present study, only the strictly confirmatory as alternative models framework are employed. The strictly confirmatory (SC) framework is used to confirm if Xiao's 12-Factor model, which is the hypothesised model, fits the sample data. At this stage of the analysis, there is only concern if the manifest or observed variables are measuring the latent or unobserved variables that they set out to measure. Fit indices guide the assessment of the model.

Then the alternative model (AM) framework is employed. In the AM set-up, "the researcher proposes several alternative (competing models), all of which are grounded in theory and following analysis of a single set of empirical data, he or she selects one model as most appropriate in representing the sample data" (Byrne, 1998, p. 8). Once it is confirmed if the hypothesised model fitted the sample data, alternative models are tested to find the best model that would fit the sample data as well as direct future analysis. In the MG setting, "the researcher postulates and rejects a theoretically derived model on the basis of its poor fit to the sample data and then proceeds in an exploratory (rather than confirmatory) fashion to modify and re-estimate the model" (Byrne, 1998, p. 8). It was suggested that the best model to employed was MG (Byrne, 1998, p. 8). However, for the context of this study only two frameworks are employed: the SC and the AM.

Xiao's (2003) Needs Analysis Questionnaire comprises 57 items with a 5 point Likert-scale response ranging from 1. Strongly disagree, 2. Disagree, 3. Neutral, 4. Agree, to 5. Strongly Agree. The items are categorized by Xiao (2003) according to themes such as attitude towards group work, speaking in the classroom, teacher-centred approach, student-

centred approach, communicative and non-communicative activities, compensation strategies, social strategies, authority in the classroom, nature and strength of motivation, culture learning in EFL as well as difficulties encountered in the learning process in class. Xiao reported that the needs analysis questionnaire was used in an empirical study, which was part of a larger investigation on Chinese EFL learners' needs and preferences carried out over three years. Xiao (2003) emphasised that the questionnaire was written in Chinese. Xiao did not expound on the translation processes but the questionnaire is published in English.

Xiao (2003) categorizes the following items of the questionnaire into the themes mentioned in the earlier paragraph: students' attitudes towards group work in class (items 1, 2, 3, 4); students' attitudes towards speaking out in class (items 5, 6, 7, 9, 57); nature and strength of motivation among students (items 10, 12, 13, 14, 15, 16, 17); students' attitudes towards teacher-centred approach in class (item 18); students' attitudes towards student-centred approach in class (item 19); students' attitudes to communicative activities in class (items 21, 22, 25); students' attitudes towards non-communicative activities in class (items 20, 24, 42); culture learning in EFL (items 11, 23, 36, 37); students' attitudes towards compensation strategies (items 29, 31, 32); students' attitudes towards social strategies (items 33, 34, 35); students' attitudes towards authority in class (items 43, 44, 45, 46) and major difficulties encountered in students' learning process items (40, 41, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56). An in-depth examination of the items in the questionnaire emphasises that items 8, 26, 27, 30 and 39 are not assigned any factors. Additionally, Xiao (2003) has not reported these items in her analysis.

The themes discussed above are assigned the following factor names:

(a) student's attitude towards group work in class (items 1, 2, 3, 4): [GRWKCM];
(b) student's attitude towards speaking out in class (items 5, 6, 7, 9, 57): [SPKCRM]
(c) nature and strength of motivation among students (items 10, 12, 13, 14, 15, 16, 17): [MOTSTR]
(d) student's attitude towards teacher-centred approach in class (item 18): [TCCAP];
(e) student's attitude towards student-centred approach in class (item 19): [STCAP];
(f) student's attitude towards communicative activities in class (items 21, 22, 25): [COMACT];
(g) student's attitude towards non-communicative activities in class (items 20, 24, 42): [NCOMAC];
(h) culture learning in EFL (items 11, 23, 36, 37): [CULLNG];

(i) student's attitude towards compensation strategies (items 29, 31, 32): [COMSTR];

(j) student's attitude towards social strategies (items 33, 34, 35): [SOCSTR];

(k) student's attitude towards authority in class (items 43, 44, 45, 46): [AUTHCR]; and

(l) major difficulties encountered in student's learning process (items 40, 41, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56): [DIFLNP]

Table 1 lists the items for each of the factors.

Table 1

Items in the Author's Factors

Factor	Items
GRWKCM (attitude towards group work and communication)	1. In English class, I like to participate in group work with 2-4 people, e.g. English dialogues, group discussion, role play. 2. In group work, I like committing myself to achieving our common goal with my peers. 3. I like my teacher to divide the whole class into several small groups in which we do teacher-directed group work. 4. In English class, I like listening to my peers give English oral presentations of interesting stories or information that are well-prepared outside of class.
SPKCRM (attitude towards speaking in the classroom)	5. In group work, I like to ask and answer questions in English. 6. When working in a group, I like to help keep the atmosphere friendly and harmonious. 7. In group work, I do not like to 'stand out' by voicing my opinions or asking questions. 8. Sometimes I feel nervous answering a question in class because I am afraid of being wrong. 9. In class or in group activities, I like to prepare what I want to say in English mentally before I speak. 57. I like to answer questions in English in class.
MOTSTR (nature and strength of motivation)	10. I work especially hard when my own success will benefit me and other people (e.g. my family or my relatives). 12. I like learning English. 13. I am interested in the cultures of major English-speaking nations. 14. I learn English because I want to know about the economic, social, political and technological developments in other countries of the world. 15. I learn English because I want to find a good job. 16. I want to be enrolled in the Master degree program. 17. I want to go abroad for advanced study or work.
TCCAP (attitude towards teacher-centred approach)	18. In English class, I like teacher-centred teaching method employed by teachers.
STCAP (attitude towards student-centred approach)	19. In English class, I like a student-centred teaching method employed by teachers.
COMACT (attitude towards communicative activities)	21. In English class, I like teacher-guided and text-related discussions on such topics as population problems, my favourite books, films, or how to be a better learner of English. 22. In English class, I like to watch English language films or videos and then discuss them in groups with teacher facilitation and guidance. 25. In English class, I like my teacher to ask students text-based and thought-provoking questions to keep the lesson interesting in order that students have chances to practise their spoken English.

NCOMAC (attitude towards non-communicative activities)	20. In the English Intensive Reading class, I like my teacher to deal with the text materials in a sentence-by-sentence way. 24. In English class, I like to do simulation test exercises and listen to my teacher explanations. 42. I link its Malay/Chinese/Tamil meaning to a new word to help me remember the word in English.
CULLNG (culture learning in EFL)	11. In English class, I like to learn about Western cultures including their way of life, social customs, etc. 23. I learn a lot about western cultures from my English classes. 36. My knowledge about Western culture(s) mainly comes from English classroom teaching and learning. 37. I like to read English language text materials which cover Western cultures.
COMSTR (attitude towards compensation strategies)	29. If I cannot think of a word during a conversation in English, I depend on my native language to explain it. 31. When I can't think of a word during a conversation in English, I use gestures. 32. When I can't think of a word during a conversation in English, I use a word or phrase that means the same thing.
SOCSTR (attitude towards social strategies)	33. I have at least one peer with whom I often practise English. 34. I like to participate in extra-curricular activities in which I can practise my oral English, e.g. English corner. 35. I like after-class activities in which I can practise my English writing skills, e.g. drama group and newspaper group.
AUTHCR (attitude towards authority in class)	43. I expect my teacher rather than myself to be responsible for evaluating how much I have learnt. 44. In class I see teacher as somebody whose authority should not be questioned. 45. I see knowledge, as something that the teacher should pass on to me rather than something that I should discover myself. 46. In English class, the teaching method used by the teacher is very important to students' English study.
DIFLNP (difficulties encountered in the learning process)	40. I remember new words by thinking of relationships between what I already know and new things I learn in English. 41. I use new words in a sentence so I can remember well. 47. I do not have a clear long-term aim of learning English, and lack motivation. 48. My learning styles are too rigid and inflexible. 49. I have few opportunities to practise my English. 50. There is a lack of authentic English materials, audio and visual. 51. The idea of finding a good job after graduation from the university exerts heavy pressure on me. 52. We lack chances to speak English in class. 53. This course exerts heavy pressures on me. 54. Teachers place too much stress on the structure, grammar and reading comprehension in English class. 55. The English language textbook are not compatible with the requirements of the student-centred approach in English class. 56. We have little knowledge or information about Western cultures.

Published writings with reference to needs analysis emphasised that 'learning needs' generally influenced learning outcomes. It is possible that investigating the learning needs of

the Communicative English One (CE1) students may highlight the needs, potential and constraints of the language learning situation.

On the assumption that Xiao (2003) would have embarked on Exploratory Factor Analysis (EFA) as well as a comprehensive review of both literature and theory in the design of the instrument, no EFA procedures are employed in the present research study. In the present study, this instrument then is the hypothesised model and Confirmatory Factor Analysis (CFA) is carried out, in an effort to determine if the number of factors and the loadings of them measure or indicator (observed) variables on them conform to what is expected on the basis of a pre-established theory. CFA was conducted to see if they load as predicted as well as to determine if measures created to represent a latent variable really belong together as hypothesised (Diamantopoulous & Siguaw, 2000, pp. 1-141; Phakiti, 2007, pp. 37-61;).

It was the aim of the present research study to test the adequacy of the hypothesised model so as to adequately and meaningfully infer from the collected data. This is done by conducting CFA. The first step in this process is to develop a model to examine if the observed variables (items) in the questionnaire are in fact measuring the latent variable (unobserved variable) which they set out to measure. The measurement model can be used to "postulate relationships among variables, if goodness-of-fit is adequate" (Phakiti, 2007, p. 42). The principal task at this stage is to confirm if the hypothesised model fits the sample data. Measurement models can be created by means of a CFA (Kelloway, 1998; Phakiti, 2007). Unobserved variables or latent variables as was commonly termed cannot be directly seen or measured. They can only be measured through observed variables or manifest variables. These observed variables comprised items in an instrument.

According to Phakiti (2007, p. 44),

> based on CFA, the loading of each observed variable on a factor indicates it correlation with the construct of interest…fit statistics are used to determine model fit. Since measurement model deals with the relationship between the measured variables and the factor under study, the scale of each factor and the identifiability of this relationship must be established and assessed...

Confirmatory Factor Analysis of Xiao's 12-Factor Model

It is the aim of the present research study to confirm if the Xiao's 12-Factor hypothesised model fits the sample data. The 12-Factor model is tested solely to confirm if

the items in the questionnaire are measuring the latent variables. The model is shown with a path diagram in Figure 1. The indices for the model are displayed in Table 2.

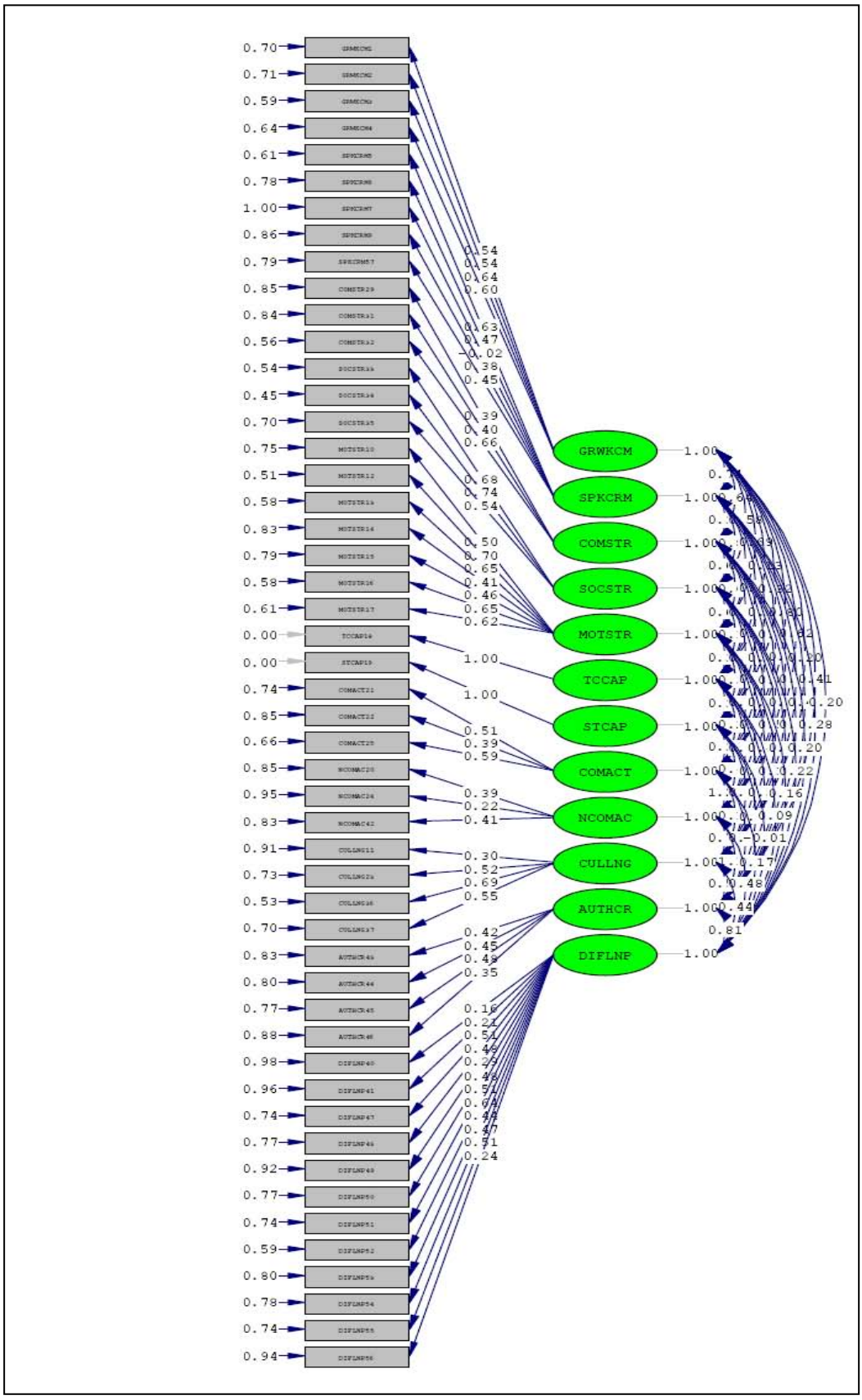

Figure 1. 12-Factor Model of Xiao's Structure of Variables

Table 2

Indices for 12-Factor Model of Xiao's Structure of Variables

INDICES	12 Factor Measurement Model
Minimum Fit Function Chi-Square (χ^2)	48.04
Degrees of Freedom (*df*)	1111
$\frac{\chi^2}{df}$	4.33
Root Mean Square Error of Approximation (RMSEA)	0.10
Comparative Fit Index (CFI)	0.69
Goodness of Fit Index (GFI)	0.65

On the basis of fit indices presented in Table 2, it can be surmised that the observed data for Xiao's (2003) 12-Factor model reflects acceptable fits.

However, the analysis of the factor loadings in the path diagram of Xiao's 12-Factor model demonstrated one observed variable (item) with a negative factor loading and a few others with exceptionally low values. A factor loading is the correlation between the observed variable (item) and the latent variable. The factor loadings of Xiao's 12-Factor Model is presented in Table 3.

Table 3

Factor Loadings for Xiao's 12-Factor Model

Factor	Factor Loading
GRWKCM (attitude towards group work in class)	
GRWKCM1	0.54
GRWKCM2	0.54
GRWKCM3	0.64
GRWKCM4	0.60
SPKCRM (attitude towards speaking out in class)	
SPKCRM5	0.63
SPKCRM6	0.47
SPKCRM7	**-0.02**
SPKCRM9	0.38
SPKCRM57	0.45
COMSTR (attitude towards compensation strategies)	
COMSTR29	0.39
COMSTR31	0.40
COMSTR32	0.66
SOCSTR (attitude towards social strategies)	
SOCSTR33	0.68
SOCSTR34	0.74
SOCSTR35	0.54
MOTSTR (nature and strength of motivation)	
MOTSTR10	0.50
MOTSTR12	0.70
MOTSTR13	0.65
MOTSTR14	0.41
MOTSTR15	0.46
MOTSTR16	0.65
MOTSTR17	0.62
TCCAP (attitude towards teacher-centred approach)	
TCCAP18	1.00
STCAP (attitude towards student-centred approach)	
STCAP19	1.00

COMACT (attitudes towards communicative activities in class)	
COMACT21	0.51
COMACT22	0.39
COMACT25	0.59
NCOMAC (attitude towards non-communicative activities in class)	
NCOMAC20	0.39
NCOMAC24	**0.22**
NCOMAC42	0.41
CULLNG (culture learning in EFL)	
CULLNG11	0.30
CULLNG23	0.52
CULLNG36	0.69
CULLNG37	0.55
AUTHCR (attitude towards authority in class)	
AUTHCR43	0.42
AUTHCR44	0.45
AUTHCR45	0.48
AUTHCR46	0.35
DIFLNP (difficulties encountered in students' learning process)	
DIFLNP40	**0.10**
DIFLNP41	**0.21**
DIFLNP47	0.51
DIFLNP48	0.49
DIFLNP49	0.29
DIFLNP50	0.48
DIFLNP51	0.51
DIFLNP52	0.64
DIFLNP53	0.44
DIFLNP54	0.47
DIFLNP55	0.51
DIFLNP56	**0.24**

*** The deviant values are in bold**

Table 3 indicates that five items are < ±.30. One of the items has a negative factor loading. Peterson (2000, p. 264) asserted that although there was no specified rule as to what constituted 'high' and 'low' factor loadings, he cited Merenda (1997) to conclude that the

proportion of variance accounted for should at least be 0.50 or greater and that 0.30 was the minimum value that was traditionally used when choices were made as to whether an item belonged to a factor. Peterson (2000, p. 264) further affirmed this justification by citing Hair et al. (1998) who recommended that "factor loadings greater than ±0.30 were considered to meet the minimal level; loadings of ±0.40 were considered more important; and if loadings were ±0.50 or greater, they were considered practically significant".

A positive loading of ±0.50 indicated that there is a strong correlation between the factor and the variable whereas a negative loading indicated a negative relation of the variable to the factor. Only 23 items fall in the ±.50 or greater range. Two of the items have factor loadings of 1. This could be due to the fact that the factors are being measured by only one item each. Additionally, the measurement errors for some of the factors in the Xiao's 12-Factor model are relatively high, thus indicating a high percentage of unexplained variance. Xiao's 12-Factor model indicate that careful consideration is required in the analysis, especially when five items have not been assigned any factors.

In addition to the argument in relation to factor loadings and measurement errors, Diamantopolous & Siguaw (2000) raised a very pertinent issue that needed to be considered: the number of latent and observed variables or items within a single model. Marsh et al. (1998) cited in Diamantopolous & Siguaw (2000, p. 16) asserted that

> the more complex the model (in term of latent and/or manifest variables), the more likely it is that problems will be encountered with the model's fit; moreover, all other things being equal, the more variables included in one's model, the greater the sample requirements. ..being overly concerned with model parsimony may lead to specification error in the structural part of the model (through the omission of important latent variables) and/or poor measurement…it is wisest to analyse relatively small data sets, say 20 variables at most, this translates to about 5-6 latent variables each measured by 3-4 indicators.

The assessment of model fit for the Xiao's 12-Factor Model indicates a poor fit for all but the GFI and AGFI. Additionally, the hypothesised model has 12 latent variables. Some of the latent variables have only one manifest or observed variable. Diamantopolous & Siguaw (2000, p. 18) advocated that in a measurement model "each latent variable is assumed to be operationalised by at least two manifest variables (observed variable)". Furthermore, observed variables 8, 26, 27, 30 and 39 have not been assigned any factors and have been left out of the hypothesised model without any explanation. Consequently, Mueller (1996) made

two important observations about CFA when he suggested: "a) that the collected data can be evaluated to examine if it is consistent with a priori specified model and b) based on an identification of possible model misspecifications from data model fit results, an initially hypothesized CFA model may be modified to improve overall data-model fit" (p. 63). Picking up from Mueller (1996) and Diamantopolous & Siguaw's (2000) proposition, the factors were restructured (Matthews, 2004) so that all the observed variables in the instrument have assigned latent variables and that none of the latent variables have less than two manifest variables. According to Matthews (2004, p. 95), restructured meant "that the manifest variables are relocated on different latent variables in order to improve the model fit".

Besides the stance of researchers discussed in the previous sections, the motivation to initiate a new structure is based on a few aspects. The communalities for Xiao's (2003) 12-Factor Model are low (refer to Appendix 7.2). Communality was the variance of observed variables accounted by a common factor. Large communality was strongly influenced by an underlying construct (Costello & Osborne, 2005; *Exploratory Factor Analysis*, 2004; Suhr, 2003). Costello & Osborne (2005, p. 4) suggested that item communalities were

> high if they are all .8 or greater – but this is unlikely to occur in real data. More common magnitudes in the social sciences are low to moderate communalities of .40 to .70…less than .40, it may a) not be related to other items, or b) suggest an additional factor that should be explored.

Twenty-five items in Xiao's (2003) Model have communalities that range from 0.20 to 0.40, thus indicating that they may not be correlated to each other. Additionally, Cronbach Alpha's reliability analysis indicates low indices as well. Cronbach's Alpha was "an index of reliability associated with the variation accounted for by the true score of the underlying construct" (Santos, 1999, p. 2). Hatcher (1994) cited in Santos (1999) defined a construct as "the hypothetical variable that is being measured". Nunnally (1978) advocated, that an acceptable reliability coefficient index was 0.7. Only one of the 12 factors, [MOTSTR] which is the acronym for 'nature and strength of motivation', reflects a reliability index of 0.73. The other factors demonstrate the following values: [GRWKCM (group work and communication): 0.64], [SPKCRM (speaking in the classroom: 0.35], [COMSTR (compensation strategies): 0.46], [SOCSTR (social strategies): 0.62], [COMACT (communicative activities in class): 0.45], [NCOMAC (non-communicative activities in class): 0.27] , [CULLNG (culture learning in EFL): 0.52], [AUTHCR (authority in the classroom): 0.40] and [DIFLNP (difficulties encountered in the learning process): 0.69]

Researcher's Restructured Factors

More importantly, the Xiao (2003) has failed to assign five observed variables (items) to any factors. The items measuring affective strategies are also not assigned to any factors. Additionally, two of the latent variables are only being measured by one observed variable each. All these limitations of Xiao's (2003) 12-Factor model necessitated a restructure. Table 4 displays the researcher's restructured factors.

Table 4

Researcher's Restructured Factor Structure

Factor		Old Order	New Order	Classification
Author	Researcher	Subscale	Subscale	
Attitude towards group work [GRWKCM]	Attitude towards group work and communication [GRWKCM]	Subscale 1: (4 items) Item 1	Subscale 1: (7 items) GRWKCM1	
		Item 2	GRWKCM2	
		Item 3	GRWKCM3	
		Item 4	GRWKCM4	
			GRWKCM5	Reassigned
			GRWKCM6	Reassigned
			GRWKCM57	Reassigned
Attitude towards speaking in class [SPKCRM]	-	Subscale 2: (5 items) Item 5	-	Reassigned
		Item 6		Reassigned
		Item 7		Dropped
		Item 9		Reassigned
		Item 57		Reassigned
Nature and strength of motivation [MOTSTR]	Nature and strength of motivation [MOTSTR]	Subscale 3: (7 items) Item 10	Subscale 2: (7 items) MOTSTR10	
		Item 12	MOTSTR12	
		Item 13	MOTSTR13	
		Item 14	MOTSTR14	
		Item 15	MOTSTR15	
		Item 16,	MOTSTR16	
		Item 17	MOTSTR17	
Attitude towards teacher-centred approach [TCCAP]	Attitude towards teacher-centred approach [TCCAP]	Subscale 4: (1 item) Item18	Subscale 3: (11 items) TCCAP18	
			TCCAP20	Reassigned
			TCCAP21	Reassigned
			TCCAP22	Reassigned
			TCCAP24	Reassigned
			TCCAP25	Reassigned
			TCCAP26	Reassigned
			TCCAP27	Reassigned
			TCCAP43	Reassigned
			TCCAP45	Reassigned
			TCCAP46	Reassigned
Attitude towards student-centred approach [STCAP]	Attitude towards student-centred approach [STCAP]	Subscale 5: (1 item) Item19	Subscale 4: (2 items) STCAP19	
			STCAP28	Reassigned

Attitude towards communicative approach [COMACT]	-	Subscale 6: (3 items) Item21 Item 22 Item25	-	Reassigned Reassigned Reassigned
Attitude towards non-communicative approach [NCOMAC]	-	Subscale 7: (3 items) Item20 Item24 Item42	-	Reassigned Reassigned Reassigned
Culture learning in EFL [CULLNG]	Culture learning in EFL [CULLNG]	Subscale 8: (4 items) Item11 Item23 Item36 Item37	Subscale 5: (4 items) CULLNG11 CULLNG23 CULLNG36 CULLNG37	
Attitude towards compensation strategies [COMSTR]	Attitude towards learning strategies [LRNST]	Subscale 9: (3 items) Item29 Item31 Item32	Subscale 6: (13 items) LRNST9 LRNST29 LRNST30 LRNST31 LRNST32 LRNST33 LRNST34 LRNST35 LRNST38 LRNST39 LRNST40 LRNST41 LRNST42	Reassigned Reassigned Reassigned Reassigned Reassigned Reassigned Reassigned Reassigned Reassigned Reassigned
Attitude towards social strategies [SOCSTR]	-	Subscale 9: (3 items) Item33 Item34 Item35	-	Reassigned Reassigned Reassigned
Attitude towards authority in class [AUTHCR]	-	Subscale 10: (4 items) Item43 Item44 Item45 Item46	-	Reassigned Dropped Reassigned Reassigned
Difficulties encountered in learning process [DIFLNP]	Difficulties encountered in learning process [DIFLNP]	Subscale 11: (12 items) Item40 Item41 Item47 Item48 Item49 Item50 Item51 Item52 Item53 Item54 Item55 Item56	Subscale 7: (11 items) DIFLNP8 DIFLNP47 DIFLNP48 DIFLNP49 DIFLNP50 DIFLNP51 DIFLNP52 DIFLNP53 DIFLNP54 DIFLNP55 DIFLNP56	Reassigned Reassigned

Table 4 presents the observed variables that have been reassigned to other factors or dropped totally. Review of literature, expert opinion as well careful analysis of the items in the questionnaire guides this process. Items in the questionnaire that are measuring attitudes towards group work and speaking in the classroom are clustered together as all the items are in reference to group work. Factor analysis of these items reflect high communalities (refer to Appendix 7.2). Additionally, items measuring factors 'attitude towards authority in class' as well as 'attitude towards communicative and non-communicative approach' are reassigned to 'attitude towards teacher-centred approach' or 'TCCAP' as all the items are referring to student's attitude towards teacher-centred teaching. The reassignment of the items to factor 'TCCAP' increases the observed variable from 1 to 11, thus increasing the reliability of the measure. In addition, observed variables measuring 'attitude towards compensation strategies and social strategies' are reassigned to 'attitude towards learning strategies' or 'LRNST' as literature indicates that compensation and social strategies fall under learning strategies (Oxford, 1990). Furthermore, items measuring affective strategies are not assigned to any factors. These items are clustered under the factor 'LRNST' as well. Two observed variables: items 7 and 44 are dropped as they indicate very low communalities irrespective of the factors they are assigned to. The sample data is clearly not fitting the Xiao's (2003) 12-Factor hypothesized model. This motivated the re-examination of the individual items to see the conceptual fit to the broader trait or factor.

The revised factor structure increases the reliability indices for the some of the factors while others remain the same:

Subscale 1 (attitude to group work and communication) [GRWKCM] : Items 1, 2, 3, 4, 5, 6, 57: Cronbach Alpha's index of reliability: 0.69

Subscale 2 (nature and strength of motivation) [MOTSTR] : Items 10, 12, 13, 14, 15, 16, 17: Cronbach Alpha's index of reliability: 0.73

Subscale 3 (attitude towards teacher-centred approach) [TCCAP] : Items 18, 20, 21, 22, 24, 25, 26, 27, 43, 45, 46: Cronbach Alpha's index or reliability: 0.70

Subscale 4 (attitude towards student-centred approach) [STCAP] : Items 19, 28: Cronbach Alpha's index of reliability: 0.53

Subscale 5 (culture learning in EFL) [CULLNG] : Items 11, 23, 36, 37: Cronbach Alpha's index of reliability: 0.52

Subscale 6 (attitude towards learning strategies) [LRNST] : Items 9, 29, 30, 31, 32, 33, 34, 35, 38, 39, 40, 41, 42: Cronbach Alpha's index of reliability: 0.76

Subscale 7 (difficulties encountered in the learning process) [DIFLNP] : Items 8, 47,

48, 49, 50, 51, 52, 53, 54, 55, 56: Cronbach Alpha's index of reliability: 0.71

Table 5 lists the items for the factors in the researcher's Seven-Factor model.

Table 5

Items in the Researcher's Seven-Factor Model

Factor	Items
GRWKCM (attitude towards group work and communication)	1. In English class, I like to participate in group work with 2-4 people, e.g. English dialogues, group discussion, role play. 2. In group work, I like committing myself to achieving our common goal with my peers. 3. I like my teacher to divide the whole class into several small groups in which we do teacher-directed group work. 4. In English class, I like listening to my peers give English oral presentations of interesting stories or information that are well-prepared outside of class. 5. In group work, I like to ask and answer questions in English. 6. When working in a group, I like to help keep the atmosphere friendly and harmonious. 57. I like to answer questions in English in class.
LRNST (attitude towards learning strategies)	9. In class or in group activities, I like to prepare what I want to say in English mentally before I speak. 29. If I cannot think of a word during a conversation in English, I depend on my native language to explain it. 30. I try to relax myself whenever I am feeling afraid of using English especially oral English 31. When I can't think of a word during a conversation in English, I use gestures. 32. When I can't think of a word during a conversation in English, I use a word or phrase that means the same thing. 33. I have at least one peer with whom I often practise English. 34. I like to participate in extra-curricular activities in which I can practise my oral English, e.g. English corner. 35. I like after-class activities in which I can practise my English writing skills, e.g. drama group and newspaper group. 38. I encourage myself to speak English even when I am afraid of making a mistake. 39. I give myself a reward or treat when I do well in English. For example, I reward myself by going to a restaurant, etc. 40. I remember new words by thinking of relationships between what I already know and new things I learn in English. 41. I use new words in a sentence so I can remember well. 42. I link its Malay/Chinese/Tamil meaning to a new word to help me remember the word in English.
MOTSTR (nature and strength of motivation)	10. I work especially hard when my own success will benefit me and other people (e.g. my family or my relatives). 12. I like learning English. 13. I am interested in the cultures of major English-speaking nations. 14. I learn English because I want to know about the economic, social, political and technological developments in other countries of the world. 15. I learn English because I want to find a good job. 16. I want to be enrolled in the Master degree program. 17. I want to go abroad for advanced study or work.
TCCAP (attitude towards teacher-centred approach)	18. In English class, I like teacher-centred teaching method employed by teachers. 20. In the English Intensive Reading class, I like my teacher to deal with the text materials in a sentence-by-sentence way. 21. In English class, I like teacher-guided and text-related discussions on such topics as population problems, my favourite books, films, or how to be a better learner of English. 22. In English class, I like to watch English language films or videos and then discuss them in groups with teacher facilitation and guidance. 24. In English class, I like to do simulation test exercises and listen to my teacher explanations.

	25. In English class, I like my teacher to ask students text-based and thought-provoking questions to keep the lesson interesting in order that students have chances to practise their spoken English. 26. In English class, I like my teacher to translate some difficult paragraphs of text materials into my first language to enhance my comprehension and translation skills. 27. You like a teacher-centred teaching method in English class? 43. I expect my teacher rather than myself to be responsible for evaluating how much I have learnt. 45. I see knowledge, as something that the teacher should pass on to me rather than something that I should discover myself. 46. In English class, the teaching method used by the teacher is very important to students' English study.
STCAP (attitude towards student-centred approach)	19. In English class, I like a student-centred teaching method employed by teachers. 28. You like a student-centred teaching method in English class?
CULLNG (culture learning in EFL)	11. In English class, I like to learn about Western cultures including their way of life, social customs, etc. 23. I learn a lot about western cultures from my English classes. 36. My knowledge about Western culture(s) mainly comes from English classroom teaching and learning. 37. I like to read English language text materials which cover Western cultures.
DIFLNP (difficulties encountered in the learning process)	8. Sometimes I feel nervous answering a question in class because I am afraid of being wrong. 47. I do not have a clear long-term aim of learning English, and lack motivation. 48. My learning styles are too rigid and inflexible. 49. I have few opportunities to practise my English. 50. There is a lack of authentic English materials, audio and visual. 51. The idea of finding a good job after graduation from the university exerts heavy pressure on me. 52. We lack chances to speak English in class. 53. This course exerts heavy pressures on me. 54. Teachers place too much stress on the structure, grammar and reading comprehension in English class. 55. The English language textbook are not compatible with the requirements of the student-centred approach in English class. 56. We have little knowledge or information about Western cultures.

Byrne (1998) asserted that in CFA, a structure was proposed and tested against real data and was either rejected or accepted on the basis of the fit. CFA can also be used to compare several other structures, to identify if one of the several alternative structures is compatible with a single measurement. In the present research study, the alternative model (AM) framework is employed to test the One-Factor, Seven-Factor correlated, Hierarchical as well as Nested models. The first part of the discussion focuses on the One-Factor and Seven-Factor correlated models. The discussion then continue with the Hierarchical and Nested models, the two other models tested in the AM framework.

The One-Factor model is tested to investigate if the items in the questionnaire are measuring just one latent variable (unobserved variable): learning needs. The Seven-Factor correlated model is tested to identify if the seven latent variables: 'GRWKCM – attitude towards group work and communication'; 'LRNST – attitude towards learning strategies'; 'MOTSTR – nature and strength of motivation'; 'TCCAP – attitude towards teacher-centred approach'; 'STCAP – attitude towards student-centred approach'; 'CULLNG – culture learning in EFL' and 'DIFLNP – difficulties encountered in the learning process' are not a

single measure but correlated factors. The diagram for the two alternative models is presented as path diagrams in Figure 2 and Figure 3. The various indices for the two models are presented in Table 6.

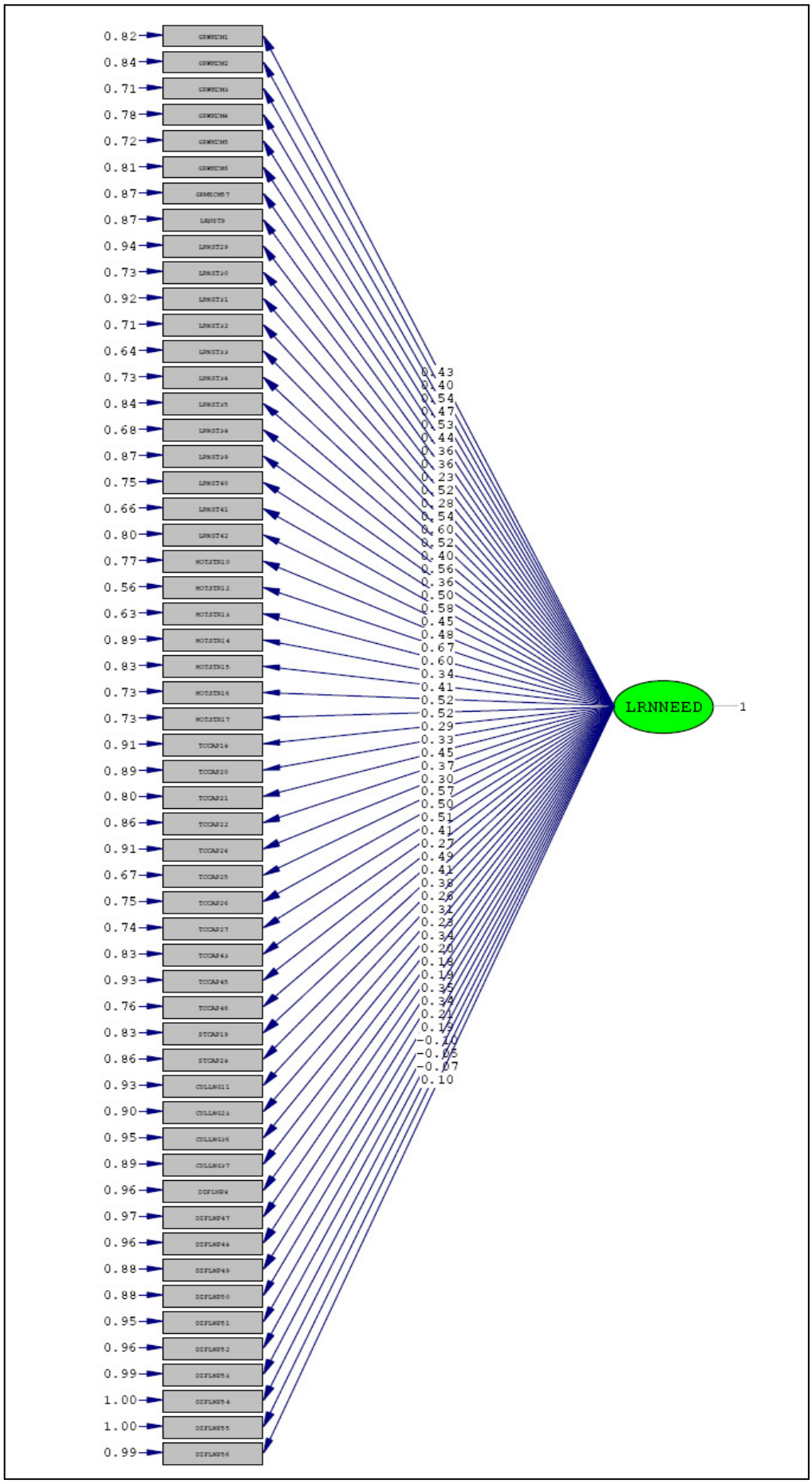

Figure 2. One-Factor Model

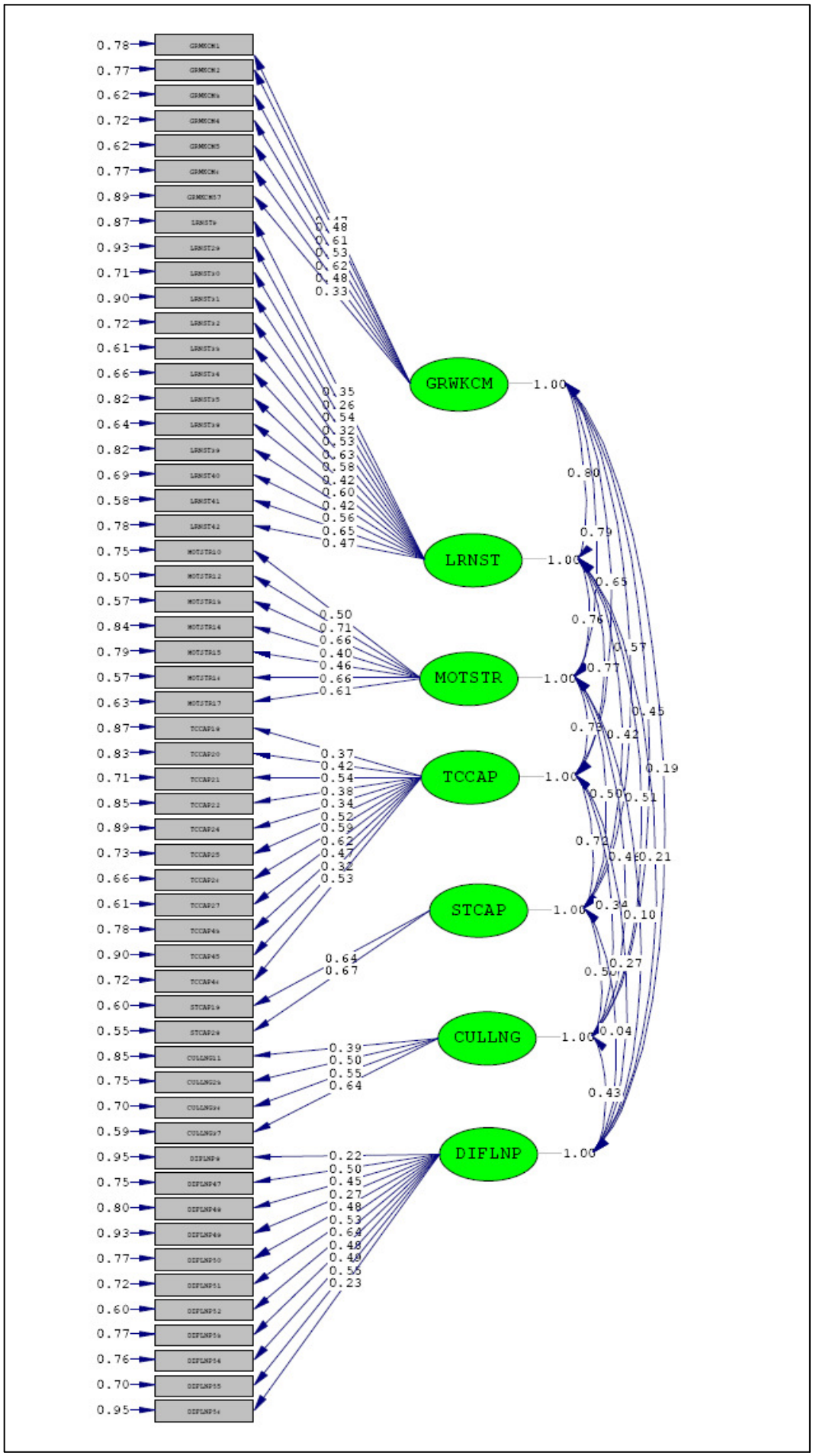

Figure 3. Seven-Factor Correlated Model

Table 6

Indices for Researcher's Alternative Models Conducted through CFA

INDICES	One-Factor Model	Seven-Factor Correlated Model
Minimum Fit Function Chi-Square (χ^2)	68.38	59.69
Degrees of Freedom (*df*)	1430	1356
$\frac{\chi^2}{df}$	4.78	4.40
Root Mean Square Error of Approximation (RMSEA)	0.10	0.092
Comparative Fit Index (CFI)	0.66	0.70
Goodness of Fit Index (GFI)	0.59	0.63

The One-Factor and Seven-Factor correlated models demonstrate unacceptable fits of the data as indicated by χ^2/df indices. The chi-square statistics demonstrate a very high value. However, the Seven-Factor correlated model indicates a RMSEA index of 0.09 which is within the stipulated range.

Consequently, if values of GFI and AGFI should range between 0 and 1 and values >0.90 are usually taken as reflecting acceptable fits (Diamantopoulos & Siguaw, 2000), then the Seven-Factor correlated model which indicates a GFI and AGFI index of 0.63 and 0.60 can be perceived as displaying marginally improved fit compared to Xiao's (2003) 12-Factor or the Researcher's One-Factor models. Additionally, Diamantopoulos & Siguaw (2000) stated that it was acceptable to have values for the PGFI that were typically much lower for acceptable models even though the chi-squares were non-significant. The goodness-of-fit indices could be in the 0.90s and parsimonious fit indices in the 0.50s. In this instance the GFI and AGFI for the Seven-Factor correlated model are 0.63 and 0.60 with the PGFI displaying a value of 0.58. As the GFI is generally recommended as the most reliable measure of absolute fit in most circumstances (Diamantopoulos & Siguaw, 2000) it is concluded that the Seven-Factor correlated model idnicates the best fit to the data if compared with Xiao's (2003) 12-Factor model and the Researcher's One-Factor model. This is further reiterated by the factor loadings as well as indices for the measurement error. The One-Factor model indicates that nearly 12 items fall below the minimal acceptable factor loading of ±.30 and the rest in the range of >±.30 to < ±.60. None of the items have loadings of ±.70 or greater. Three of the items demonstrate negative factor loadings. A positive loading of ±.50 indicates that there is a strong correlation between the factor and the variable whereas a negative loading emphasises a negative relation of the variable to the factor. The Seven-Factor correlated

model has only four items in the below ±.30 category and the remaining items fall in the >±.30 to <±.70 or greater range. None of the items have highlighted a negative factor loading. This is clearly a marked improvement compared to the other models. The factor loadings for both the One-Factor and Seven-Factor correlated models as well as Cronbach Alpha's reliability indices are presented in Table 7.

Table 7

Factor Loadings for the One-Factor and Seven-Factor Correlated Models

Item	One-Factor Model		Item	Seven-Factor Model	
	Factor Loadings	Reliability Index		Factor Loadings	Reliability Index
GRWKCM1	0.43		GRWKCM1	0.47	
GRWKCM2	0.40		GRWKCM2	0.48	
GRWKCM3	0.54		GRWKCM3	0.61	
GRWKCM4	0.47		GRWKCM4	0.53	0.69
GRWKCM5	0.53		GRWKCM5	0.62	
GRWKCM6	0.44		GRWKCM6	0.48	
GRWKCM57	0.36		GRWKCM57	0.33	
LRNST9	0.36		LRNST9	0.35	
LRNST29	0.23		LRNST29	**0.26**	
LRNST30	0.52		LRNST30	0.54	
LRNST31	0.28		LRNST31	0.32	
LRNST32	0.54		LRNST32	0.53	
LRNST33	0.60		LRNST33	0.63	
LRNST34	0.52		LRNST34	0.58	0.76
LRNST35	0.40		LRNST35	0.42	
LRNST38	0.56		LRNST38	0.60	
LRSNT39	0.36		LRSNT39	0.42	
LRNST40	0.50		LRNST40	0.56	
LRNST41	0.58		LRNST41	0.65	
LRNST42	0.45		LRNST42	0.47	
MOTSTR10	0.48		MOTSTR10	0.50	
MOTSTR12	0.67		MOTSTR12	0.71	
MOTSTR13	0.60		MOTSTR13	0.66	
MOTSTR14	0.34		MOTSTR14	0.40	0.73
MOTSTR15	0.41		MOTSTR15	0.46	
MOTSTR16	0.52		MOTSTR16	0.66	
MOTSTR17	0.52		MOTSTR17	0.61	
TCCAP18	0.29		TCCAP18	0.37	
TCCAP20	0.33	0.89	TCCAP20	0.42	
TCCAP21	0.45		TCCAP21	0.54	
TCCAP22	0.37		TCCAP22	0.38	
TCCAP24	0.30		TCCAP24	0.34	0.70
TCCAP25	0.57		TCCAP25	0.52	
TCCAP26	0.50		TCCAP26	0.52	
TCCAP27	0.51		TCCAP27	0.62	
TCCAP43	0.41		TCCAP43	0.47	
TCCAP45	0.27		TCCAP45	0.32	
TCCAP46	0.49		TCCAP46	0.53	
STCAP19	0.41		STCAP19	0.64	
STCAP28	0.38		STCAP28	0.67	0.53
CULLNG11	0.26		CULLNG11	0.39	
CULLNG23	0.31		CULLNG23	0.50	
CULLNG36	0.23		CULLNG36	0.55	0.52
CULLNG37	0.34		CULLNG37	0.65	
DIFLNP8	0.20		DIFLNP8	**0.22**	
DIFLNP47	0.18		DIFLNP47	0.50	
DIFLNP48	0.19		DIFLNP48	0.45	
DIFLNP49	0.35		DIFLNP49	**0.27**	
DIFLNP50	0.34		DIFLNP50	0.48	
DIFLNP51	0.21		DIFLNP51	0.53	0.71
DIFLNP52	0.19		DIFLNP52	0.64	
DIFLNP53	-0.10		DIFLNP53	0.48	
DIFLNP54	-0.05		DIFLNP54	0.49	
DIFLNP55	-0.07		DIFLNP55	0.55	
DIFLNP56	0.10		DIFLNP56	**0.23**	

*** The deviant values are in bold**

Structural Equation Modelling

Two other alternative models tested are the Hierarchical and Nested models. The Hierarchical model was tested to examine if the seven first order factors loaded on to a second order Learning Needs factor (Curtis, 2005). The Nested model was tested to examine if the loadings were distributed between the seven factors and also loaded uniquely to the Learning Needs factor. The following table expounds on the indices for all the alternative models tested using LISREL 8.8 software.

Table 8

Structural Models

INDICES	1 Factor Measurement Model	7 Factor Measurement Model	Hierarchical Model	Nested Model
Minimum Fit Function Chi-Square (χ^2)	68.38	59.69	63.56	54.40
Degrees of Freedom *(df)*	1430	1356	1423	1302
$\frac{\chi^2}{df}$	4.78	4.40	4.47	4.18
Root Mean Square Error of Approximation (RMSEA)	0.10	0.09	0.09	0.09
Comparative Fit Index (CFI)	0.66	0.70	0.69	0.73
Goodness of Fit Index (GFI)	0.59	0.63	0.62	0.67

All the models reflect high chi-square values. However, chi-square was sensitive to departures from multivariate normality (particularly excessive kurtosis) and sample size (Diamantopoulos & Siguaw (2000, p. 84). The next alternative is to employ the RMSEA index. The lowest RMSEA value of 0.09 for the Nested model indicates that there is a fit to the data but only at a mediocre level. The Nested model also reflect a standardized RMR index of 0.08 which indicates a good fit. Another indicator that is used to assess if the model fits the data is the goodness-of-fit (GFI) index. The GFI was generally recommended as the most reliable measure of absolute fit in most circumstances (Diamantopoulos & Siguaw, 2000). On the basis of Diamantopoulos and Siguaw's (2000) assertion, it can be surmised that the observed data for the Nested Model indicates the best fit to the sample data. The One-Factor Measurement Model is rejected based on the assessment of fit indices. CFA to test alternative models indicate that the Nested model clearly reflect the best fit to the sample data compared to the other models tested. The factor loadings for the Hierarchical as well as Nested models is presented in Table 9. Figure 4 and Figure 5 graphically show the structural models through path diagrams.

Table 9

Factor Loadings for Hierarchical and Nested Models

Item	Factor Loading Hierarchical Model	Item	Factor Loading Nested Model
GRWKCM1	0.48	GRWKCM1	0.15
GRWKCM2	0.50	GRWKCM2	0.19
GRWKCM3	0.62	GRWKCM3	0.38
GRWKCM4	0.53	GRWKCM4	0.21
GRWKCM5	0.60	GRWKCM5	0.56
GRWKCM6	0.47	GRWKCM6	0.42
GRWKCM57	0.43	GRWKCM57	0.25
LRNST9	0.33	LRNST9	-0.00
LRNST29	0.27	LRNST29	0.18
LRNST30	0.54	LRNST30	0.22
LRNST31	0.38	LRNST31	0.38
LRNST32	0.54	LRNST32	0.19
LRNST33	0.63	LRNST33	0.45
LRNST34	0.58	LRNST34	0.59
LRNST35	0.43	LRNST35	0.57
LRNST38	0.61	LRNST38	0.36
LRSNT39	0.43	LRSNT39	0.60
LRNST40	0.55	LRNST40	0.33
LRNST41	0.65	LRNST41	0.46
LRNST42	0.46	LRNST42	0.32
MOTSTR10	0.49	MOTSTR10	0.20
MOTSTR12	0.70	MOTSTR12	0.49
MOTSTR13	0.65	MOTSTR13	0.44
MOTSTR14	0.41	MOTSTR14	0.57
MOTSTR15	0.47	MOTSTR15	0.39
MOTSTR16	0.67	MOTSTR16	0.55
MOTSTR17	0.62	MOTSTR17	0.48
TCCAP18	0.36	TCCAP18	0.50
TCCAP20	0.43	TCCAP20	0.44
TCCAP21	0.53	TCCAP21	0.32
TCCAP22	0.39	TCCAP22	0.16
TCCAP24	0.34	TCCAP24	0.23
TCCAP25	0.55	TCCAP25	0.18
TCCAP26	0.59	TCCAP26	0.30
TCCAP27	0.60	TCCAP27	0.66
TCCAP43	0.44	TCCAP43	0.36
TCCAP45	0.32	TCCAP45	0.38
TCCAP46	0.54	TCCAP46	0.26
STCAP19	0.69	STCAP19	0.58
STCAP28	0.62	STCAP28	0.73
CULLNG11	0.35	CULLNG11	0.29
CULLNG23	0.55	CULLNG23	0.51
CULLNG36	0.58	CULLNG36	0.67
CULLNG37	059	CULLNG37	0.59
DIFLNP8	0.23	DIFLNP8	0.20
DIFLNP47	0.49	DIFLNP47	0.49
DIFLNP48	0.43	DIFLNP48	0.44
DIFLNP49	0.26	DIFLNP49	0.24
DIFLNP50	0.47	DIFLNP50	0.45
DIFLNP51	0.52	DIFLNP51	0.51
DIFLNP52	0.63	DIFLNP52	0.63
DIFLNP53	0.51	DIFLNP53	0.53
DIFLNP54	0.50	DIFLNP54	0.53
DIFLNP55	0.55	DIFLNP55	0.58
DIFLNP56	0.25	DIFLNP56	0.33

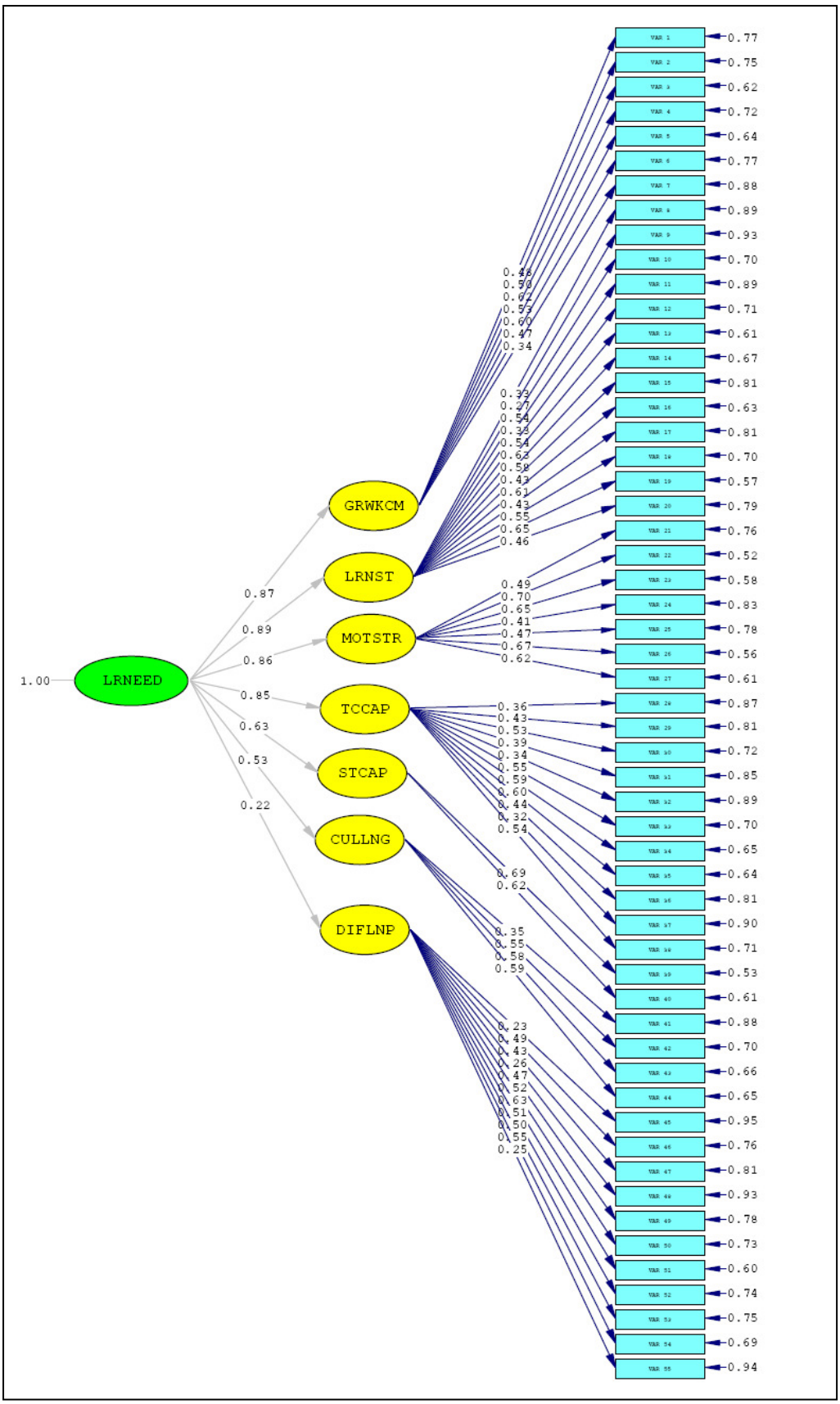

Figure 4. Hierarchical Model

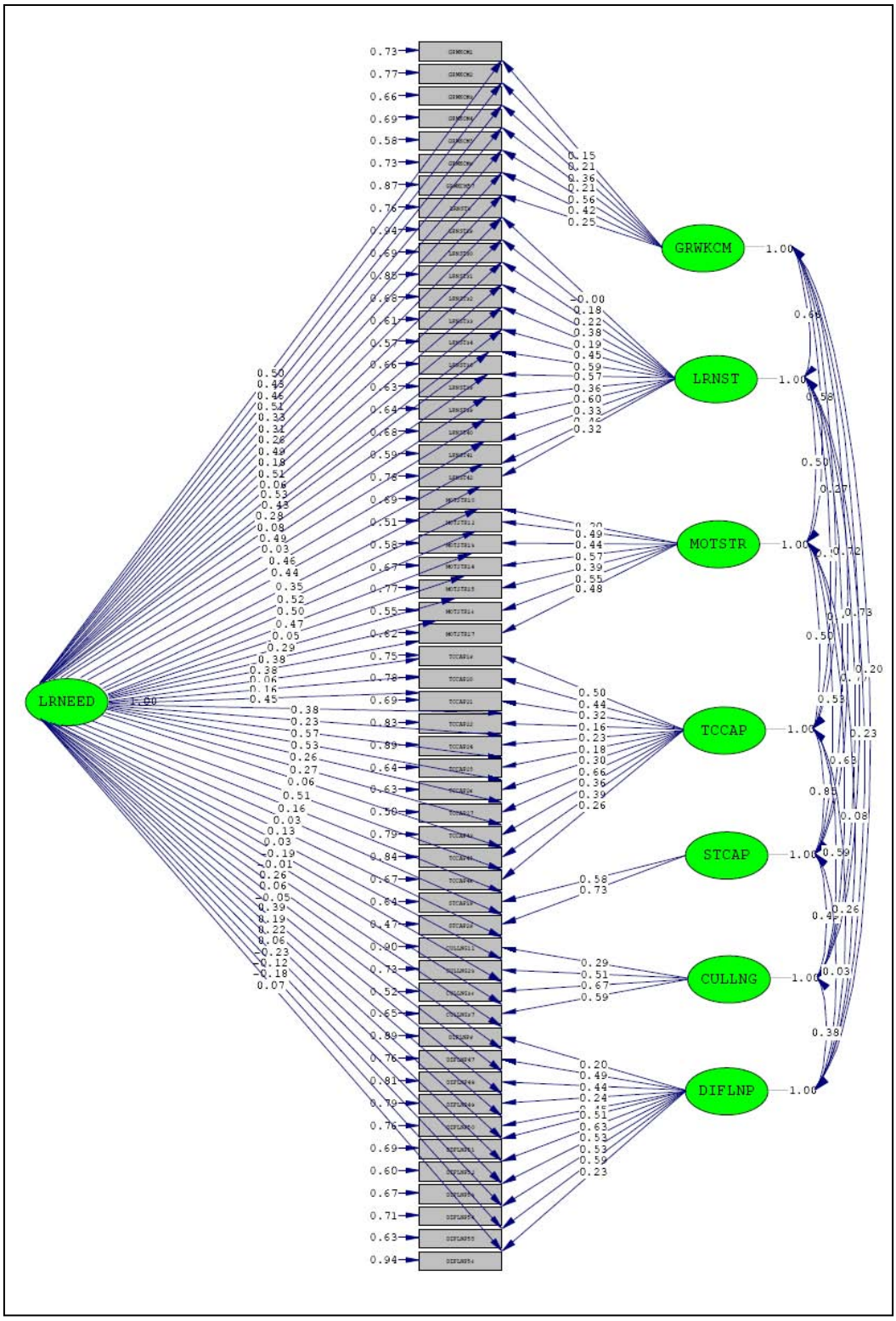

Figure 5. Nested Model

Confirmatory Factor Analysis enabled several alternative models to be compared (Curtis, 2005, p. 189). Analysis of the different models demonstrated that apart from the One-Factor model, the Seven-Factor correlated, Hierarchical and Nested models were measuring a unitary underlying construct (Curtis, 2005). The assessment of fit indices indicate reasonable fit of data to all models, although the Nested Model reflects the best fit. However, as a

decision has to be made on a model that would guide future analysis, based on literature and theory the Seven-Factor correlated and Hierarchical Models would guide future analysis. The decision to use the Seven-Factor correlated Model and the Hierarchical Model was based on "*a priori* information about the data structure expressed in the form of a specified theory or hypothesis, a given classificatory design for indicators (or subset of indicators) according to known features of content and format, known experimental conditions or knowledge from previous studies" (Rowe, 2005, p. 40). The substantive hypothesis is that although the Nested Model demonstrates the best fit to data, it is a complex model. Literature highlights that the more complex a model, the higher the resulting 'noise'. On the basis of model parsimony and the relatively similar indices to the Seven-Factor correlated model, both these models would direct future analysis.

Employing CFA in the validation procedure of the Needs Analysis questionnaire emphasises that the sample data does not fit Xiao's (2003) hypothesised model. CFA is a process that seeks to determine if the number of factors and the loadings of them measure or indicator variables on them conform to what is expected on the basis of a pre-established theory (hypothesised). The current study sought to determine, if measures created by the author of the instrument to represent a latent variable, really belonged together.

The initial instrument had 57 items. Confirmatory Factor Analysis indicates that items SPKCRM7 and AUTHCR44 have low communalities, factor loadings as well as reliability indices no matter which factor they are assigned to. Hence, these items are dropped from the analysis. Xiao (2003) has assigned 12 factors to measure 57 items. Of these 12 factors, two are measured with just one item each. This is in contrast with Marsh et al. (1998) cited in Diamantopolous & Siguaw's (2000, p. 16) who argued that "…it is wisest to analyse relatively small data sets, say 20 variables at most, this translates to about 5-6 variables each measured by 3-4 indicators" This view is further justified by factor loadings indicated by Xiao's (2003) 12 factor model. The factors that are measured with just one item, each indicate factor loadings of one. This could possibly be attributed to the complexity of the model as suggested by Diamantopolous & Siguaw's (2000, p. 16) who stated that "the more complex the model (in terms of latent/and or manifest variables) the more likely it is that problems will be encountered with the model's fit".

The restructured Seven-Factor Model demonstrates improved factor loadings. From 12, the latent variables were reduced to seven and each of them had at least a minimum of two

indicators (Diamantopolous & Siguaw's, 2000). The seven latent variables are measured by 55 indicators. All the observed variables are assigned to factors. Additionally, although the RMSEA indices for both Xiao's (2003) 12-Factor model and the Researcher's Seven-Factor Model are between 0.08 and 0.10 which indicate that the models reflect a mediocre fit, the Seven-Factor Model demonstrates an index of 0.09 which is a slight improvement from Xiao's. The relatively better factor loadings, reliability indices as well as all observed variables (items) having assigned factors dictates that the Seven-Factor model is clearly highlighting that the Needs Analysis scale has seven key factors that need consideration. These factors have been displayed in Table 10.

Table 10

Nallaya's (2009) Needs Analysis Scale

Xiao's (2003) Needs Analysis Scale	Nallaya's (2009) Needs Analysis Scale
GRWKCM: (Group work and communication)	GRWKCM: (Group work and communication)
GRWKCM1 GRWKCM2 GRWKCM3 GRWKCM4	GRWKCM1 GRWKCM2 GRWKCM3 GRWKCM4 GRWKCM5 GRWKCM6 GRWKCM57
SPKCRM: (Speaking in classroom)	
SPKCRM5 SPKCRM6 SPKCRM7 SPKCRM9 SPKCRM57	-
MOTSTR: (Nature of motivation and strength)	MOTSTR: (Nature of motivation and strength)
MOTSTR10 MOTSTR12 MOTSTR13 MOTSTR14 MOTSTR15 MOTSTR16 MOTSTR17	MOTSTR10 MOTSTR12 MOSTR13 MOTSTR14 MOTSTR15 MOTSTR16 MOTSTR17
TCCAP: (Teacher-centred approach)	TCCAP: (Teacher-centred approach)
TCCAP18	TCCAP18 TCCAP20 TCCAP21 TCCAP22 TCCAP24 TCCAP25 TCCAP26 TCCAP27 TCCAP43 TCCAP45 TCCAP46
STCAP: (Student-centred approach)	STCAP: (Student-centred approach)
STCAP19	STCAP19 STCAP28
COMACT: (Attitude toward communicative approach)	
COMACT21 COMACT22 COMACT25	-
NCOMAC: (Attitude towards non-communicative approach)	
NCOMAC20 NCOMAC24 NCOMAC42	-
CULLNG: (Culture learning in EFL)	CULLNG: (Culture learning in EFL)
CULLNG11 CULLNG23 CULLNG36 CULLNG37	CULLNG11 CULLNG23 CULLNG36 CULLNG37
COMSTR: (Attitude towards compensation strategies)	LRNST: (Learning strategies)
COMSTR29 COMSTR31	LRNST9 LRNST29

COMSTR32	LRNST30 LRNST31 LRNST32 LRNST33 LRNST34 LRNST35 LRNST38 LRNST39 LRNST40 LRNST41 LRNST42
SOCSTR: (Attitude towards social strategies)	
SOCSTR33 SOCSTR34 SOCSTR35	-
AUTHCR: (Attitude towards authority in class)	
AUTHCR43 AUTHCR44 AUTHCR45 AUTHCR46	-
DIFLNP: (Difficulties encountered in the learning process)	DIFLNP: (Difficulties encountered in the learning process)
DIFLNP40 DIFLNP41 DIFLNP47 DIFLNP48 DIFLNP49 DIFLNP50 DIFLNP51 DIFLNP52 DIFLNP53 DIFLNP54 DIFLNP55 DIFLNP56	DIFLNP8 DIFLNP47 DIFLNP48 DIFLNP49 DIFLNP50 DIFLNP51 DIFLNP52 DIFLNP53 DIFLNP54 DIFLNP55 DIFLNP56

CFA enables the testing of a hypothesised model as well as the comparison of several alternative models. The analysis emphasised that the Needs Analysis questionnaire is consistent with a unitary underlying construct as is demonstrated in the Seven-Factor and Hierarchical Models. Based on model parsimony as well as relatively similar indices to each other, both the Seven-Factor correlated Model and Hierarchical Model would be employed to direct further analysis of the data. In other words, CFA enables the investigation of the structure of the questionnaire. This was conducted based "*a priori* information about the data structure expressed in the form of a specified theory or hypothesis, a given classificatory design for indicators (or subset of indicators) according to known features of content and format, known experimental conditions or knowledge from previous studies" (Rowe, 2005, p. 40). The validation of an instrument cannot stop at the structure level as a model may fit the observed data but yet demonstrate other limitations. CFA does not have provisions for missing data and interval scales. In addition, the measure is not independent of both the person and item. Thus further statistical analysis is required to overcome these limitations. The use of Item Response Theory (IRT) helps to overcome these limitations.

IRT enables the examination of constructs at the item level (Ercikan & Koh, 2005), some estimated the relationship of items to the latent trait using only sufficient statistics and is at times known as 'partial-information method'. The IRT uses all information in the pattern responses for the estimation of all item parameters and is sometimes referred to as 'full-

information method' (Cyr and Davies, 2005, p. 2). Based on these contentions, IRT is employed as another statistical procedure in the present research study to overcome the limitations of CFA.

Rasch Model

The Item Response Theory's Rasch Model is used in the present study because "each item is described by a set of parameters that can be used to graphically depict the relation between an item and a latent trait through use of an item characteristic curve (ICC)" (Meade et al., 2005, p. 282). Additionally, IRT allowed the analysis of the relation between the latent trait and the probability of response. It also enabled the discrimination of persons with different levels of latent trait (Meade et al., 2005, p. 282). Rasch Analysis was a statistical procedure where the total score

> totally summarizes a person's standing on a variable, arises from a more fundamental requirement: that the comparison of two people is independent of which items may be used within the set of items assessing the same variable. Thus the Rasch model is taken as a criterion for the structure of the responses which they should be satisfied, rather than a mere statistical description of the responses. Analysing data according to the Rasch model, that is a Rasch analysis, gives a range of details checking whether or not adding the scores is justified in the data. This is called the test of fit between the data and the model. If the invariance of responses across different groups of people does not hold, then taking the total score to characterize a person is not justified The linearised value is the location of the person on the unidimensional continuum - the value is called a parameter in the model and there can be only one number in a unidimensional framework. This parameter can then be used in analysis of variance and regression more readily than the raw total score which has floor and ceiling effects.
>
> (*Rasch Analysis*, 2006, p. 1)

Furthermore, the Rasch Model enabled the recognition of the ordinal character of the data (Harwell & Gatti, 2001). Supporting this, Curtis and Ben (2009) cited (Michell, 1997) who affirmed that "measurement demands that responses by individuals to items conform to requirements such as additivity (refer to Chapter Two). Additionally, Curtis and Ben (2009, pp. 6-7) articulated that

> in assessing the conformity of responses to the requirements of measurement, the Rasch model generates fit indicators. Both items and individuals may fail to conform to measurement, and such misfit is revealed by these indicators. Where items fail to conform to measurement requirements, those items are deleted from the analysis. Similarly, where individuals misfit, those individuals may be removed from the analysis, especially when the instrument is being calibrated, as misfitting responses contribute noise rather than information to the calibration process.

Rigour had been added to the validation of the needs analysis instrument by employing the Rating Scale Model, an extension of Partial Credit Model (PCM) in the Rasch family of models. The Rasch measurement model comprised a family of models such as the Rating Scale Model (RSM), Poisson Model (PM), Partial Credit Model (PCM) and Item Analysis Model (IAM). For measures of polytomous response options (more than two) there were a number of models available which include two rating scale models: "*Wright and Master's Rating Scale* model" and "*Andersen's Rating Scale* model" as well as the Partial Credit (Russell et al., 2002, p. 29). Russell et al. (2002, p. 29) explain that "*Wright and Master's Rating Scale* Model assumed that the relative step difficulties within items were equal across items where *Andersen's Rating Scale* model assumed that step difficulties were constant within items". The present study employed *Wright and Master's Rating Scale* model for the validation procedures. The Rating Scale Model (RSM) was generally utilised to analyse Likert-type data (Smith et al., 2008). Smith et al. affirmed that the RSM described the relationship between item difficulty (δ) and person ability (β). Additionally, they implied that

> thresholds are derived for each adjacent response category in a scale. In general, for *k* response categories, there are *k*-1 thresholds. Each threshold has its own estimate of difficulty (F_k). The RSM describes the probability, P_{ni} of a person with ability $\beta_{n'}$ choosing a given category with a threshold F_k and item difficulty δ_i. A single set of thresholds is estimated for all items in a scale.

Linacre (2000) stressed that "if blocks of items all use the same response format, e.g., Strongly Disagree, Disagree, Agree, Strongly Agree, then the test constructors, respondents, and test users all perceive the items to share the same rating scale". Thus it is implied that a Rating Scale Model would be more efficient than a Partial Credit Model (PCM) as PCM operates with the assumption that each item has a different dimension. Masters (1982), proposed that rating scales are a "common method for recording performances on an item by rating students' attempts at the item on a scale (e.g. 1 to 5)" (p. 103).

Masters adds

> rating scales are also common methods of measuring attitudes and personalities… respondents are usually provided with a fixed set of response alternatives like 'never, sometimes, often, always or strongly disagree, agree, strongly agree' to be used with all items in the questionnaire (p. 103).

Additionally, Masters advocated that the Rating Scale Model (RSM) can be used to analyse "questionnaires in which a [likert-type] fixed set of response alternatives like 'strongly disagree', 'disagree', 'agree' and 'strongly agree' was used with every item on the questionnaire" (1982, p. 105). Masters also concluded that in the RSM, "the ordered response levels are not defined by a series of subtasks, but by the fixed set of ordered rating points used

with items. As the same set of rating points is used with every item, the relative difficulties of the steps within each item should not vary greatly from item to item" (p. 162).

The ConQuest, a Rasch-scaling software developed by ACER is used for data analysis in the current study. Lietz and Kotte (2005) cited Adams, Wilson & Wu (1997), Wang, Wilson & Adams (1997) and Loehlin (1998) in suggesting that ConQuest is "an enhancement of the first Rasch-scaling software, QUEST released by ACER in the early 1990s…as it employs a number of additional modules and options carrying the application of Rasch-scaling considerably further" (p. 88).

Keeves and Alagumalai (1999) indicated that "the tests for uni-dimensionality that was widely employed in the use of the Rasch model was the degree of fit of the responses of both the persons and items to the theoretical person and item characteristic curves and the logistic model employed" (p. 32). Athanasou & Lampriana (2002, p. 211) articulated that uni-dimensionality meant that "all the questions of a test measure a single ability…if it behaves as if it measures a single ability". Keeves and Alagumalai further substantiated that

> tests of fit assume that the observed probabilities of response are normally distributed and deviate from the expected or theoretical curve by amounts that can be summed and tested. The theoretical curve is specified by the logistic function which with large enough samples sizes approximates to the normal distribution function can be safely employed.

Additionally Keeves and Alagumalai (1999, p. 24) suggested that chi-square statistics "are not normally distributed, but they can be transformed and standardised to yield a *t*-distribution which is sometimes considered to be easier to interpret with values in excess of 2 being considered statistically significant at the five percent level". The authors, however, hinted that sample sizes can influence this and often the statistics produced are not meaningful for "large cluster samples and small cluster samples of items" (p. 34). With these arguments as the founding principles of the next level of discussion, the infit statistics of the Needs Analysis questionnaire is anlaysed. Keeves and Alagumalai (1999, p. 35) cited Adams and Khoo (1993) who implied that it is "customary for items to be considered to fit the Rasch model if they have *item infit* or *weighted mean square* statistics with the range 0.77 to 1.30 although many researchers would prefer to use a more restricted range from 0.83 to 1.20. It should be noted that the existence of few items on a scale commonly resulted in all persons tending to fit the scale. With a large number of items, the proportion of misfitting persons tended to increase". Athanasou & Lampriana (2002, p. 211) have cited Wright and Linacre (1985) to demonstrate 'Reasonable Question Infit and Outfit Mean-square Ranges'.

Table 11

NOTE:
This table is included on page 337
of the print copy of the thesis held in
the University of Adelaide Library.

Wright and Linacre (1985) cited in Athanasou & Lampriana (2002, p.211)

Athanasou & Lampriana (2002) argued that fit statistics "measure the average mismatch between the responses of the pupils and the Rasch model…the larger infit means square then the larger are the discrepancies between the model and the responses" (p. 210). Additionally, Smith et al. (2008, p. 3) asserted that fit statistics "describe the fit of the items to the model. The mean square fit statistics have a chi-square distribution and an expected value of 1, where fits statistics greater than 1 can be interpreted as demonstrating more variation between the model and the observed scores". Smith et al. (2008, p. 3) added

> a fit statistic of 1.25 for an item would indicate 25% more variation (or noise) than predicted by the Rasch model, in other words there is an underfit with the model…an item with a fit statistic of 0.70 would indicate 30% less variation (or overlap) than predicted or the items overfit the model.

Conversely, Russell et al. (2002) proposed that,

> item-fit-statistics identify items that do not conform to the model. Item-fit-statistics describe how well items measure the underlying attribute of the test. The better the item can reliably discriminate subjects of varying ability the better the item fit… the *infit* statistic describes how well the item measures people with abilities close to the difficulty of the item. The outfit statistic describes how well the item measures people functioning either far above or far below the difficulty (p. 28).

According to Smith et al. (2008, p. 4) both the infit and outfit mean squares were derived from standardised residuals for each item/person interaction. The outfit mean square

> is the average of the standardised residual variance across items and person and is unweighted, meaning that the estimate produced is relatively more affected by unexpected responses distant to item or person measures…The infit mean square residuals are weighted by their individual variance to minimise the impact of unexpected responses far from the measures.

Table 12 displays the fit statistics for the Seven-Factor model.

Table 12

Fit Indices for the Seven-Factor Model

Item	Estimate	Measurement Error	Infit MNSQ	Infit *t*	Outfit MNSQ	Outfit t
GRWKCM1	-0.48	0.054	1.04	0.5	1.04	0.5
GRWKCM2	0.14	0.052	0.90	- 3.0	0.91	-1.2
GRWKCM3	0.59	0.054	1.07	0.9	1.06	0.7
GRWKCM4	-0.50	0.054	0.77	-3.0	0.77	-3.1
GRWKCM5	0.47	0.052	0.86	-1.8	0.87	-1.8
GRWKCM6	-0.58	0.054	0.92	-1.0	0.92	-0.9
GRWKCM57	0.54	0.052	0.96	-0.4	0.98	-0.3
LRNST9	-0.58	0.054	1.13	1.6	1.14	1.7
LRNST29	0.02	0.053	0.96	-0.5	0.98	-0.2
LRNST30	-0.68	0.054	0.99	-0.1	0.98	-0.2
LRNST31	0.13	0.053	0.94	0.8	0.94	-0.7
LRNST32	-0.36	0.053	0.74	-3.6	0.74	-3.6
LRNST33	0.20	0.052	**0.63**	-5.3	**0.64**	-5.2
LRNST34	0.25	0.052	0.93	-0.9	0.93	-0.8
LRNST35	0.25	0.052	1.06	0.7	1.07	0.9
LRNST38	-0.19	0.053	0.89	-1.4	0.90	-1.3
LRNST39	0.58	0.052	0.81	-2.5	0.82	-2.4
LRNST40	-0.14	0.053	0.71	-4.1	0.71	-4.0
LRNST41	-0.12	0.053	0.90	-1.2	0.91	-1.2
LRNST42	0.16	0.052	1.09	1.2	1.10	1.3
MOTSTR10	-0.82	0.054	1.19	2.3	1.19	2.3
MOTSTR12	-0.87	0.054	1.02	0.3	1.02	0.3
MOSTR13	-0.02	0.053	0.95	-0.6	0.96	-0.5
MOTSTR14	-0.26	0.053	1.29	3.4	1.30	3.5
MOTSTR15	-0.76	0.054	1.28	3.4	1.30	3.4
MOTSTR16	-0.66	0.054	1.13	1.6	1.13	1.6
MOTSTR17	-0.52	0.054	1.09	1.1	1.08	1.0
TCCAP18	-0.05	0.053	0.82	-2.4	0.83	-2.3
TCCAP20	-0.02	0.053	0.91	-1.2	0.91	-1.1
TCCAP21	-0.56	0.054	0.88	-1.6	0.88	-1.5
TCCAP22	-0.26	0.053	1.18	2.2	1.21	2.5
TCCAP24	-0.32	0.053	0.79	-2.9	0.80	-2.6
TCCAP25	-0.21	0.053	0.92	-1.0	0.91	-1.1
TCCAP26	-1.18	0.055	0.96	-0.5	0.96	-0.5
TCCAP27	-0.25	0.053	0.83	-2.3	0.84	-2.1
TCCAP43	0.10	0.053	0.86	-1.8	0.87	-1.7
TCCAP45	0.52	0.052	0.88	-1.6	0.89	-1.4
TCCAP46	-0.57	0.054	1.01	0.2	1.03	0.4
STCAP19	0.24	0.052	0.85	-1.9	0.86	-1.7
STCAP28	0.21	0.052	0.90	-1.3	0.91	-1.1
CULLNG11	0.10	0.052	1.12	1.5	1.13	1.6
CULLNG23	0.73	0.051	0.80	-2.6	0.82	-2.4
CULLNG36	0.75	0.051	0.97	-0.4	0.98	-0.2
CULLNG37	0.56	0.052	**0.69**	-4.4	**0.69**	-4.3
DIFLNP8	-0.42	0.053	**1.43**	4.9	**1.44**	4.9
DIFLNP47	0.59	0.052	**1.27**	3.1	**1.27**	3.2
DIFLNP48	0.60	0.052	1.04	0.5	1.05	0.7
DIFLNP49	0.14	0.052	0.87	-1.7	0.88	-1.5
DIFLNP50	0.31	0.052	1.08	1.0	1.08	1.0
DIFLNP51	0.02	0.053	**1.38**	4.3	**1.39**	4.4
DIFLNP52	0.55	0.052	1.29	3.3	1.30	3.5
DIFLNP53	0.93	0.051	**1.71**	7.5	**1.72**	7.5
DIFLNP54	0.96	0.051	**1.34**	4.0	**1.36**	4.1
DIFLNP55	1.09	0.051	1.18	2.2	1.19	2.3
DIFLNP56	0.65	0.388	1.20	2.4	1.21	2.5

*** Deviant values are in bold**

Many researchers cited Adams and Khoo (1993) to suggest that the item infit or Infit MNSQ within the ranges of 0.77 and 1.30 were employed as the acceptable statistics to assess fit. However, these values were more suitable for the 'run-of-the-mill' type of test. Wright and Linacre (1985) cited in Athanasou & Lampriana (2002, p. 211) advocated that rating scale type surveys should employ values in the range of 0.6 to 1.4. These values are more applicable to the context of the current study as the data is collected with an 'attitude scale'

and not a test. The infit as well as outfit MNSQ for [GRWKCM or group work and communication] are within the range of 0.6 and 1.4 thus indicating that the measurement highlighted a consistency in fit of students to the item characteristics curve for each of the items.

Additionally, researchers sometimes report the *t-value*. Acceptable values for *t,* range from -2 to +2 ($p < .05$). Values greater than +2 are termed underfitting and those less than -2 as over-fitting. '*t*-value' is more sensitive to the influence of outlying scores. The infit *t*-value for two items in [GRWKCM]: 'GRWKCM2' and 'GRWKCM4' are smaller than -2, hence, indicating that the responses of the students were too determined and that there was too little variation, resulting in an overfit (Bond & Fox, 2007, p. 239). The outfit *t*-value for 'GRWKCM4' is <-2 indicating an overfit as well. As the infit t-value was sensitive to sample size and outfit statistics was "affected by unexpected responses distant to item or person measures" Smith et al., 2008, p.4) a decision was made to examine other fit statistics (Wu & Adams, 2007) before making a choice on whether to reject the items. Wu & Adams (2007, p. 64) advocated that the discrimination index indicated how well each item performed in measuring the latent (unobserved) variable. The item discrimination index (refer to Appendix 7.3) for the seven items: 'GRWKCM1, GRWKCM2, GRWKCM3, GRWKCM4, GRWKCM5, GRWKCM6 and GRWKCM57' range from 0.51 to 0.64. The discrimination index was the "correlation between the person's score on the item and their total score on the questionnaire" (Wu & Adams, 2007, p. 64). Wu and Adams implied that

> if this item reflects well the level of autonomy (for which the total score on the questionnaire is a surrogate measure), then one would expect a high correlation between the score on this item and the total score on the questionnaire. A discrimination value of 0 indicates that there is no relationship between the item score and the total score. A positive discrimination indicates a positive relationship. The higher the discrimination index, the better the item is able to discriminate between people. One would not accept any item discrimination index less than 0.2. It is preferable to select those above 0.4.
>
> (Wu & Adams, 2007, p. 64)

The discrimination index for the seven items indicate that the items are positively discriminating between people. Scruggs and Mastropieri (2006, p. 59) stated that in Item Response Theory (IRT) "the higher the discrimination index, the steeper the item characteristic curve (ICC) is at the location of item difficulty. The item characteristic curve (ICC) plots the probability of agreeing with an item as a function of the magnitude of the latent trait underlying the performance on the test items. The ICC is assumed to have an s-shape (see Scruggs and Mastropieri, 2006). Furthermore, the item deltas, sometimes referred

to as item difficulty, for the seven items are ordered. This reflected that the items are fitting the model. In addition, the separation reliability for the items in [GRWKCM] is 0.99. Separation reliability was the proportion of the observed variance that was considered true. What this fit statistic does is that it indicates the amount of 'noise' in the data that is perceived as error in the measurement. The higher the value of the separation reliability, the lower the measurement error (Linacre, 2000). In this instance the high separation reliability demonstrated that the error in measurement was low (Adams & Khoo, 1993). The analysis continued with the examination of the latent variable map to study the distribution pattern of the items and responses. Figure 6 illustrates the variable map for [GRWKCM].

Figure 6 indicates that three items: 'GRWKCM2', 'GRWKCM5' and 'GRWKCM57' were located between logit scale 0 and 1. These items were more difficult than 'GRWKCM1', 'GRWKCM3', 'GRWKCM4' and 'GRWKCM6, which were located below 0 the mean of the difficulty level of the items. The students' abilities were higher than item difficulty. The items were modestly discriminating between high and low ability students. All the different fit statistics for [GRWKCM] with the exception of infit-*t* indicated that the items fitted the model. This motivated the researcher not to reject any of the items in [GRWKCM].

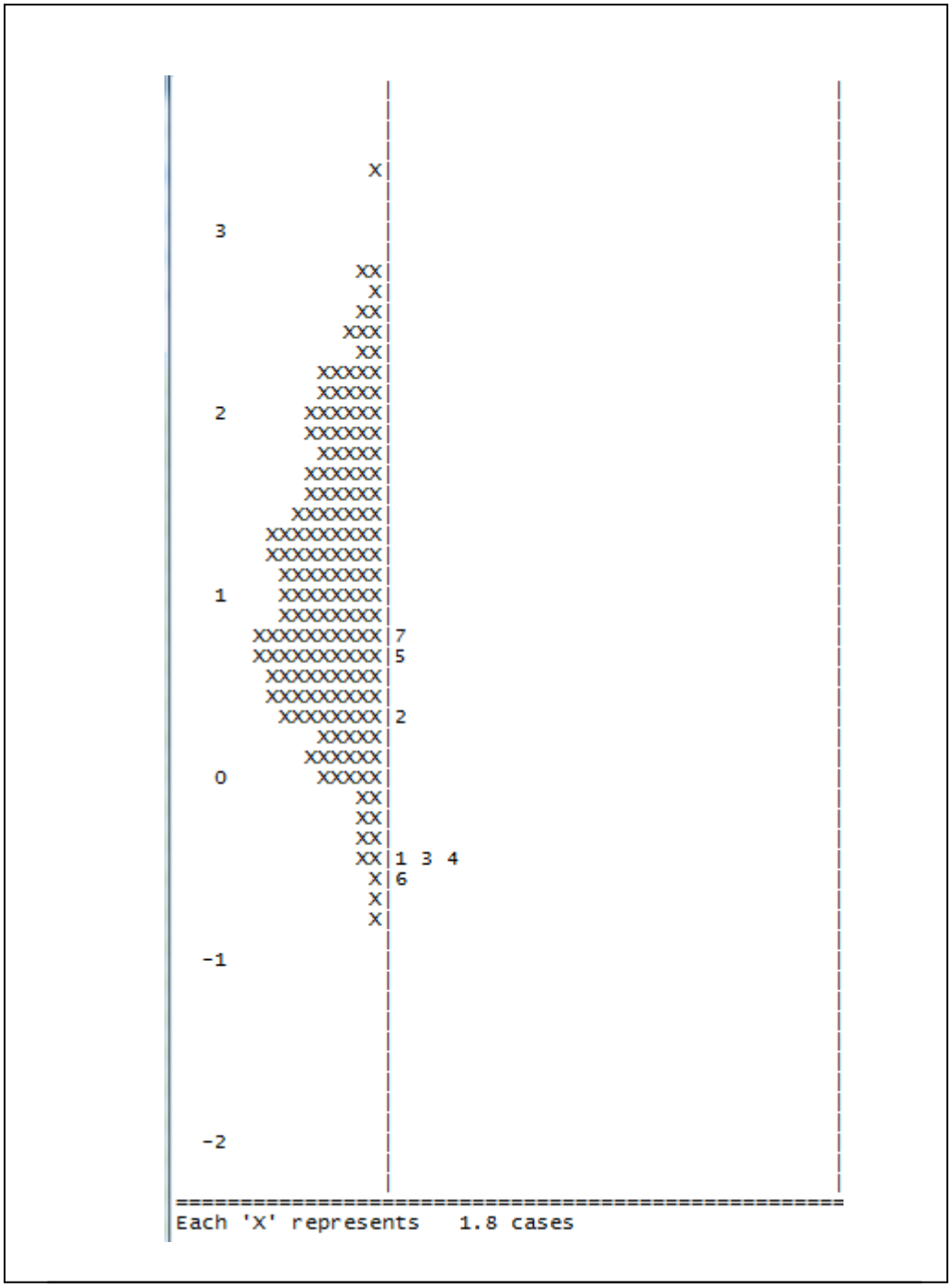

Figure 6. Latent Variable Map of [GRWKCM]

All the 13 items for [LRNST or learning strategies]: reflected infit as well as outfit MNSQs that were within the acceptable range of 0.6 and 1.4. However, the infit and outfit *t* for four items: 'LRNST32, LRNST33, LRNST39, and LRNST40' were < -2 thus over-fitting the model as well as indicating that the students' responses were too determined. As fit statistics are sample size, test (questionnaire) length as well as unidimensionality dependent, one cannot reject items that reflect high indices at the first instance (Hawthorne et al.,2008). Hawthorne et al. (2008) suggest that small sample sizes may contribute to misfitting items.

Working on Hawthorne et al. and Wu and Adams' (2007) premise that other fit statistics should be assessed before rejecting items, the researcher of the current study proceeded to examine the item deltas. The item deltas for all the items in [LRNST] were ordered, thus indicating that the items were not misfitting the model. Additionally, the item discrimination index (refer to Appendix 7.3) for the 13 items ranged from 0.37 to 0.62. The items were discriminating between high and low ability students. More pertinently, the separation reliability for 'learning strategies or LRNST' was 0.98, thus highlighting that the 'noise' in the data was low. The next step in the process was to examine the latent trait variable map. Figure 7 depicts the latent trait variable map for [LRNST].

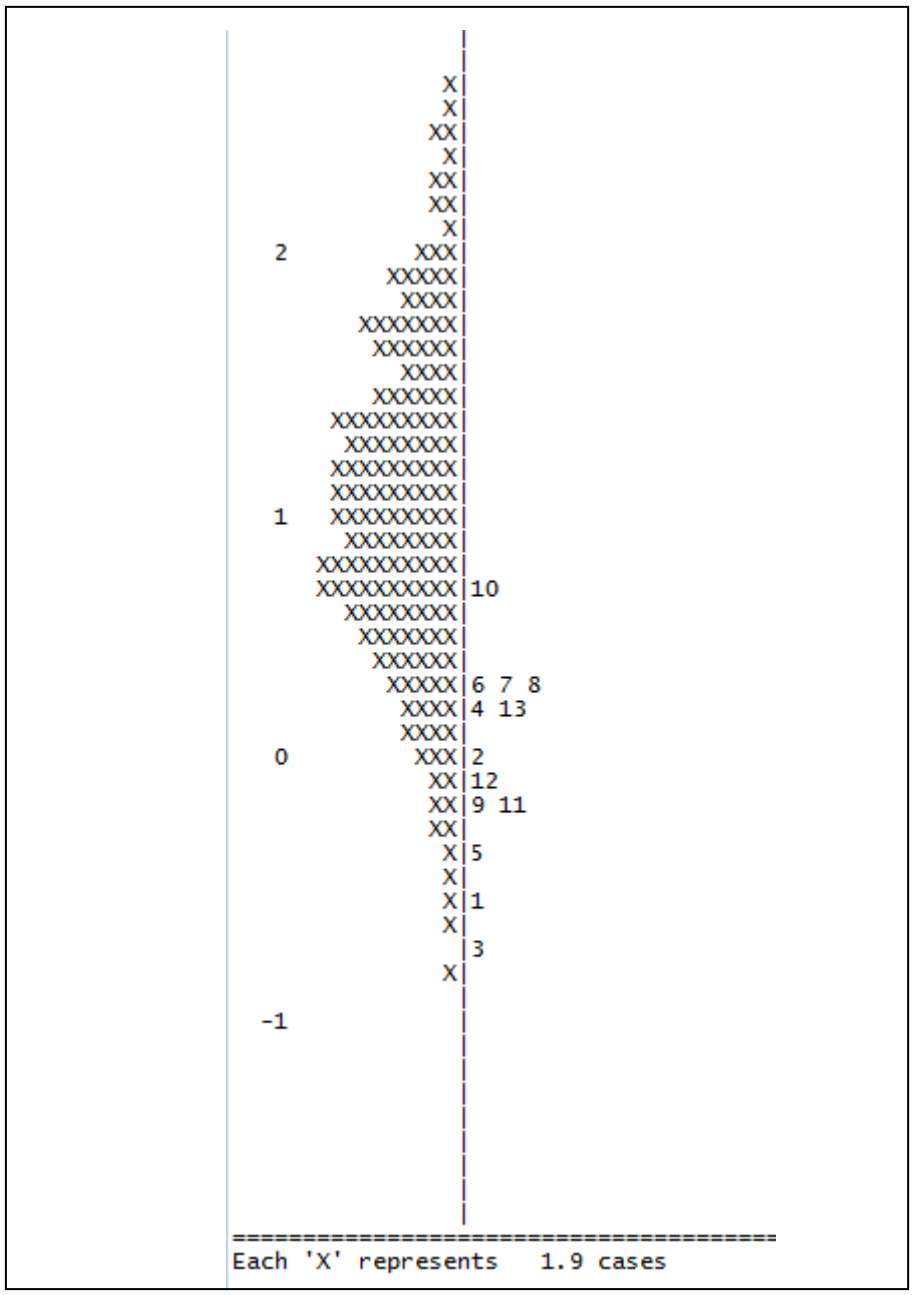

Figure 7. Latent Variable Map of [LRNST]

In Figure 7, the logit scale was shown on the left and the performance of student responses was represented by 'x'. The difficulty of each of the numbered items was shown on the right (Thompson, 2008, p. 147). Six items are located above 0, the mean of the difficulty level of the items and six below. Item 10 or LRNST39 is particularly difficult and LRNST30 which is item three is easier for the students. Item two or LRNST29 is located at logit scale 0 thus not conveying much information about both item difficulty and person ability. Piquero et al. (2000) stated that items bunched in the middle, i.e. around the mean of the difficulty level, were undistinguishable because they were not providing much information about the item. The variable map demonstrates that the student ability was higher than item difficulty. The projection of all these fit indices have justified that the 13 items in [LRNST] are fitting the model. The researcher decided not to reject any of the items in [LRNST].

All the seven items in [MOTSTR or nature and strength of motivation] reflect infit and outfit MNSQ as well *t*-values that are within the recommended range. The separation reliability for [MOTSTR] is 0.974 and the discrimination index (refer to Appendix 7.3) for the seven items: 'MOTSTR10', 'MOTSTR12', 'MOTSTR13', 'MOTSTR14', 'MOTSTR15', 'MOTSTR16' and 'MOTSTR17' range from 0.54 to 0.70, thus modestly discriminating between high ability and low ability students. Figure 8 depicts the latent variable map for [MOTSTR].

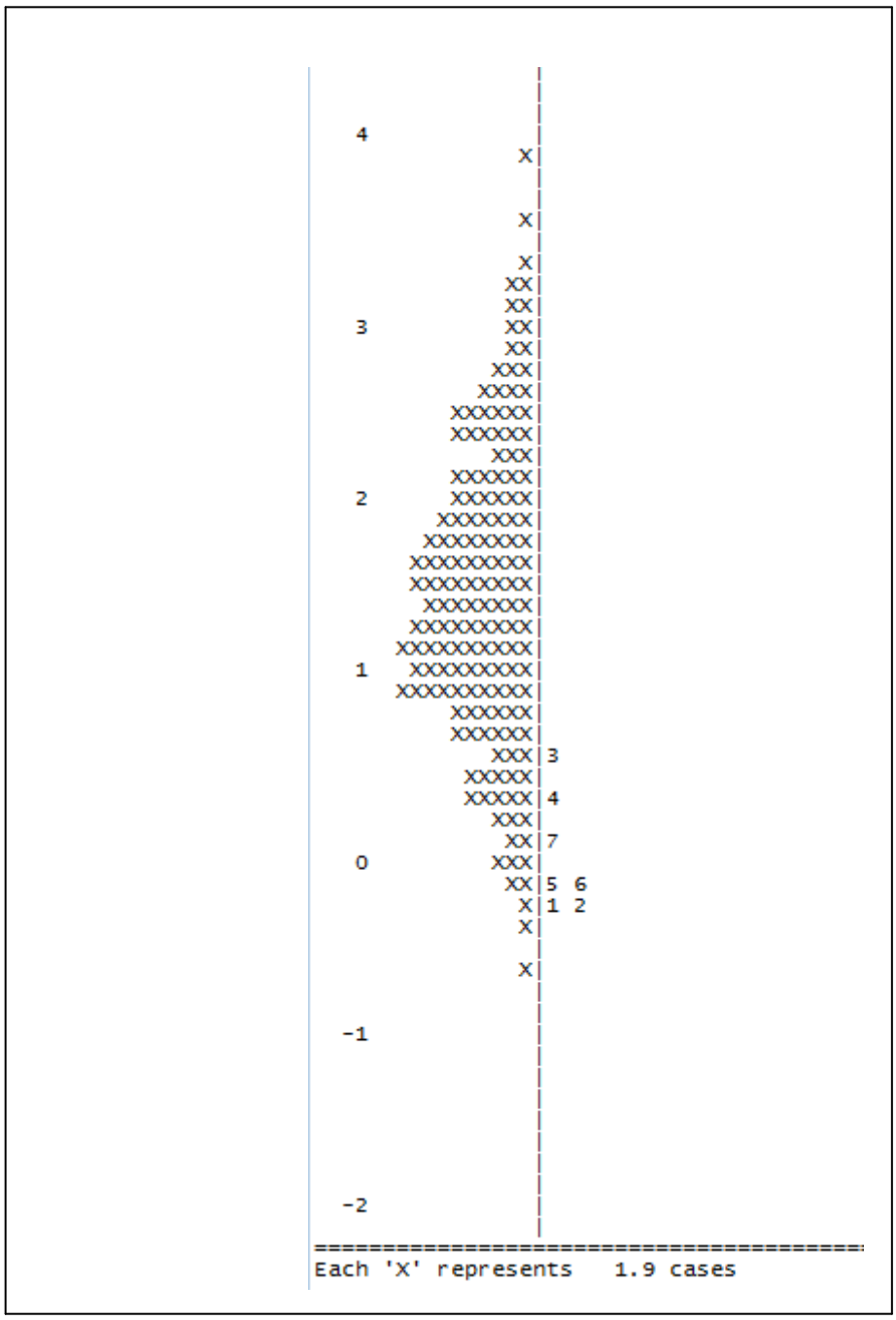

Figure 8. Latent Variable Map for MOTSTR

Figure 8 indicates that three items in the 'nature and strength of motivation or MOTSTR] factor: MOTSTR13 or item 3, MOTSTR14 or item 4 and MOTSTR17 or item seven are above logit scale 0 and three: MOTSTR10 or item 1, MOTSTR12 or item 2, MOTSTR15 or item 5 and MOTSTR16 or item 6 are below. From the variable map, it can be surmised that the ability of the students are clearly higher than the difficulty of the items.

For [TCCAP or teacher-centred approach], four items, ‘TCCAP18’, ‘TCCAP22’, ‘TCCAP24’ and ‘TCCAP27’ although having infit and outfit MNSQs that are in the 0.6 and 1.4 range, display infit *t* > +2 or <-2 compelling further analysis. The analysis continued with the examination of the item deltas, discrimination index as well as the separation reliability. The analysis of the various indices demonstrated that the item deltas are ordered and that there are no over-swapping of deltas. Moreover, the discrimination index (refer to Appendix 7.3) range between 0.41 and 0.59, modestly discriminating between high ability and low ability students. A separation reliability of 0.99 indicates low measurement error. The latent variable map is further analysed for investigation of item performance. The latent trait variable map in Figure 9 illustrates the distribution of both the item and student responses for [TCCAP].

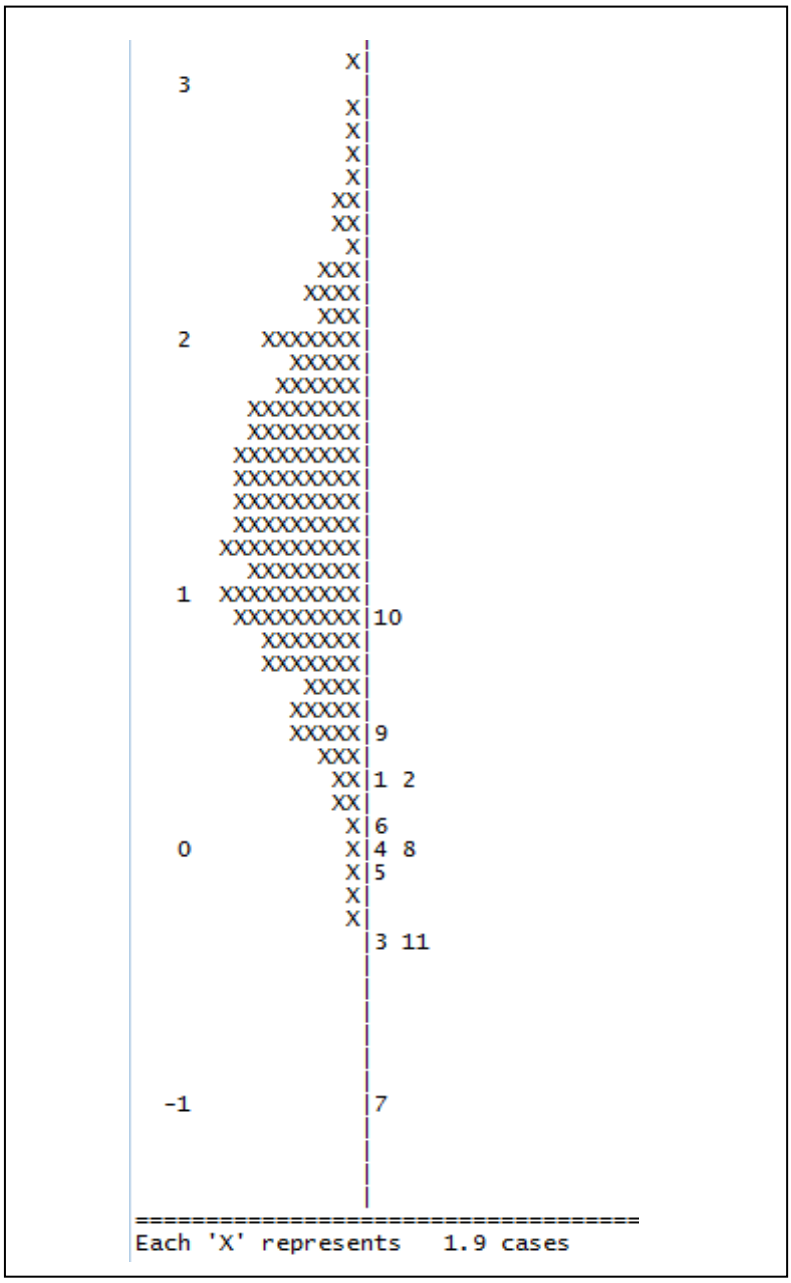

Figure 9. Latent Variable Map for [TCCAP]

Figure 9 demonstrates that two items: 'TCCAP22' and 'TCCAP27' are located at logit scale 0, the mean of the difficulty level of the items, thus not conveying much information about item difficulty or student ability. Items: 5-TCCAP24', '3-TCCAP21', '11-TCCAP46' and '7-TCCAP26' are below logit scale 0. These items are easier than the other five items which are above logit scale 0. Item seven or 'TCCAP26' is the easiest. The easy and difficult items are well distributed. From the variable map we can conclude that the students' ability is relatively higher than the items. The examination of the various fit indices has motivated the researcher of the current study not to reject any of the items.

The infit and outfit MNSQ as well as *t-values* for [STCAP or student-centred approach] are in the acceptable range. However, two items in [CULLNG or culture learning in EFL]: 'CULLNG23' and 'CULLNG37' although reflecting acceptable infit and outfit MNSQ, are demonstrating infit $t < -2$. This necessitated a closer examination of the other features of the fit statistics. The item deltas are ordered, hence, indicating that there is no serious problems with the items. The discrimination index (refer to Appendix 7.3) of the four items reflect a range of 0.60 to 0.69. These values emphasise that the items are modestly discriminating between the high ability and low ability students. Additionally, the separation index for the four items is 0.98, implying low measurement error or 'noise' in the data. Figure 10 depicts the latent variable map for [CULLNG].

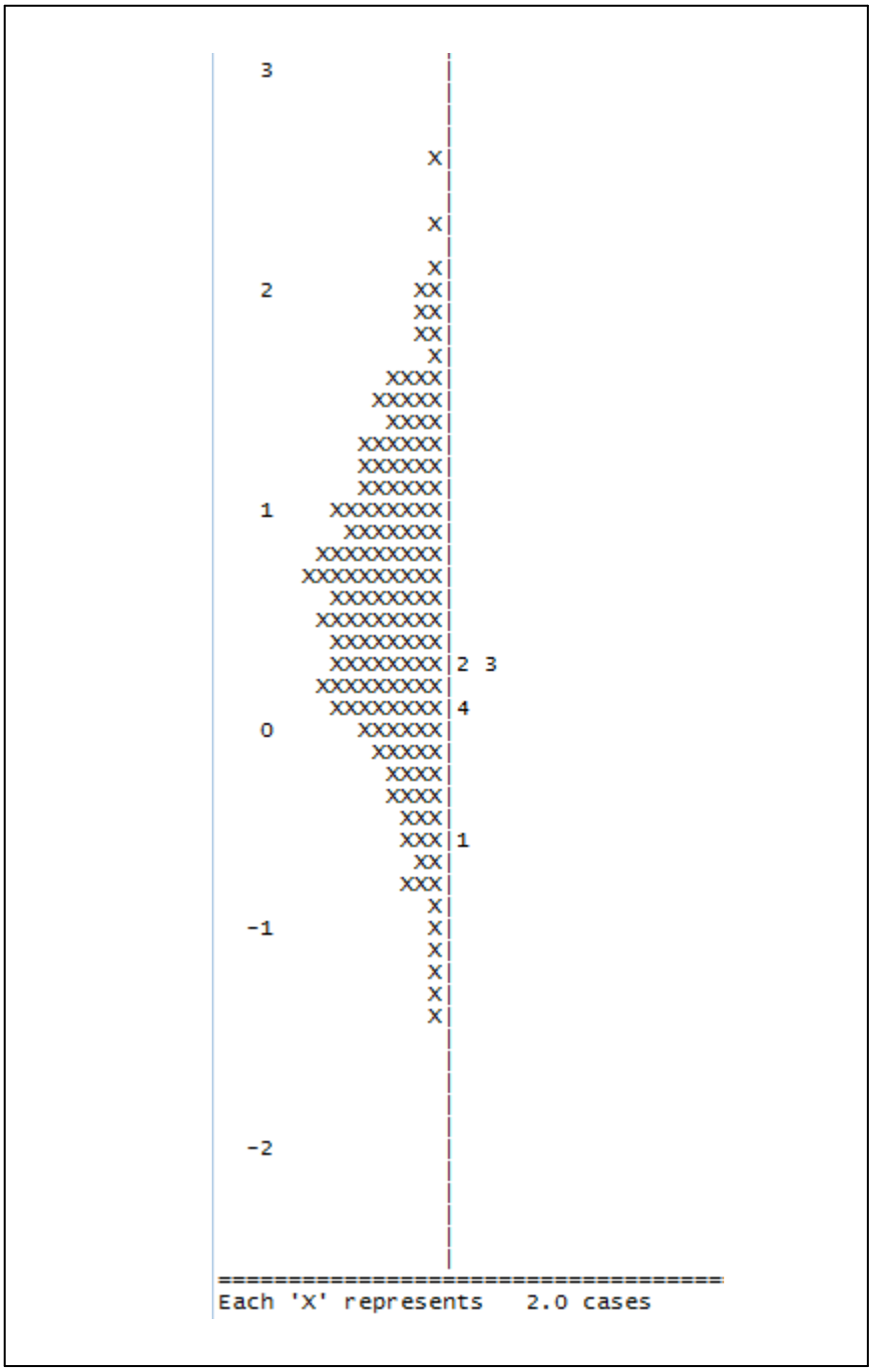

Figure 10. Latent Variable Map of [CULLNG]

Figure 10 illustrates that the three items: '2-CULLNG23', '3-CULLNG36' and 4-CULLNG37' are located above logit scale 0, the mean of the difficulty level of the items. Item 1 or 'CULLNG11' appears to be the easiest item in the scale. Items '2-CULLNG23' and '3-CULLNG36' are the most difficult. Students' abilities are distributed between -1.5 and +2.5. The variable map is highlighting that the items are modestly discriminating between high ability and low ability students. The researcher decided not to reject any of the items in this factor based on all these rationalization.

The analysis continues with the examination of the infit and outfit MNSQ for all the items in [DIFLNP or difficulties encountered in the learning process]. The infit and outfit MNSQs for 9 items, are within the acceptable range of 0.6 and 1.4. Two item; 'DIFLNP8' and 'DIFLNP53' are outside the range. Additionally, eight items: 'DIFLNP8', 'DIFLNP47', 'DIFLNP51', DIFLNP52', DIFLNP53, 'DIFLNP54', DIFLNP55' and 'DIFLNP56' demonstrate infit as well as outfit *t*-values which are greater than +2, thus idnicating a haphazard response pattern as well as too much of variation, resulting in underfit of the data to the model. On the other hand, the item deltas or item difficulties are ordered. There is no over-swapping of item difficulties. The discrimination index (refer to Appendix 7.3) range from 0.35 to 0.60. This indicates that the items are moderately discriminating between the high and low ability students. The separation reliability for the 11 items is 0.99, indicating low measurement error. Figure 11 depicts the latent variable map for [DIFLNP].

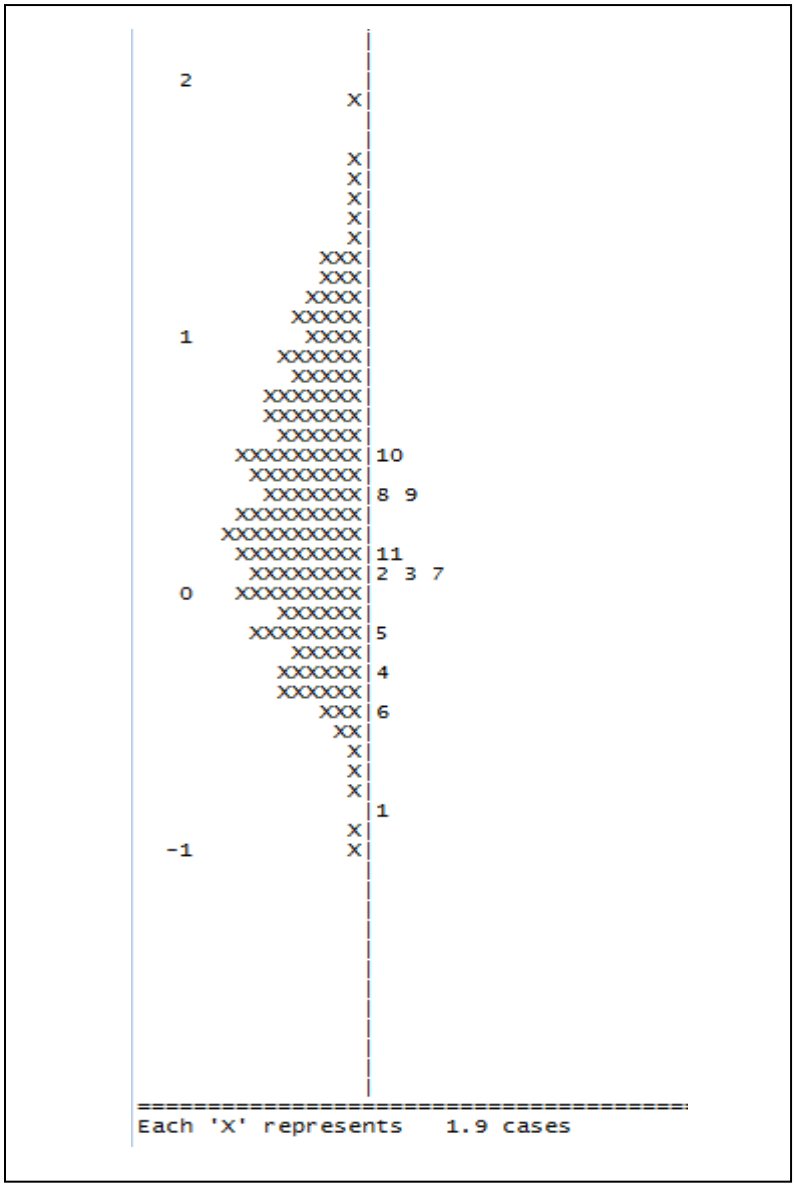

Figure 11. Latent Variable Map for [DIFLNP]

As illustrated in Figure 11, items: '10-DIFLNP55', '8-DIFLNP53', '9-DIFLNP54', '11-DIFLNP56', '2-DIFLNP47', '3-DIFLNP48', '7-DIFLNP52' are above logit scale 0. These items are more difficult than items '5-DIFLNP50', '4-DIFLNP49', '6-DIFLNP51' and '1-DIFLNP8'. All the items are modestly discriminating between high ability and low ability students. Additionally, the items are distinctly distributed between logit scales -1 and +1. The variable map demonstrates that the students are responding to both the easy items and difficult items. As the infit t-value was sensitive to sample size and outfit statistics was "affected by unexpected responses distant to item or person measures" (Smith et al., 2008, p.4) it is decided not to reject any of the items.

Validation of the Needs Analysis questionnaire indicates that at the item level, although some of the items reflect infit and outfit *t*-values > +2 or < -2, the other features of the fit demonstrate that the items are fitting the model. The researcher of the current study opted to retain all of the 55 items in the Needs Analysis questionnaire. The final structure of the questionnaire that is employed in this research is displayed in Table 13.

Table 13

Nallaya's (2009) Needs Analysis Questionnaire Structure

FACTOR	ITEM
GRWKCM: (Group work and communication)	GRWKCM1 GRWKCM2 GRWKCM3 GRWKCM4 GRWKCM5 GRWKCM6 GRWKCM57
LRNST: (Learning strategies)	LRNST9 LRNST29 LRNST30 LRNST31 LRNST32 LRNST33 LRNST34 LRNST35 LRNST38 LRNST39 LRNST40 LRNST41 LRNST42
MOTSTR: (Nature of motivation and strength)	MOTSTR10 MOTSTR12 MOTSTR13 MOTSTR14 MOTSTR15 MOTSTR16 MOTSTR17
TCCAP: (Teacher-centred approach)	TCCAP18 TCCAP20 TCCAP21 TCCAP22 TCCAP24 TCCAP25 TCCAP26 TCCAP27 TCCAP43 TCCAP45 TCCAP46
STCAP: (Student-centred approach)	STCAP19 STCAP28
CULLNG: (Culture learning in EFL)	CULLNG11 CULLNG23 CULLNG36 CULLNG37
DIFLNP: (Difficulties encountered in the learning process)	DIFLNP8 DIFLNP47 DIFLNP48 DIFLNP49 DIFLNP50 DIFLNP51 DIFLNP52 DIFLNP53 DIFLNP54 DIFLNP55 DIFLNP56

Summary

This chapter focuses on the procedures employed to validate Xiao's (2003) Needs Analysis questionnaire. The chapter begins with a discussion on Confirmatory Factor Analysis (CFA). In this section, three frameworks are described: Strictly Confirmatory (SC), Alternative Models (AM) as well as Model Generating (MG). Two important concepts are

also introduced: the measurement and structural models as well as the contexts in which they are employed. The discussion proceeds with a detailed description of Xiao's (2003) Needs Analysis questionnaire. The manifest or observed variables as well as latent variables utilised by Xiao (2003) is described in detail. This is followed with a rationale of why Confirmatory Factor Analysis (CFA) is employed in the present research study.

Employing the CFA, Xiao's (2003) 12-Factor Model is tested to investigate if it fit the sample data. The models are assessed for fit. The analysis of the indices demonstrates only a mediocre fit of the sample data. Moreover, some the latent variables are measured only by one observed variable. Additionally, there are 12 latent variables, which literature implied as too many (Marsh et al. (1998) cited in Diamantopoulos & Siguaw (2000). More pertinently, some of the observed variables are not assigned to any latent variables. The factor loadings for Xiao's (2003) 12-Factor model are also relatively low. All these aspects motivates a restructure the latent variables. Some of the observed variables are reassigned and others are dropped because of low factor loadings as well as Alpha Cronbach's reliability indices. This results in seven latent variables with each having at least a minimum of two observed variables. This is followed by the testing of alternative models, namely, the One-Factor, Seven-Factor correlated, Hierarchical as well as Nested Models. The One-Factor model is rejected based on the fit indices. The Seven-Factor correlated model appears to demonstrate a marginally improved fit to the sample data compared to Xiao's (2003) 12-Factor model. The indices for the Seven-Factor Model, Hierarchical Model and Nested Model are compared. All the models demonstrate acceptable fits. But, the Nested Model demonstrated the best fit.

Since a decision has to be made on the best model that will guide the analysis of data in this research, it is decided that both the Seven-Factor correlated and the Hierarchical Models would be employed to guide further analysis of the sample data for reasons of model parsimony as well as the similar indices that both these model share. Although, the Nested Model demonstrates the best fit to the sample data, it is a complex model. Literature emphasises that the more complex a model is, the more 'noise' the analysis would create.

The discussion continues with a description of Item Response Theory's (IRT) Rasch Model which is used to conduct item level analysis. The Rating Scale Model, a model commonly used for polytomous scales is employed to run the analysis. The analysis indicates that although some of the items demonstrate *t*-values >+2 or <-2, based on infit and outfit MNSQs, item deltas, discrimination indices as well as the separation reliabilities, none of the

items are rejected at the item level analysis. Hence, the items listed below constitute the final structure of the Needs Analysis questionnaire:

Latent Variable [GRWKCM] : GRWKCM1, GRWKCM2, GRWKCM3, GRWKCM4, GRWKCM5, GRWKCM6, GRWKCM57

Latent Variable [LRNST]: LRNST9, LRNST29, LRNST30, LRNST31, LRNST32, LRNST33, LRNST34, LRNST35, LRNST38, LRNST39, LRNST40, LRNST41, LRNST42

Latent Variable [MOTSTR]: MOTSTR10, MOTSTR12, MOTSTR13, MOTSTR14, MOTSTR15, MOTSTR16, MOTSTR17

Latent Variable [TCCAP]: TCCAP18, TCCAP20, TCCAP21, TCCAP22, TCCAP24, TCCAP25, TCCAP26, TCCAP27, TCCAP43, TCCAP45, TCCAP46

Latent Variable [STCAP]: STCAP19, STCAP28

Latent Variable [CULLNG]: CULLNG11, CULLNG23, CULLNG36, CULLNG37

Latent Variable [DIFLNP]: DIFLNP8, DIFLNP47, DIFLNP48, DIFLNP49, DIFLNP50, DIFLNP51, DIFLNP52, DIFLNP53, DIFLNP54, DIFLNP55, DIFLNP56

Thus in reporting about the Needs Analysis, students' perceptions in the seven areas, vis-à-vis, group work and communication, learning strategies, nature and strength of motivation, teacher-centred approach, student-centred approach, culture learning in EFL as well as difficulties encountered in the learning process, would be provided

Communalities for the Author's 12-Factor Model

Communalities

	Initial	Extraction
GRWKCM1	1.000	.49
GRWKCM2	1.000	.68
GRWKCM3	1.000	.60
GRWKCM4	1.000	.58
SPKCRM5	1.000	.58
SPKCRM6	1.000	.56
SPKCRM7	1.000	.67
SPKCRM9	1.000	.56
SPKCRM57	1.000	.64
COMSTR29	1.000	.63
COMSTR31	1.000	.58
COMSTR32	1.000	.60
SOCSTR33	1.000	.54
SOCSTR34	1.000	.67
SOCSTR35	1.000	.70
MOTSTR10	1.000	.67
MOTSTR12	1.000	.62
MOTSTR13	1.000	.68
MOTSTR14	1.000	.72
MOTSTR15	1.000	.60
MOTSTR16	1.000	.68
MOTSTR17	1.000	.75
TCCAP18	1.000	.65
STCAP19	1.000	.57
COMACT21	1.000	.62
COMACT22	1.000	.67
COMACT25	1.000	.54
NCOMAC20	1.000	.60
NCOMAC24	1.000	.51
NCOMAC42	1.000	.67

CULLNG11	1.000	.69
CULLNG23	1.000	.62
CULLNG36	1.000	.70
CULLNG37	1.000	.67
AUTHCR43	1.000	.65
AUTHCR44	1.000	.61
AUTHCR45	1.000	.63
AUTHCR46	1.000	.53
DIFLNP40	1.000	.65
DIFLNP41	1.000	.68
DIFLNP47	1.000	.60
DIFLNP48	1.000	.62
DIFLNP49	1.000	.62
DIFLNP50	1.000	.64
DIFLNP51	1.000	.61
DIFLNP52	1.000	.66
DIFLNP53	1.000	.64
DIFLNP54	1.000	.69
DIFLNP55	1.000	.65
DIFLNP56	1.000	.63

Extraction Method: Principal Component Analysis.

Appendix 7.3

Discrimination Indices of Needs Analysis

Item	Discrimination Index
GRWKCM1	0.59
GRWKCM2	0.59
GRWKCM3	0.62
GRWKCM4	0.59
GRWKCM5	0.64
GRWKCM6	0.57
GRWKCM57	0.51
LRNST9	0.39
LRNST29	0.37
LRNST30	0.56
LRNST31	0.44
LRNST32	0.52
LRNST33	0.56
LRNST34	0.60
LRNST35	0.46
LRNST38	0.57
LRNST39	0.47
LRNST40	0.53
LRNST41	0.62
LRNST42	0.51
MOTSTR10	0.54
MOTSTR12	0.65
MOSTR13	0.62
MOTSTR14	0.55
MOTSTR15	0.58
MOTSTR16	0.70
MOTSTR17	0.67
TCCAP18	0.46
TCCAP20	0.52
TCCAP21	0.56
TCCAP22	0.43
TCCAP24	0.41
TCCAP25	0.50
TCCAP26	0.59
TCCAP27	0.58
TCCAP43	0.50
TCCAP45	0.43
TCCAP46	0.54
STCAP19	0.82
STCAP28	0.83
CULLNG11	0.60
CULLNG23	0.63
CULLNG36	0.69
CULLNG37	0.65
DIFLNP8	0.35
DIFLNP47	0.57
DIFLNP48	0.50
DIFLNP49	0.33
DIFLNP50	0.51
DIFLNP51	0.57
DIFLNP52	0.60
DIFLNP53	0.56
DIFLNP54	0.55
DIFLNP55	0.59
DIFLNP56	0.36

Validation of Multimodal and Language Proficiency Questionnaire Through Confirmatory Factor Analysis

Previous research emphasises that media and technology have a strong influence on the lives of youth. Scholars and researchers who see multimodal texts as the alternative language teaching resource recommend its use in the classroom. They contend that learners do not have problems alternating between one mode and another. Learners, it appeared can "easily combine and move between drama, art, text, music, speech, sound, physical movement, animation/gaming, etc." (NCTE guideline, 2004, p. 1). As the present study investigates 'The Impact of Multimodal Texts on the Development of English Language Proficiency', it is imperative to explore the language behaviours of the participants of the study in relation to how often they use English to listen, speak, read and write multimodal texts in their every day lives as well as perceptions with regard to their proficiency when indulging in these activities; frequency of English use for university activities and their perceptions of proficiency when carrying out these activities. It is also intended to investigate how participants rate their English language proficiency in every day communication employing both print and multimodal texts to listen, speak, read and write.

Multimodal and Language Proficiency Questionnaire

The Language Centre in the Hong Kong University of Science and Technology's (LTCFIT) Placement Facility and Needs Analysis (2006) questionnaire is adapted to collect data for the present study. The adapted instrument is named Multimodal and English Language Proficiency (MMLP) questionnaire. 316 pre-service teachers enrolled in the Communicative English One (CE1) course are participants of the study. This chapter discusses the validation processes of the instrument. The Multimodal and English Language Proficiency (MMLP) questionnaire comprises eight sections which are categorized as a) personal information, b) academic and professional qualifications, c) use of technology, d) frequency of multimodal texts use in English for activities in daily life, e) frequency of English use for university activities f) perceptions of proficiency for the use of multimodal texts in English, g) perceptions of proficiency for university activities, and h) perceptions of proficiency for everyday communication. Section A and B of the questionnaire investigates respondents' personal information as well as academic qualifications. In Section C of the instrument, the researcher asks ten 'Yes/No' questions in relation to the types of information technology they have access to inside and outside the university. The factor name given to this section is [USETEC]. Section

D of the questionnaire has 29 items that investigates the 'frequency of English language use to operate multimodal texts' in students' daily life and is supported by a five-point Likert-type scale response ranging from 1. Hardly ever 2. Occasionally 3. Sometimes 4. Quite often to 5 Very often. This section of the questionnaire is given the factor name [FRMENG]. The items for factors [USETEC] and [FRMENG] are presented in Table 1 and Table 2.

Table 1

Items for the [USETEC] factor

Factor	Items
USETEC	1. I have a computer at home. 2. I have a laptop / notebook. 3. I have access to a computer at the university. 4. I have Internet at home. 5. I am able to access the Internet at the university. 6. I have a cell phone. (If the response is no, skip the next two statements) 7. I use my cell phone to make calls more than to text messages. 8. I use my cell phone to text messages more than to make calls. 9. I have a television at home. 10. I have DVD player at home.

Table 2

Items for the [FRMENG] factor

Factor	Item
FRMENG	How often do you use English for the following activities in your daily life? 1. watching TV / videos / films 2. listening to radio broadcasts 3. communicating with family members 4. communicating with domestic help 5. socialising with friends 6. reading newspapers and magazines 7. reading stories / novels 8. searching web sites for information 9. reading / writing letters 10. reading / writing emails 11. read picture books / information texts 12. listening to talking books 13. reading CD-ROM narratives and factual texts 14. reading/viewing web quests /book raps 15. playing video games 16. watching DVDs 17. watching VCDs or DVDs with subtitles in English 18. reading discussion boards 19. writing in the discussion boards 20. chatting in chat rooms 21. listening to iPods 22. producing power point presentations 23. producing digital photos / video clips 24. reading blogs 25. writing blogs 26. producing WIKIS / MUDS 27. producing videos / video editing 28. producing animation / movie-maker 29. writing sms / mms messages

Section E investigates the 'frequency of English language use for the listed university activities'. The factor name for this section is [FRENGUS]. Nine items: frengus1 – frengus9 with a five-point Likert-type scale response ranging from 1. Hardly ever 2. Occasionally 3.

Sometimes 4. Quite often to 5 Very often, are used to collect data. The items for [FRENGUS] are presented in Table 3.

Table 3

Items for the [FRENGUS] Factor

Factor	Items
FRENGUS	How often do you use English for the following university activities? 1. learning in the Communicative English One classroom 2. learning in your study program 3. taking part in extra-curricular activities 4. conducting or participating in meetings 5. participating in group discussions 6. listening to lecturers, discussion or seminars 7. writing letters / faxes / reports 8. writing emails 9. reading reports / minutes of Meetings

Section F explores respondent's 'perception on how they rate their English language proficiency for the 29 listed activities'. This section is assigned the acronym [PPFMEN] and measured with observed variables or items ppfmen1-29. Respondents have to choose from a five-point Likert-type scale response ranging from: 1. Poor 2. Less than adequate 3. Adequate 4. Good Quite to 5. Excellent. As [PPFMEN] is a latent variable, CFA procedures are used to validate this section of the questionnaire. The items for [PPFMEN] are presented in Table 4.

Table 4

Items for the factor [PPFMEN]

Factor	Items
PPFMEN	How do you rate your English language proficiency for the following activities? 1. watching TV / videos / films 2. listening to radio broadcasts 3. communicating with family members 4. communicating with domestic help 5. socialising with friends 6. reading newspapers and magazines 7. reading stories / novels 8. searching web sites for information 9. reading / writing letters 10. reading / writing emails 11. read picture books / information texts 12. listening to talking books 13. reading CD-ROM narratives and factual texts 14. reading/viewing web quests /book raps 15. playing video games 16. watching DVDs 17. watching VCDs or DVDs with subtitles in English 18. reading discussion boards 19. writing in the discussion boards 20. chatting in chat rooms 21. listening to iPods 22. producing power point presentations 23. producing digital photos / video clips 24. reading blogs 25. writing blogs 26. producing WIKIS / MUDS 27. producing videos / video editing 28. producing animation / movie-maker 29. writing sms / mms messages

Section G investigates 'respondents' perceptions regarding English language proficiency for nine listed university activities' and a five-point Likert-type scale response of 1. Poor 2. Less than adequate 3. Adequate 4. Good Quite and 5. Excellent are used to elicit the information.

Observed variables or items ppfenus1-9 set out to measure [PPFENUS]. The items for [PPFENUS] are presented in Table 5.

Table 5

Items for [PPFENUS]

Factor	Items
PPFENUS	How do you rate your English language proficiency for the following university activities? 1. learning in the Communicative English One classroom 2. learning in your study program 3. taking part in extra-curricular activities 4. conducting or participating in meetings 5. participating in group discussions 6. listening to lecturers, discussion or seminars 7. writing letters / faxes / reports 8. writing emails 9. reading reports / minutes of meetings

The final section of the questionnaire, Section H, examines 'how respondents rate their English language proficiency in everyday communication' through [PPFEDCM]. Observed variables ppfedcm1-9 set out to measure [PPFEDCM] through a five-point Likert-type scale response of 1. Poor 2. Less than adequate 3. Adequate 4. Good Quite and 5. Excellent. The items for [PPFEDCM] are presented in Table 6. The reason this instrument is chosen to investigate multimodal and language proficiency behaviours of respondents in the present study is that the instrument indicates the relevant observed variables that can measure the latent variables which this research study wishes to investigate.

Table 6

Items for [PPFEDCM]

Factor	Items
PPFEDCM	How do you rate your English language proficiency in everyday communication? 1. reading print texts 2. reading multimodal texts 3. writing print texts 4. writing multimodal texts 5. listening 6. listening to multimodal texts 7. classroom language 8. speaking face-to-face 9. speaking in chat rooms

The factors discussed above can be organised into the following categories:

(a) 10 items elicits information for [USETEC]: usetec1 to usetec10
(b) 29 items contribute to [FRMENG- frequency of multimodal texts use in English for activities in daily life]: frmeng1 to frmeng9;
(c) Nine items contribute to [FRENGUS- frequency of English use for university activities]: frengus1 to frengus9;
(d) 29 items contribute to [PPFMEN- perceptions of proficiency for the use of multimodal texts in English]: ppfmen1 to ppfmen29;
(e) Nine items contribute to [PPFENUS- perceptions of proficiency of university activities]: ppfenus1 to ppfenus9; and
(f) Nine items contribute to [PPFEDCM- perceptions of proficiency for everyday communication

All the factors are subjected to Cronbach Alpha's reliability analysis. Cronbach's Alpha was "an index of reliability associated with the variation accounted for by the true score of the underlying construct" (Santos, 1999, p. 2). Hatcher (1994) cited in Santos (1999) defined a construct as "the hypothetical variable that is being measured". Nunnally (1978) advocated that an acceptable reliability coefficient index is 0.7. The reliability statistics for all the factors are relatively high. These high reliability indices for the factors indicate that they are reliable measures. Additionally, Cronbach's Alpha was not only dependent on the correlation among the items but on the variance of the score themselves. If the actual variation amongst the person was very small, then the reliability of the instrument measured by Cronbach Alpha would also tend to be small. If the variance amongst persons was large then the reliability would tend to be large.

Confirmatory Factor Analysis for Multimodal and Language Proficiency Questionnaire

Confirmatory Factor Analysis (CFA) was carried out with the data collected from 363 pre-service teachers who are respondents in this research. Similar validation processes undertaken with the Needs Analysis questionnaire discussed in Appendix 7.1, are employed in the validation of the Multimodal and Language Proficiency (MMLP) questionnaire. CFA is conducted employing LISREL8.0. As detailed review of literature in relation to these procedures are discussed in Appendix 7.1, the discussion will continue with the actual validation process of the Multimodal and Language Proficiency (MMLP) questionnaire. The next section of this chapter expands on this.

At this stage of the validation process, the strictly confirmatory (SC) framework is use to determine if the hypothesised models fit the sample data. Three models were tested with CFA "to determine the way in which observed measurements are mapped to particular factors" (Diamantopoulos & Siguaw, 2000, p. 18). The Two-Factor USETEC, One-Factor PPFMEN, Five-Factor FRMENG, One-Factor FRENGUS, One-Factor PPFENUS as well as One-Factor PPFEDCM models are tested to see if the observed variables are truly measuring the latent variables that they set out to measure.

Three items from USETEC: usetec7, usetec8 and usetec9 are dropped because of low factor loadings. Usetec1, usetec4, usetecusetec6, and 10 are observed variables that are measures for the latent variable [SELF]. This acronym is later changed to [PERSNL] as it is decided that the students are using technology for personal use. Usetec2, usetec3 and usetec5 are observed variables that are measures for latent variables [UNI]. The factor loadings for the tested models are moderately high. The path diagrams for the Two-Factor USETEC, Five-Factor FRMENG and One-Factor FRENGUS are presented in the following diagrams followed by the fit indices in Table 7.

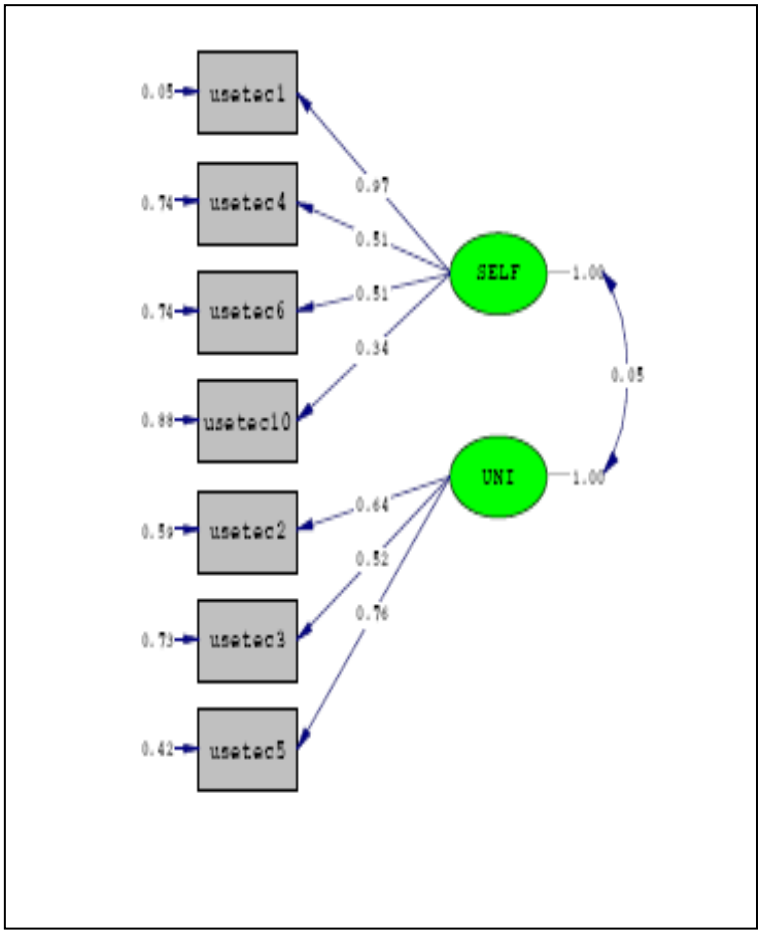

Figure 1. Two-Factor USETEC

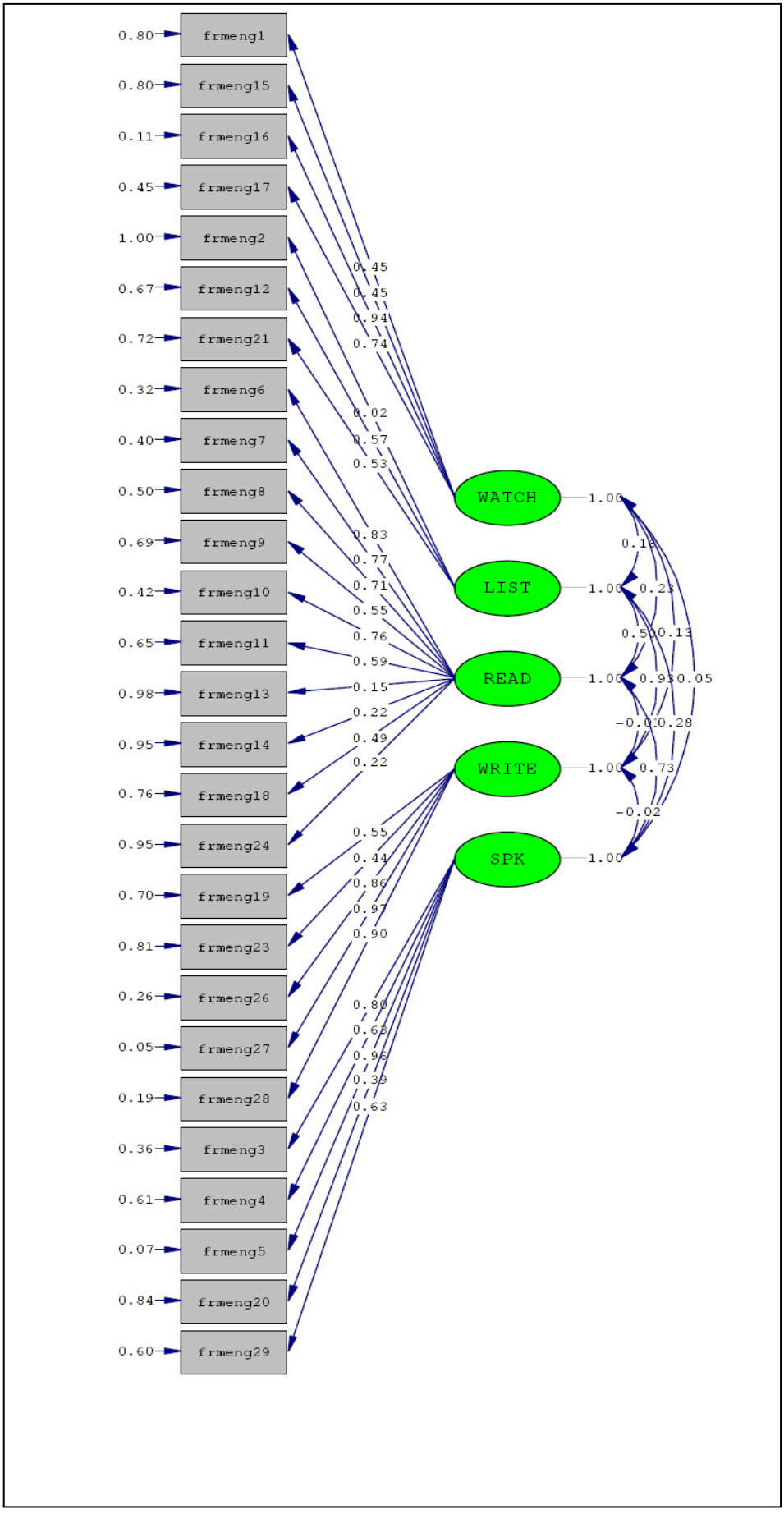

Figure 2. Five-Factor FRMENG

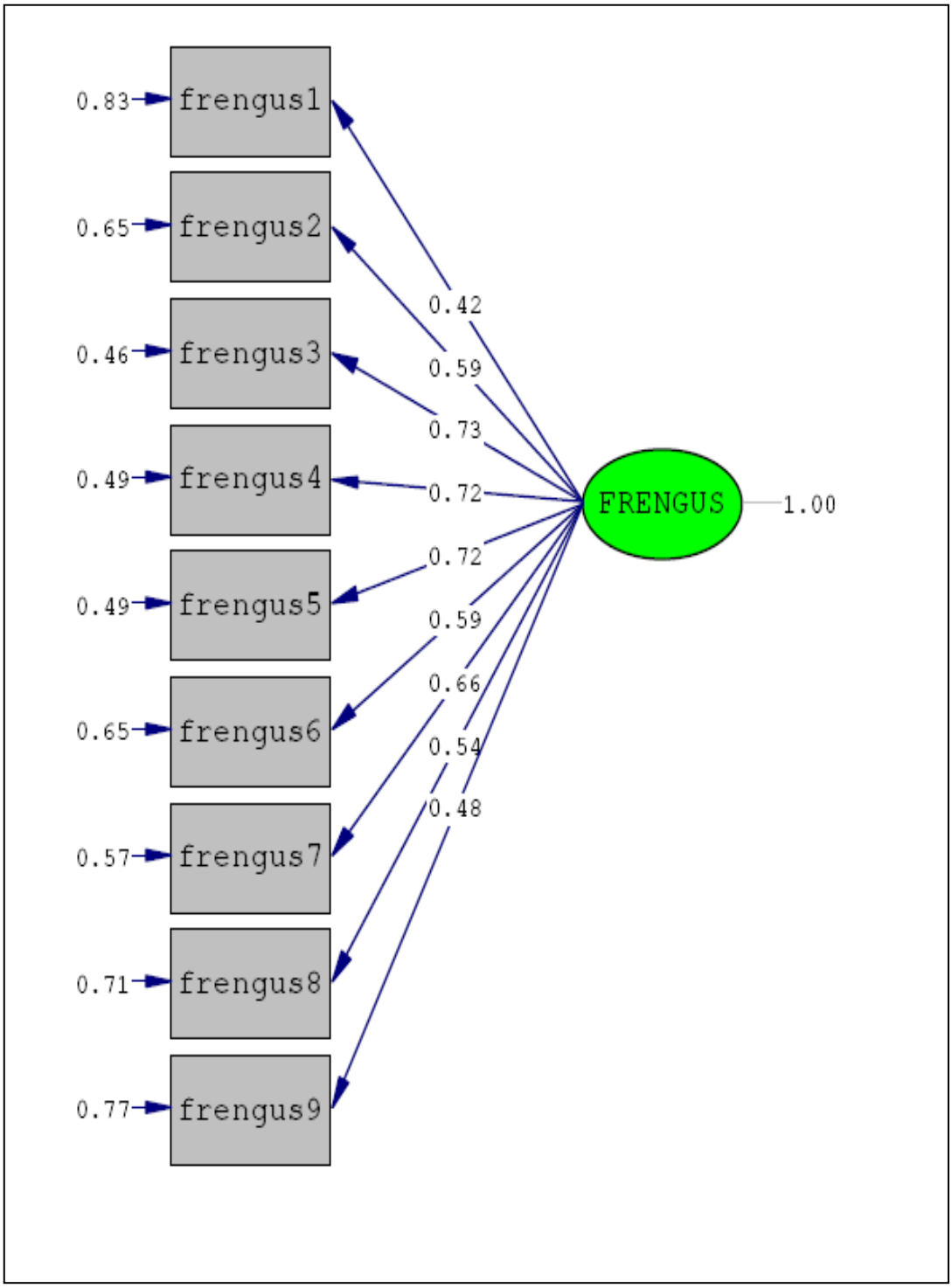

Figure 3. One-Factor FRENGUS

Table 7

Fit Indices for the Factor Models

INDICES	Two-Factor USETEC	Five-Factor FRMENG	One-Factor FRENGUS
Minimum Fit Function Chi-Square (χ^2)	55.21	30.71	57.92
Degrees of Freedom (*df*)	19	340	26
$\frac{\chi^2}{df}$	2.91	9.03	2.22
Root Mean Square Error of Approximation (RMSEA)	0.25	0.17	0.25
Comparative Fit Index (CFI)	0.17	0.73	0.70
Goodness of Fit Index (GFI)	0.75	0.55	0.70

* The high degrees of freedom for the Five-Factor FRMENG could be possible because of the positive definite warning generated by the computer output. Hence, the ridge option was employed by the software to run the analyses.

It is found that the factor loadings for the One-Factor PPFMEN model are low (* refer to footnote). The loadings for the One-Factor PPFMEN model ranged from ±.20 to ±.30. The factor loadings for the One-Factor PPFMEN model, is presented in Table 8. Peterson asserted that although there was no specified rule as to what constituted 'high' and 'low' factor loadings, he cited Merenda (1997) to conclude that the proportion of variance accounted for should at least be 0.50 or greater and that 0.30 was the minimum value that was traditionally used when choices were made as to whether an item belonged to a factor. Peterson (2000, p. 264) further affirmed this justification by citing Hair et al. (1998) who recommended that "factor loadings greater than ±0.30 are considered to meet the minimal level; loadings of ±0.40 are considered more important; and if loadings are ±0.50 or greater, they are considered practically significant". Using these values to guide the assessment of loadings, it is found that 12 observed variables have loadings less than the minimal ±0.30.

Table 8

Factor Loadings for the One-Factor PPFMEN Model

Item	Factor Loading
ppfmen1	0.33
ppfmen2	0.30
ppfmen3	**0.29**
ppfmen4	0.30
ppfmen5	**0.24**
ppfmen6	**0.27**
ppfmen7	0.32
ppfmen8	0.30
ppfmen9	**0.26**
ppfmen10	0.48
ppfmen11	**0.27**
ppfmen12	0.32
ppfmen13	**0.27**
ppfmen14	0.30
ppfmen15	**0.28**
ppfmen16	0.39
ppfmen17	0.31
ppfmen18	0.34
ppfmen19	0.31
ppfmen20	**0.28**
ppfmen21	0.33
ppfmen22	0.36
ppfmen23	0.32
ppfmen24	**0.26**
ppfmen25	**0.27**
ppfmen26	0.39
ppfmen27	**0.22**
ppfmen28	**0.28**
ppfmen29	0.30

***The deviant values are in bold**

* In this estimation a warning was given on the computer print out that the denominator employed was not positive definite. Under these circumstances the ridge option was employed and all coefficients in the sub-matrix had to be estimated giving rise to 377 degrees of freedom and the RMSEA value and other fit statistics coefficients became zero.

On the other hand, both the One-Factor PPFENUS and One-Factor PPFEDCM models demonstrate high factor loadings. The factor loadings as well as the measurement errors for the One-Factor PPFENUS and One-Factor PPFEDCM models are presented in Table 9 and Table 10. All the factor loadings for the One-Factor PPFENUS models are ±0.70 or greater, indicating that the items are positively loading onto to the latent variable. The measurement errors for the nine observed variables are also significantly low. The same is observed for the One-Factor PPFEDCM model. The factor loadings for the nine observed variables are ±0.70 or greater thus highlighting that they are significantly correlated to the latent variable.

Table 9

Factor Loadings for the One-Factor PPFENUS Model

Item	Factor Loading
ppfenus1	0.73
ppfenus2	0.79
ppfenus3	0.84
ppfenus4	0.82
ppfenus5	0.82
ppfenus6	0.71
ppfenus7	0.77
ppfenus8	0.78
ppfenus9	0.76

Table 10

Factor Loadings for the One-Factor PPFEDCM Model

Item	Factor Loading
ppfedcm1	0.81
ppfedcm2	0.81
ppfedcm3	0.86
ppfedcm4	0.82
ppfedcm5	0.82
ppfedcm6	0.83
ppfedcm7	0.75
ppfedcm8	0.72
ppfedcm9	0.64

Figure 5, Figure 6, and Figure 7 present the path diagram for the three tested models. This is followed by Table 11 which presents the fit indices.

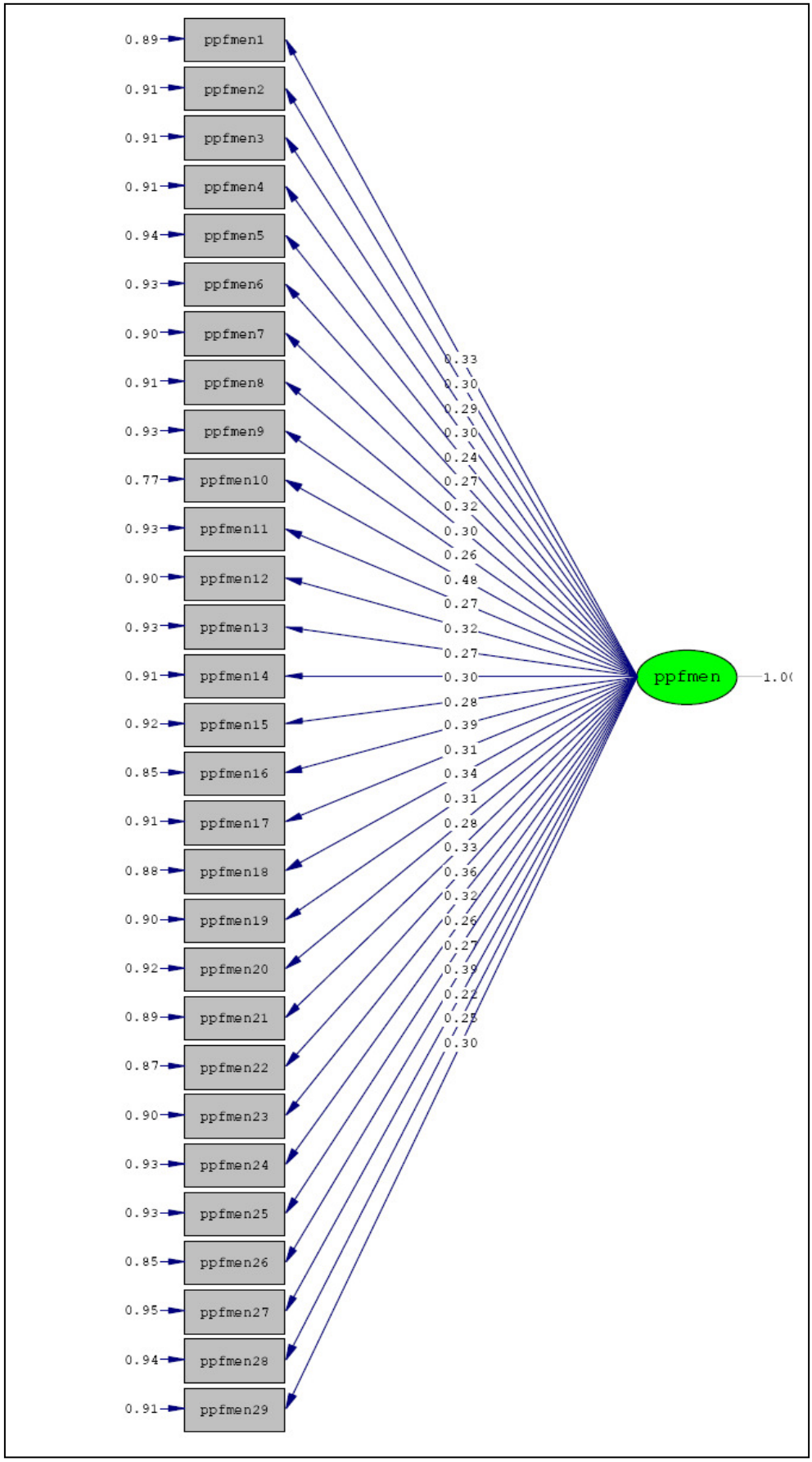

Figure 5. One-Factor PPFMEN Model

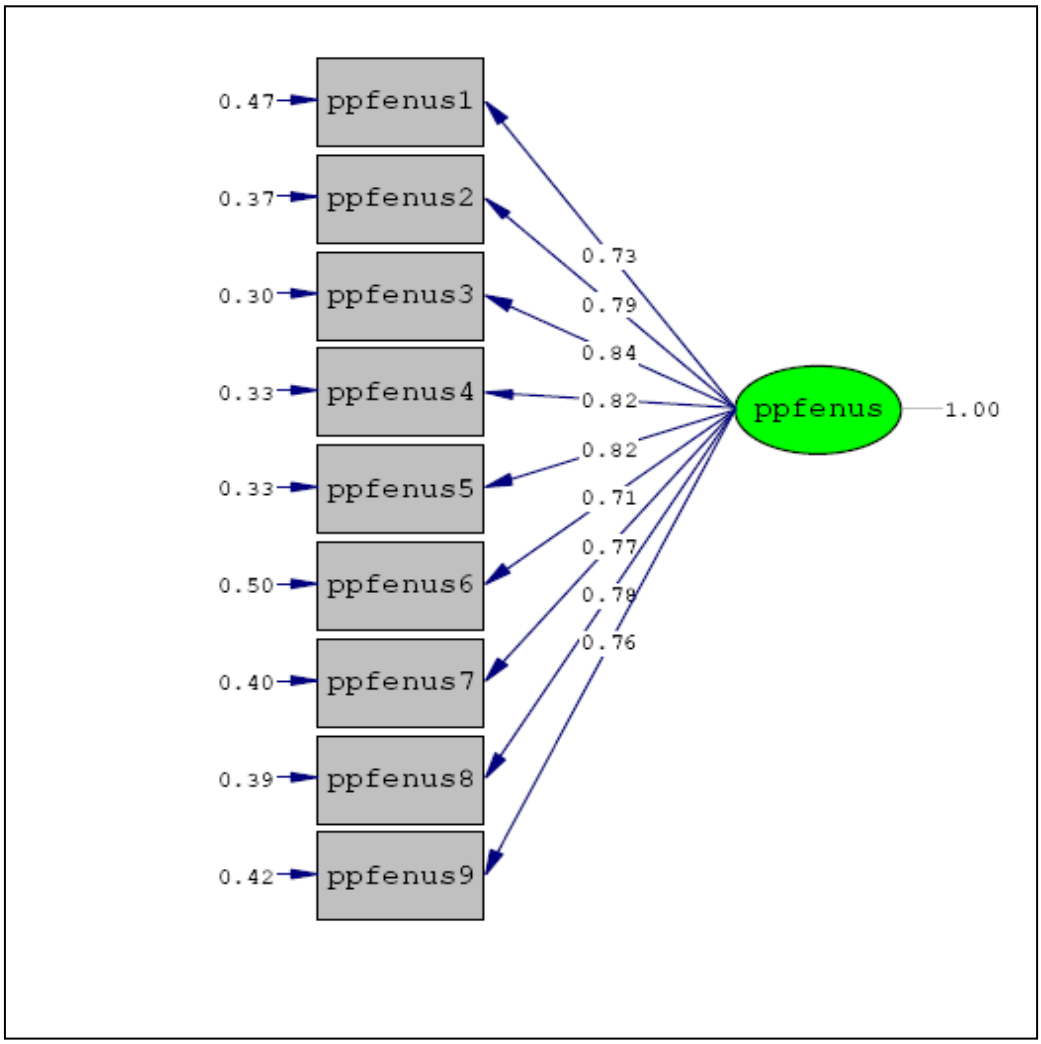

Figure 6. One-Factor PPFENUS Model

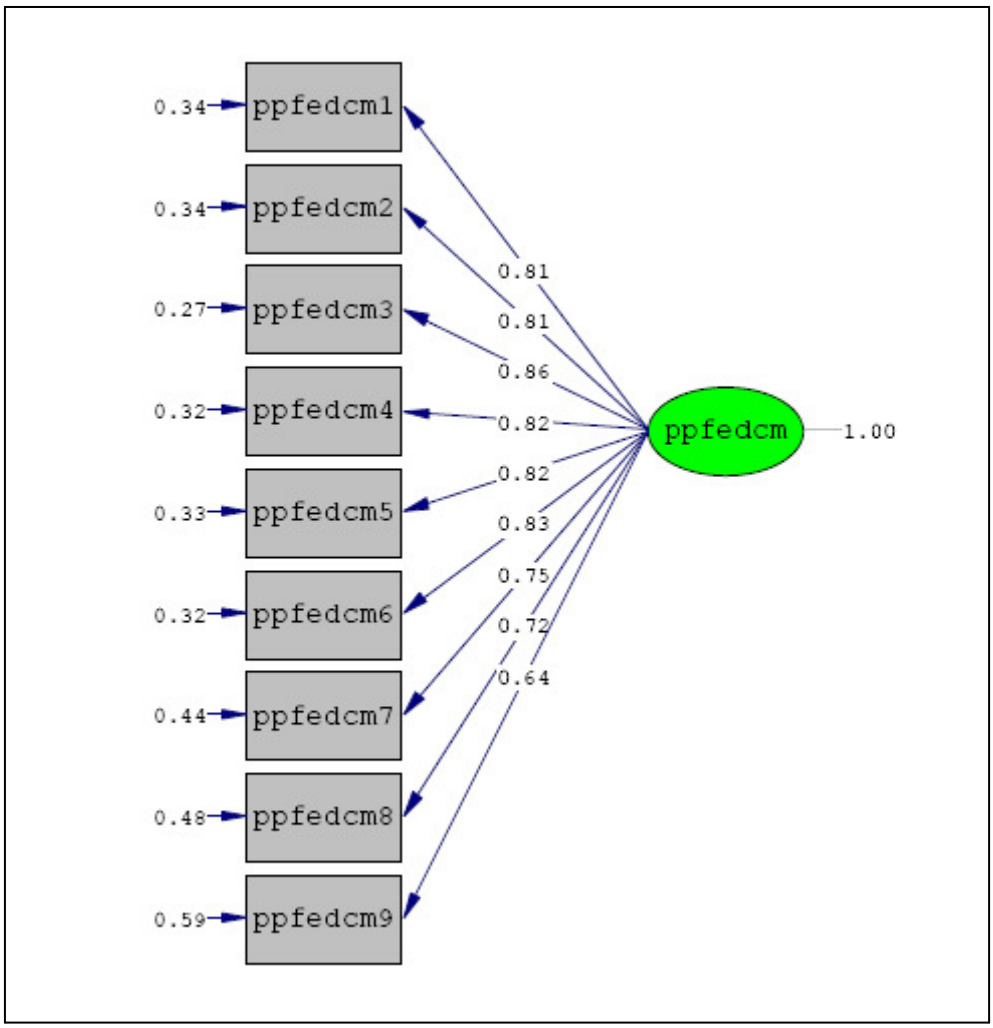

Figure 7. One-Factor PPFEDCM Model

Table 11

Comparative Indices for the Multimodal and Language Proficiency Models

INDICES	One-Factor PPFMEN Model	One-Factor PPFENUS Model	One-Factor PPFEDCM Model
Minimum Fit Function Chi-Square (χ^2)	15.66	48.40	59.16
Degrees of Freedom (*df*)	377	27	27
$\frac{\chi^2}{df}$	4.15	1.79	2.19
Root Mean Square Error of Approximation (RMSEA)	0.0	0.24	0.26
Comparative Fit Index (CFI)	1.00	0.91	0.89
Goodness of Fit Index (GFI)	0.97	0.73	0.71

The One-Factor PPFMEN Model demonstrates the highest chi-square value among the three tested models. However, a warning is given in the computer print out that the denominator employed is not a positive definite and thus the ridge option isused in the running of the analyses. So, rather than make judgements on the models based on the chi-square statistic it is appropriate to look at the RMSEA value. The RMSEA showed "how well, would the model with unknown but optimally chosen parameter values, fit the population covariance matrix if it were available. Values less than 0.05 are indicative of good fit, between 0.05 and under 0.08 of reasonable fit, between 0.08 and 0.10 of mediocre fit and >0.10 of poor fit" (p. 85). The RMSEA values for the One-Factor PPFMEN model demonstrate an index of 0.0, which is an indication of good fit. However, the p-value for Test of Close fit (RMSEA < 0.05) reflects an index of 1. This implies that there are other factors influencing the fit.

With standardized RMR and RMR values of 0.77 and 0.77 for the One-Factor PPFENUS Model as well as 0.74 and 0.74 for the One-Factor PPFEDCM Model, it can be considered that the both the models demonstrate good fit. The One-Factor PPFMEN model, however, demonstrates a very low standardised RMR value of 0.027. The goodness-of-fit (GFI) is generally recommended as the most reliable measure of absolute fit in most circumstances (Diamantopoulos & Siguaw, 2000). On the basis of Diamantopoulos and Siguaw's (2000) assertion, it can be surmised that the observed data for the One-Factor PPFMEN Model reflects the best fit to the sample data. Among the three models tested in the SC framework the One-Factor PPFMEN model demonstrates an index of 0.97.

Researchers indicateed that CFA allows the comparison of several alternatives as well as identified if one or more of these alternative structures were compatible with the measurement (Byrne, 1998 cited in Curtis, 2004). In the SC framework, "the researcher postulates a single model based on theory, collects the appropriate data and then tests the fit of the hypothesized model to the sample data" (Byrne, 1998, p. 8). In the current study, three models are tested: the One-Factor PPFMEN, One-Factor PPFENUS as well as One-Factor PPFEDCM in the SC framework. These are the hypothesised models. The researcher then went on to employ the alternative model (AM) framework. In the AM set-up, "the researcher proposes several alternative (competing models), all of which are grounded in theory and following analysis of a single set of empirical data, he or she selects one model as most appropriate in representing the sample data" (Byrne, 1998, p. 8). Once it is confirmed that the hypothesised model fits the sample data, alternative models are tested to find the best model that fits the sample data as well

as direct future analysis. Three models are tested in the AM framework: the Three-Factor NEWMPPF, Hierarchical as well as Nested.

Alternative Models

The Three-Factor NEWMPPF is tested to examine if the three factors ('PPFMEN', PPFENUS' and 'PPFEDCM') are correlated. The Hierarchical Model is tested to examine if the proposed three first order factors ('PPFMEN', PPFENUS' and 'PPFEDCM') loaded onto a second order Multimodal and Language Proficiency (MMLP) factor (Curtis, 2005). The Nested model was tested to investigate if the loadings were distributed between three factors as well as loaded orthogonally onto the Multimodal and Language Proficiency factor (MMLP). In Nested Models "the variance may load onto both specific and general groups of values at the same time (Curtis, 2005). Figure 8, Figure 9 and Figure 10 illustrate the path diagrams for the Three-Factor NEWMPPF, Hierarchical and Nested Models. The diagrams are discussed with reference to factor loadings as well as fit indices.

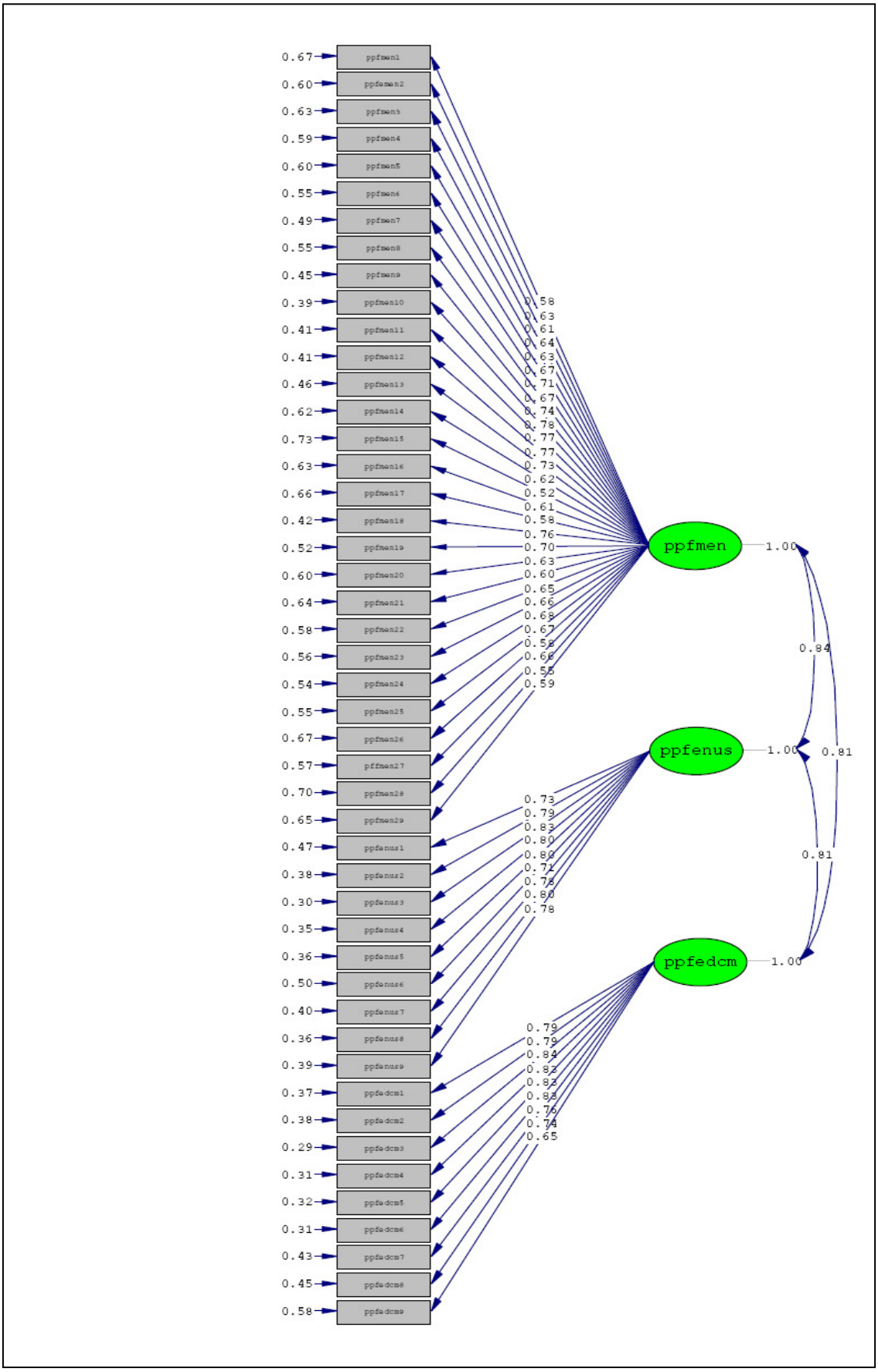

Figure 8. Three-Factor NEWMPPF Model

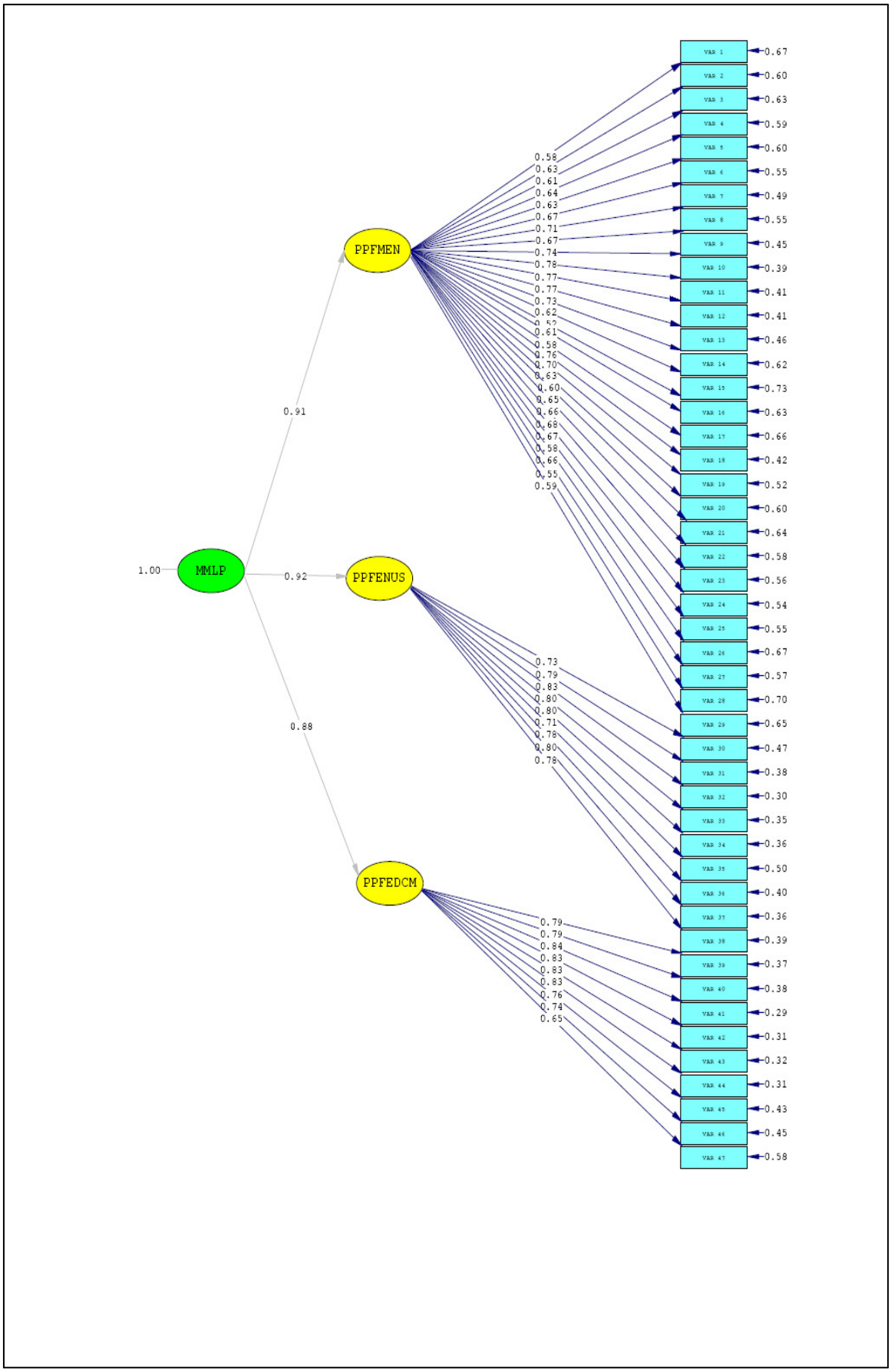

Figure 9. Hierarchical Model for Multimodal and Language Proficiency

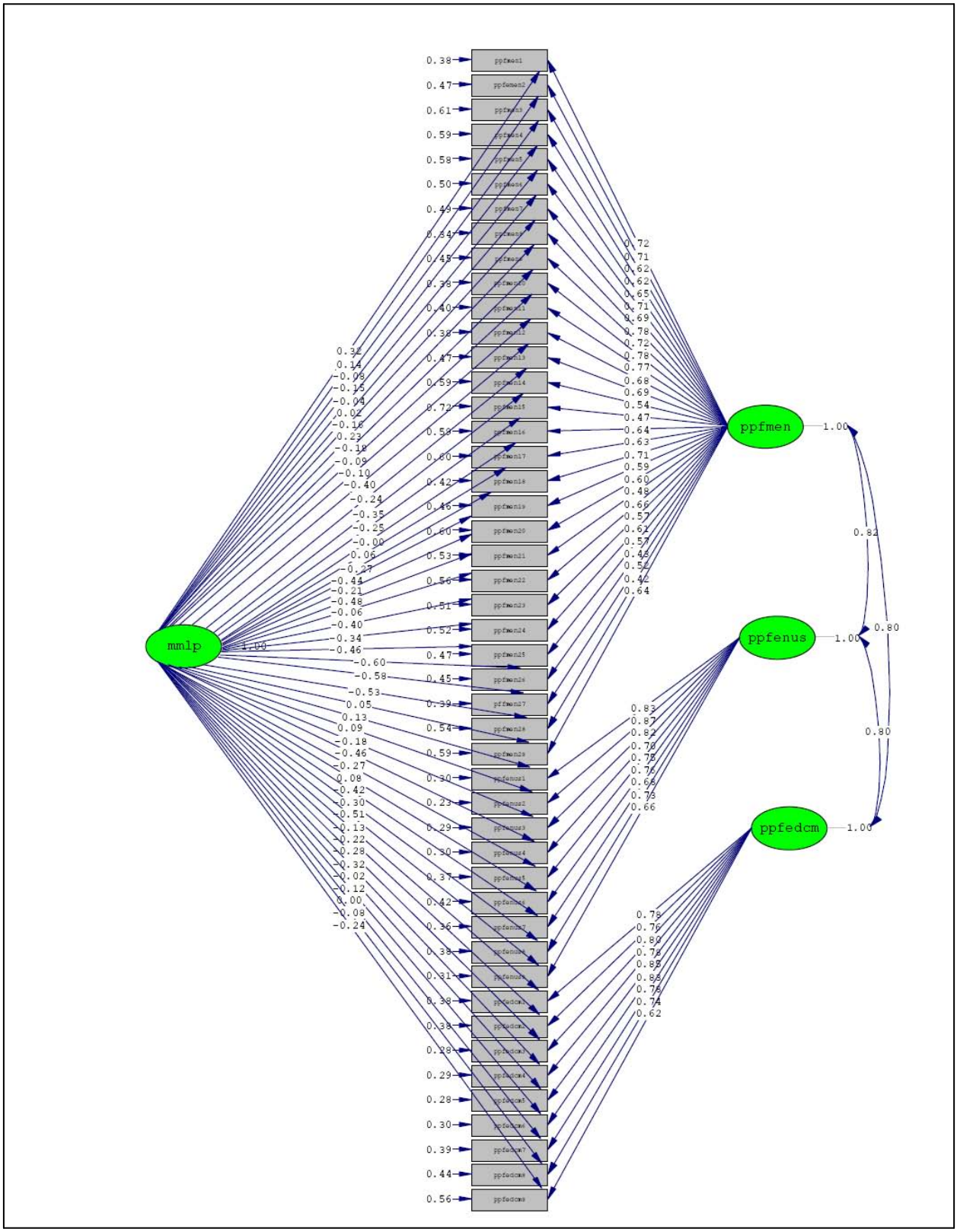

Figure 10. Nested Model for Multimodal and Language Proficiency

The Three-Factor NEWMPPF model demonstrates high factor loadings which range from ±.50 to ±.80 or greater (refer to Table 12). There is also an indication of a significant correlation between the three latent variables. The factor loadings for the Hierarchical Model is greater than 0.50, thus indicating positive correlations. The correlations between the latent

variables are also high. The analysis of factor loadings indicate that all three constructs which are from the first order factors are loading on to a higher second order factor which is the MMLP or Multimodal and Language Proficiency.

Table 12

Factor Loadings for the Three-Factor NEWMPPF, Hierarchical as well as Nested Models

Item	Three-Factor NEWMPPF	Hierarchical Model	Nested Model
	Loadings	Loadings	Loadings
ppfmen1	0.58	0.56	0.72
ppfemn2	0.63	0.63	0.71
ppfmen3	0.61	0.61	0.62
ppfemen4	0.64	0.64	0.62
ppfemen5	0.63	0.63	0.65
ppfmen6	0.67	0.67	0.71
ppfmen7	0.71	0.71	0.69
ppfmen8	0.67	0.67	0.78
ppfmen9	0.74	0.74	0.72
ppfmen10	0.78	0.78	0.78
ppfmen11	0.77	0.77	0.77
ppfmen12	0.77	0.77	0.68
ppfmen13	0.73	0.73	0.69
ppfmen14	0.62	0.62	0.54
ppfmen15	0.52	0.52	0.47
ppfmen16	0.61	0.61	0.64
ppfmen17	0.58	0.58	0.63
ppfmen18	0.76	0.76	0.71
ppfmen19	0.70	0.70	0.59
ppfmen20	0.63	0.63	0.60
ppfmen21	0.60	0.60	0.48
ppfmem22	0.65	0.65	0.66
ppfmen23	0.66	0.66	0.57
ppfmen24	0.68	0.68	0.61
ppfmen25	0.67	0.67	0.57
ppfmen26	0.58	0.58	0.48
ppfmen27	0.66	0.66	0.52
ppfmen28	0.55	0.55	0.42
ppfmen29	0.59	0.59	0.64
ppfenus1	0.73	0.73	0.83
ppfenus2	0.79	0.79	0.87
ppfenus3	0.83	0.83	0.82
ppfenus4	0.80	0.80	0.78
ppfenus5	0.80	0.80	0.75
ppfenus6	0.71	0.71	0.76
ppfenus7	0.78	0.78	0.68
ppfenus8	0.80	0.80	0.73
ppfenus9	0.78	0.78	0.66
ppfedcm1	0.79	0.79	0.78
ppfedcm2	0.79	0.79	0.78
ppfedcm3	0.84	0.84	0.80
ppfedcm4	0.83	0.83	0.78
ppfedcm5	0.83	0.83	0.85
ppfedcm6	0.83	0.83	0.83
ppfedcm7	0.76	0.76	0.78
ppfedcm8	0.74	0.74	0.74
ppfedcm9	0.65	0.65	0.62

The factor loadings for the Nested Model are in the + 0.40 to + 0.87 range thus indicating that they are positively loading onto the three component constructs. However, the factor loadings also demonstrate that the three component constructs are not loading positively onto a separate Multimodal and Language Proficiency factor. The fit indices for the Three-Factor NEWMPPF, Hierarchical and Nested Models are presented in Table 13.

Table 13

Fit Indices for the Three-Factor NEWMPPF, Hierarchical and Nested Models

INDICES	Three-Factor NEWMPPF Model	Hierarchical Model	Nested Model
Minimum Fit Function Chi-Square (χ^2)	72.69	72.69	61.35
Degrees of Freedom (*df*)	1031	1031	984
$\frac{\chi^2}{df}$	7.05	7.05	6.23
Root Mean Square Error of Approximation (RMSEA)	0.14	0.14	0.12
Comparative Fit Index (CFI)	0.92	0.92	0.93
Goodness of Fit Index (GFI)	0.49	0.49	0.58

The high chi-square and RMSEA indices for the Three-Factor NEWMPPF Hierarchical and Nested Models indicate that they are not good indices to assess model fit with. Researchers implied that although both these indices may be indicating misfit the model may still demonstrate an acceptable fit. It was advised that more than one or two fit indices were employed to assess the fit of a model. Values of GFI and AGFI should range between 0 and 1 and values >0.90 were usually taken as reflecting acceptable fits (Diamantopoulos & Siguaw, 2000) with 1 indicative of perfect fit (Phakiti, 2007). If these indices are indicative of good fit, then the Nested Model reflects a moderate fit to the data. However, the second 'factor' loadings or the nested factor was not positive.

Researchers indicated that CFA allowed the comparison of several alternatives as well as identified if one or more of these alternative structures were compatible with the measurement (Byrne, 1998 cited in Curtis, 2004). Byrne (1998, p. 4) advocated that when researchers embarked on CFA they had "some knowledge of the underlying latent variable structure. This knowledge is based on theory, empirical research, or some combination of both". Three models are tested in the alternative model framework: the One-Factor NEWMPPF, Hierarchical as well as Nested. Although the Nested Model demonstrates the best fit to the data compared to the other two models, the loadings of the nested factor are not positive. Furthermore, the Nested Model is a complex model. As a decision has to be made on a model that would guide future

analysis, it is decided that the Hierarchical as well as the Three-Factor NEWMPPF Models would be used because of similar indices as well as model parsimony.

Rasch Model

The previous section examined the structural and measurement properties of selected scales (Rowe, 1998). The Rasch Model was utilised to examine further the item-level functions within each scale (Andrich, 2007). In the current study Rasch Analysis is used employing the ConQuest program to test the following latent variables: [USETEC- use of technology], [FRMENG- frequency of multimodal use in English], [FRENGUS- frequency of English use for university activities], [PPFMEN- perceptions of proficiency for the use of multimodal texts in English], [PPFENUS- perceptions of proficiency of university activities] and [PPFEDCM- perceptions of proficiency for everyday communication]. The fit statistics for [USETEC] is presented in Table 14. The variable map is presented in Figure 11.

Table 14

Fit Statistics for [USETEC-PERSNL]

Item	Estimate	Measurement Error	Infit MNSQ	Infit *t*	Outfit MNSQ	Outfit t
Item1	0.18	0.10	1.00	0.0	0.99	-0.1
Item2	0.88	0.11	1.02	0.3	1.03	0.4
Item3	2.02	0.12	1.00	0.0	0.91	-1.2
Item4	0.59	0.10	1.00	0.0	1.01	0.2
Item5	2.27	0.13	1.00	0.0	1.01	0.1
Item6	2.00	0.13	1.08	0.5	1.11	0.7
Item10	0.61	0.28	1.03	0.3	1.05	0.6

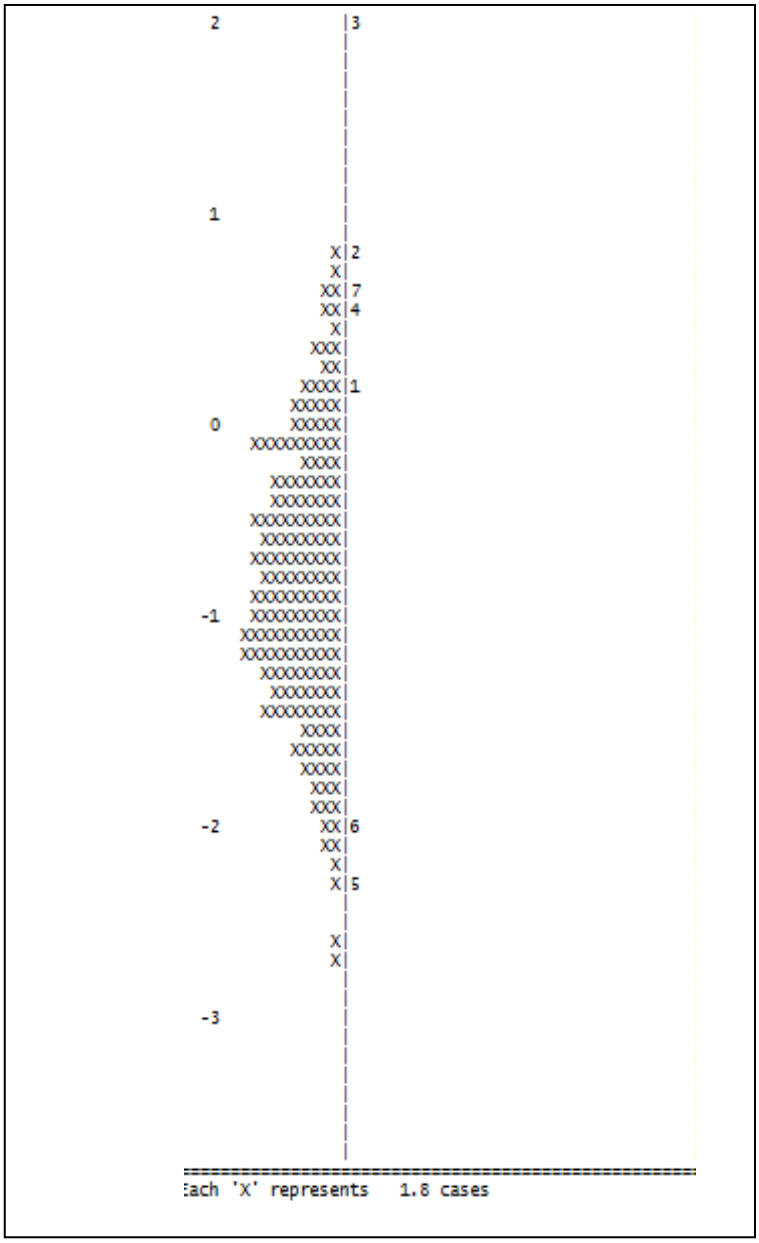

Figure 11. Latent Variable Map for [USETEC]

In Appendix 7.1, the acceptable and reasonable fit (infit and outfit) indices are discussed. Although most researchers employed the 0.77 – 1.30 index to assess infit MNSQ, in current study the 0.6 – 1.4 range is used as the instrument employed to collect data is a rating scale survey. The infit MNSQ measures the consistency of fit of the students to the item characteristic curve (ICC) for each item with weighted consideration given to those persons close to the 0.5 probability level. Values above the acceptable range (0.6 – 1.4) indicated that these items did not discriminate well and those below indicated that students gave correct responses more frequently than expected (from the model) when their ability was higher than the difficulty of the question or it may mean that they gave incorrect responses more frequently than expected when their ability was lower than the question's difficulty (Athanasou & Lamprianou, 2002, pp. 199-251).

Analysis of the infit and outfit MNSQ demonstrate that all the seven items are within the acceptable range of 0.6 to 1.4. Examination of infit *t-value* for [USETEC- use of technology] scale emphasise that the *t*-values for seven items were < 2 and > -2. '*t*-values' measured the consistency of the fit of the items to the student characteristic curve for each student with special consideration given to extreme items. When data were compatible with the model, the expected value of the mean square was approximately one and the expected value of the *t*-value was approximately zero. When the outfit *t*-value for items were < -2, they indicated that the responses of the students were too determined and that there was too little variation, resulting in an overfit (Bond & Fox, 2007, p. 239). Items that reflect values that are > +2 indicated that the responses were haphazard and that there were too much of variation, thus underfitting the model. As the infit t-value was sensitive to sample size and outfit statistics was "affected by unexpected responses distant to item or person measures" Smith et al., 2008, p.4) item statistics were examined (Wu & Adams, 2007) before making a choice on whether to reject the items. Wu & Adams (2007, p. 64) advocated that the discrimination index would indicate how well each item performed in measuring the latent (unobserved) variable.

The discrimination index was the "correlation between the person's score on the item and their total score on the questionnaire" (Wu & Adam, 2007, p. 64). Wu and Adam implied that

> if this item reflects well the level of autonomy (for which the total score on the questionnaire is a surrogate measure), then one would expect a high correlation between the score on this item and the total score on the questionnaire. A discrimination value of 0 indicates that there is no relationship between the item score and the total score. A positive discrimination indicates a positive relationship. The higher the discrimination index, the better the item is able to discriminate between people. One would not accept any item discrimination index less than 0.2. It is preferable to select those above 0.4.
>
> (Wu & Adam, 2007, p. 64)

The discrimination index for the seven items range from 0.39 to 0.57. These values indicate the extent to which an item discriminates between high ability students and low ability students. The relatively high values for the seven items suggest that the items in the questionnaire are efficiently discriminating between the high and low ability respondents. Additionally, the item deltas for the [USETEC] demonstrate that all the items are ordered. Likewise, the separation reliability for [USETEC] is 0.99. Separation reliability was the proportion of the observed variance that was considered true. What this fit statistic did was that it indicated the amount of 'noise' in the data that is perceived as error in the measurement. The higher the separation reliability, the lower the measurement error (Linacre, 2000). In this instance the high separation

reliability demonstrates that the error in measurement (noise in the data) is low (Adams & Khoo, 1993).

The analysis continues with the examination of the latent trait variable map for [USETEC]. In Figure 11, the logit scale is shown on the left and the performance of student responses is represented by 'x'. The difficulty of each of the numbered items is shown on the right (Thompson, 2008, p. 147). The map indicates that the items are well distributed. Items 1, 2, 3, 4 and 5 are located between logit scales of 0 and 2. Items 6 and 10 are located between 0 and -3. The items that are higher on the logit scale are more difficult compared to those that are on the lower logit scales.

The analysis continues with [FRMENG]. he fit indices for [FRMENG]. Is presented in Table 15. The latent variable map is presented in Figure 12.

Table 15

Fit Indices for [FRMENG]

Item	Estimate	Measurement Error	Infit MNSQ	Infit *t*	Outfit MNSQ	Outfit t
frmeng1	-0.35	0.04	0.85	-2.0	0.86	-1.8
frmeng2	-0.29	0.04	0.89	-1.5	0.89	-1.4
frmeng3	-0.14	0.04	**1.41**	4.9	1.40	4.5
frmeng 4	0.05	0.04	0.78	-3.1	0.79	-2.9
frmeng 5	-0.24	0.44	1.23	2.9	1.23	2.7
frmeng 6	-0.23	0.44	0.84	-2.3	0.83	-2.2
frmeng 7	0.01	0.04	0.79	-3.0	0.79	-2.9
frmeng 8	-0.46	0.04	**1.49**	5.7	**1.48**	5.3
frmeng 9	0.00	0.04	0.70	-4.5	0.69	-4.3
frmeng 10	-0.06	0.04	0.73	-3.9	0.73	-3.7
frmeng 11	-0.03	0.44	0.64	-5.5	0.64	-5.2
frmeng 12	0.21	0.44	0.68	-4.9	0.68	-4.6
frmeng 13	0.23	0.04	0.69	-4.6	0.70	-4.3
frmeng 14	0.09	0.04	0.71	-4.4	0.71	-4.1
frmeng 15	0.06	0.04	1.25	3.2	1.26	3.0
frmeng 16	-0.26	0.04	0.94	-0.7	0.95	-0.7
frmeng 17	-0.31	0.44	0.88	-1.7	0.89	-1.5
frmeng18	-0.12	0.44	0.49	-8.6	0.49	-8.0
frmeng19	0.16	0.04	0.80	-2.8	0.80	-2.7
frmeng20	0.06	0.04	1.11	1.5	1.11	1.4
frmeng21	0.35	0.04	1.40	4.9	1.40	4.5
frmeng22	-0.22	0.04	0.99	-0.1	0.99	-0.1
frmeng23	0.11	0.44	0.79	-3.0	0.79	-2.9
frmeng24	0.06	0.44	0.85	-2.1	0.85	2.7
frmeng25	0.40	0.04	1.35	4.3	1.35	-2.2
frmeng26	0.57	0.04	**1.64**	7.4	**1.64**	-2.9
frmeng27	0.40	0.04	1.28	3.5	1.28	3.2
frmeng28	0.38	0.04	1.29	3.6	1.28	3.2
frmeng29	-0.52	0.23	**1.54**	6.3	**1.53**	5.7

*** The deviant values are in bold**

Analysis of the infit and outfit MNSQ for [FRMENG- frequency of multimodal text use in English] scale indicates that four items are outside the acceptable range of 0.6 to 1.4. Examination of the *t*-values indicate that ten item are > +2 and 13 item are < -2. '*t*-values' measure the consistency of the fit of the items to the student characteristic curve for each student

with special consideration given to extreme items. When data are compatible with the model, the expected value of the mean square is approximately one and the expected value of the *t*-value is approximately zero. The outfit *t*-value for items that are < -2, indicate that the responses of the students are too determined and that there is too little variation, resulting in an overfit (Bond & Fox, 2007, p. 239). Items that reflect values that are > +2 show that the responses are haphazard and that there are too much of variation, thus underfitting the model. The discrimination index for the items range from 0.33 to 0.66. The relatively high values for the 29 items suggest that the items in the questionnaire are efficiently discriminating between the high and low ability respondents. Additionally, the item deltas for the [FRMENG] demonstrate that all the items are ordered. Likewise, the separation reliability for [FRMENG] is 0.97. The high separation reliability demonstrate that the error in measurement is low

The analysis continues with the examination of the latent trait variable map for [FMENG]. In Figure 12, the logit scale is shown on the left and the performance of student responses is represented by 'x'. The difficulty of each of the numbered items is shown on the right.

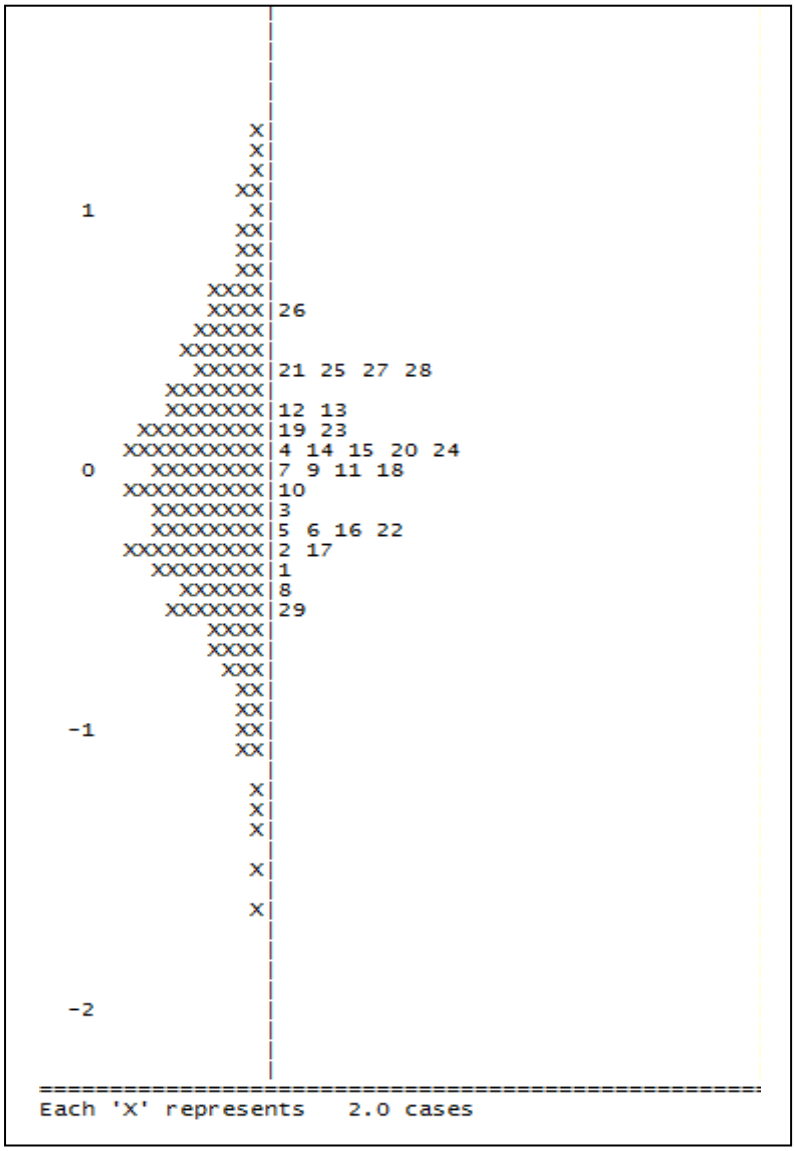

Figure 12. Latent Variable Map for [FRMENG]

The map in Figure 12 shows that the items are well distributed. The items below logit 0 are easier than those above. The items clearly discriminate between students. The next step is to analyse [FRENGUS]. The fit indices for [FRENGUS] is presented in Table 16.

Table 16

Fit Indices for [FRENGUS]

Item	Estimate	Measurement Error	Infit MNSQ	Infit *t*	Outfit MNSQ	Outfit t
frengus1	-0.53	0.05	**1.62**	6.7	**1.61**	6.5
frengus2	-0.39	0.05	1.06	0.7	1.05	0.7
frengus3	0.14	0.05	0.75	-3.6	0.75	-3.4
frengus4	0.29	0.05	0.89	-1.5	0.89	-1.5
frengus5	-0.63	0.05	0.82	-2.5	0.82	-2.4
frengus6	-0.15	0.05	1.04	0.5	1.04	0.5
frengus7	0.26	0.05	0.83	-2.3	0.83	-2.3
frengus8	0.09	0.05	0.95	-0.7	0.94	-0.7
frengus9	0.36	0.15	1.07	0.9	1.07	0.9

*** The deviant values are in bold**

Table 16 indicates that only one item frengus1 is outside the acceptable infit and outfit MNSq range. Similarly, the infit t-value for frengus1 is > +2 and reflecting that the responses are haphazard and that there are too much of variation, thus underfitting the model. Three items reflect t-values that are < -2. The responses of the students for these three items are too determined and that there is too little variation, resulting in an overfit. The discrimination index for the nine items in [FRENGUS] scale range from 0.51 to 0.73. The relatively high values for the 9 items suggest that the items in the questionnaire are efficiently discriminating between the high and low ability respondents. Additionally, the item deltas for the [FRENGUS] demonstrate that all the items are ordered. Likewise, the separation reliability for [FRMENG] is 0.97. The high separation reliability demonstrates that the error in measurement is low

The analysis continues with the examination of the latent trait variable map for [FRENGUS] presented in Figure 13.

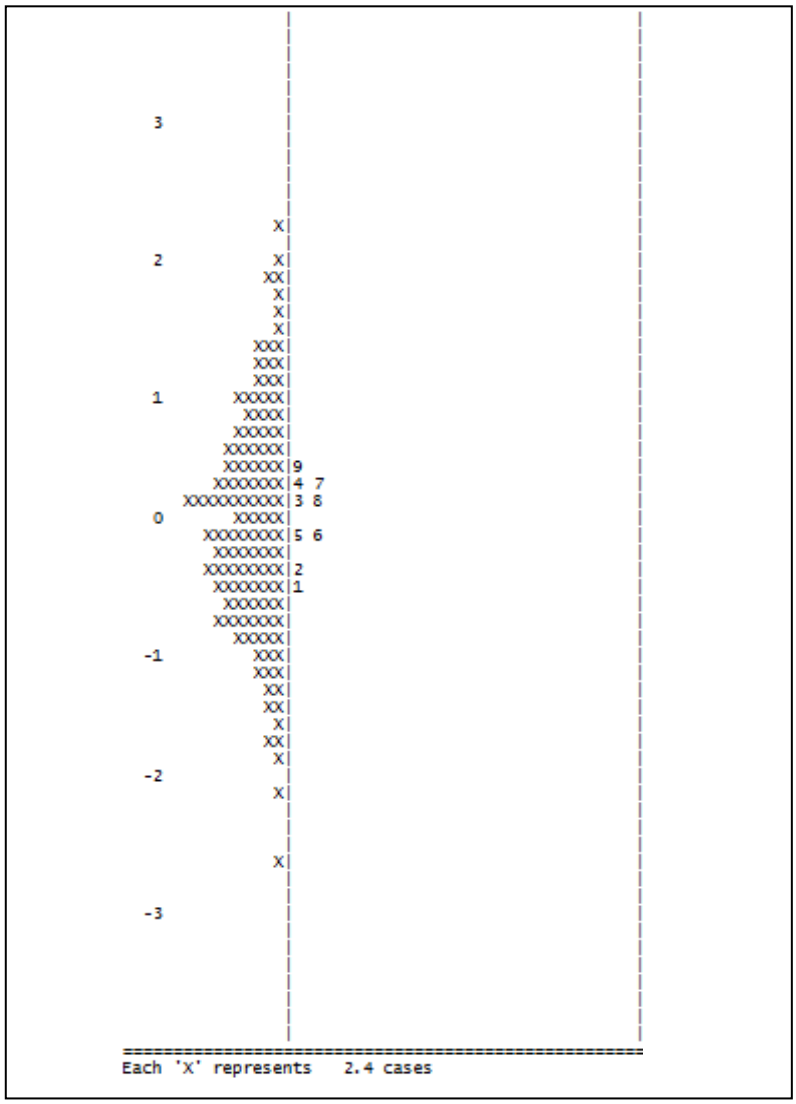

Figure 13. Latent Variable map for [FRENGUS]

The latent variable map in Figure 13 indicates that the items are bunched around the mean, although still discriminating between the students. The person ability is well distributed. Frengus1, 2, 5 and 6 are easier than frengus3, 4, 7, 8 and 9. The next section of this discussion focuses on the factor [PPFMEN]

Table 17

Fit Statistics for [PPFMEN]

Item	Estimate	Measurement Error	Infit MNSQ	Infit *t*	Outfit MNSQ	Outfit t
ppfmen1	-0.92	0.05	0.92	-1.1	0.92	-1.1
ppfmen2	-0.45	0.05	1.02	0.4	1.02	0.3
ppfmen3	0.05	0.05	1.19	2.5	1.19	2.5
ppfmen4	0.17	0.05	0.93	-1.0	0.95	-0.7
ppfmen5	-0.41	0.05	1.06	0.8	1.05	0.7
ppfmen6	-0.59	0.05	0.85	-2.1	0.86	-2.0
ppfmen7	-0.13	0.05	0.84	-2.3	0.83	-2.4
ppfmen8	-1.03	0.05	0.93	-0.9	0.91	-1.2
ppfmen9	-0.19	0.05	0.79	-3.1	0.79	-3.0
ppfmen10	-0.21	0.05	0.78	-3.2	0.78	-3.2
ppfmen11	-0.27	0.05	0.71	-4.4	0.71	-4.3
ppfmen12	0.21	0.05	0.79	-3.1	0.80	-2.8
ppfmen13	0.41	0.05	0.76	-3.7	0.76	-3.5
ppfmen14	0.25	0.05	0.90	-1.5	0.89	-1.5
ppfmen15	-0.05	0.05	**1.60**	7.1	**1.59**	6.7
ppfmen16	-0.56	0.05	1.09	1.2	1.11	1.5
ppfmen17	-0.53	0.05	1.20	2.6	1.20	2.5
ppfmen18	0.13	0.05	0.73	-4.2	0.73	-4.0
ppfmen19	0.43	0.05	0.83	-2.5	0.83	-2.5
ppfmen20	-0.13	0.05	1.34	4.3	1.34	4.1
ppfmen21	0.49	0.05	1.25	3.4	1.25	3.1
ppfmen22	-0.47	0.05	1.13	1.7	1.13	1.7
ppfmen23	0.37	0.05	1.07	1.0	1.06	0.8
ppfmen24	0.42	0.05	1.11	1.5	1.11	1.4
ppfmen25	1.20	0.05	0.96	-0.6	0.94	-0.8
ppfmen26	1.45	0.05	1.10	1.4	1.11	1.5
ppfmen27	1.02	0.05	1.07	1.0	1.05	0.7
ppfmen28	0.46	0.05	**1.42**	5.3	**1.41**	4.9
ppfmen29	-1.11	0.28	1.32	3.9	1.30	3.8

*** The deviant values are in bold**

The indices for the infit and outfit MNSQ presented in Table 17 indicate that two items: 'ppfmen15' and 'ppfmen28' are outside the acceptable range of 0.6 to 1.4. Examination of infit *t-value* for [PPFMEN- perceptions of proficiency for the use of multimodal texts in English] scale emphasise that the *t*-values for 10 items are < -2 and six items are in the > +2 range. Six items reflect values that are > +2 indicating that the responses are haphazard and that there are too much of variation, thus underfitting the model.

The discrimination index for the 29 items range from 0.56 to 0.74. These values indicate the extent to which an item discriminates between high ability students and low ability students.

The relatively high values for the 29 items suggest that the items in the questionnaire are efficiently discriminating between the high and low ability respondents. Additionally, the item deltas for the [PPFMEN] demonstrate that all the items are ordered. Likewise, the separation reliability for [PPFMEN] is 0.992. The analysis proceeded with the examination of the latent trait variable map for [PPFMEN]. Figure 14 illustrates the variable map for [PPFMEN].

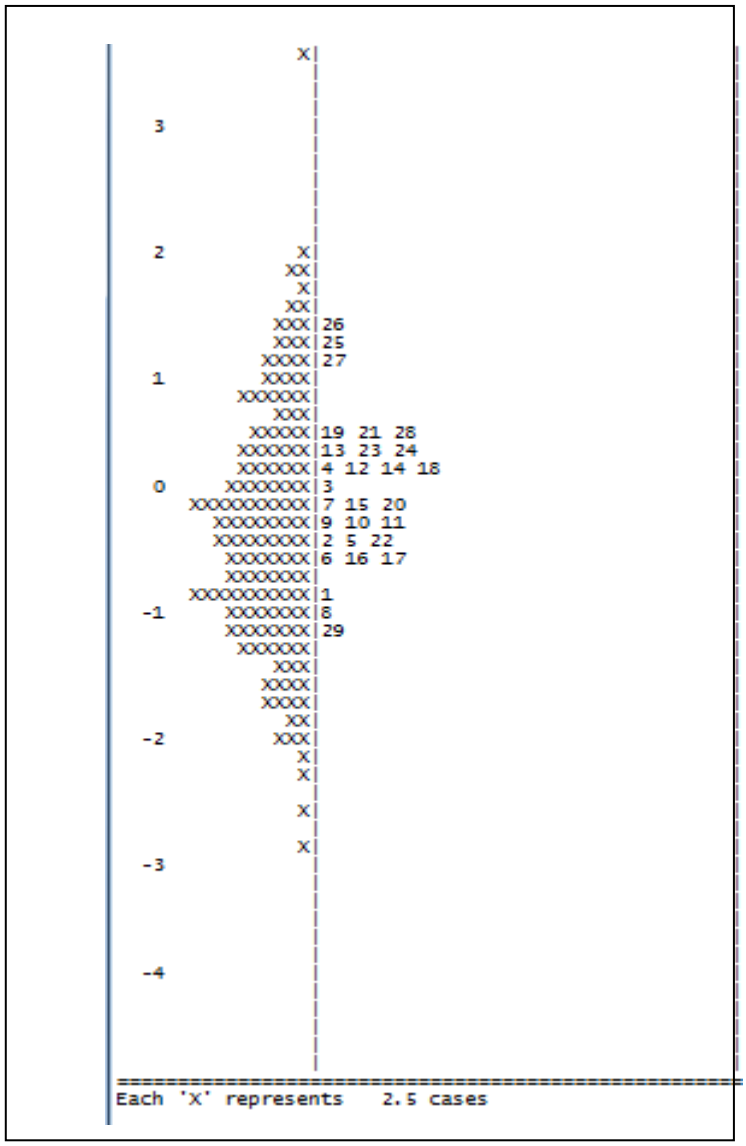

Figure 14. Latent Variable Map for [FRENGUS]

Figure 14 demonstrates that 13 items are located above 0, the mean of the difficulty level of the items. Item 26 or ppfmen26 is the most difficult item as it is located almost 1.5 logit scales above the mean of the difficulty level of the items. 'Ppfmen29' is the easiest item in the scale. It is located below logit scale -1. 15 items are located below 0. 'Ppfmen3' is the only item located at logit scale 0, conveying little information about item difficulty or person ability. Students'

responses are distributed evenly above and below the mean. The variable map demonstrates that the items are clearly discriminating between the high ability and low ability respondents. Both the difficult items as well as the easy items are distributed evenly above and below the mean. There are almost as many difficult items as there are easy items. All these features of the scale justify that none of the items should be rejected.

The proceeded with Rasch analysis for the [PPFENUS- perceptions of proficiency of university activities] scale. The fit statistics are presented in Table 18.

Table 18

Fit Indices for [PPFENUS]

Item	Estimate	Measurement Error	Infit MNSQ	Infit *t*	Outfiit MNSQ	Outfit *t*
ppfenus1	-0.95	0.06	1.09	1.2	1.09	1.2
ppfenus2	-0.66	0.06	0.91	-1.3	0.91	-1.2
ppfenus3	-0.05	0.06	0.86	-2.0	0.87	-1.9
ppfenus4	0.64	0.06	0.94	-0.8	0.95	-0.7
ppfenus5	-0.09	0.06	0.88	-1.7	0.88	-1.7
ppfenus6	-0.75	0.06	1.21	2.7	1.19	2.5
ppfenus7	0.75	0.06	0.97	-0.4	0.96	-0.5
ppfenus8	0.49	0.06	1.29	3.7	1.29	3.6
ppfenus9	0.59	0.18	1.16	2.2	1.18	2.3

The infit and outfit MNSQ for the nine items are in the acceptable range of 0.6 -1.4. However, the infit and outfit *t*-values for ‘ppfmen6’, ‘ppfmen8’ and ‘ppfmen9’ are > +2 thus indicating the data is underfitting the model, the responses are too haphazard and that there is too much of variation. But, as the *t*-values are sensitive to sample sizes, the researcher continues to look at other fit statistics such as the item deltas, discrimination index, the separation reliability and the latent variable map. All the item deltas for the nine items are ordered. The discrimination indices for ‘ppfenus1’ to ‘ppfenus9’ range from 0.72 to 0.81. This demonstrates that the items are effectively discriminating between high and low ability students. The high separation reliability of 0.991 indicates low measurement error. The latent variable map for [PPFENUS] confirms that none of the items should be rejected. Figure 15 presents the latent variable map for [PPFENUS].

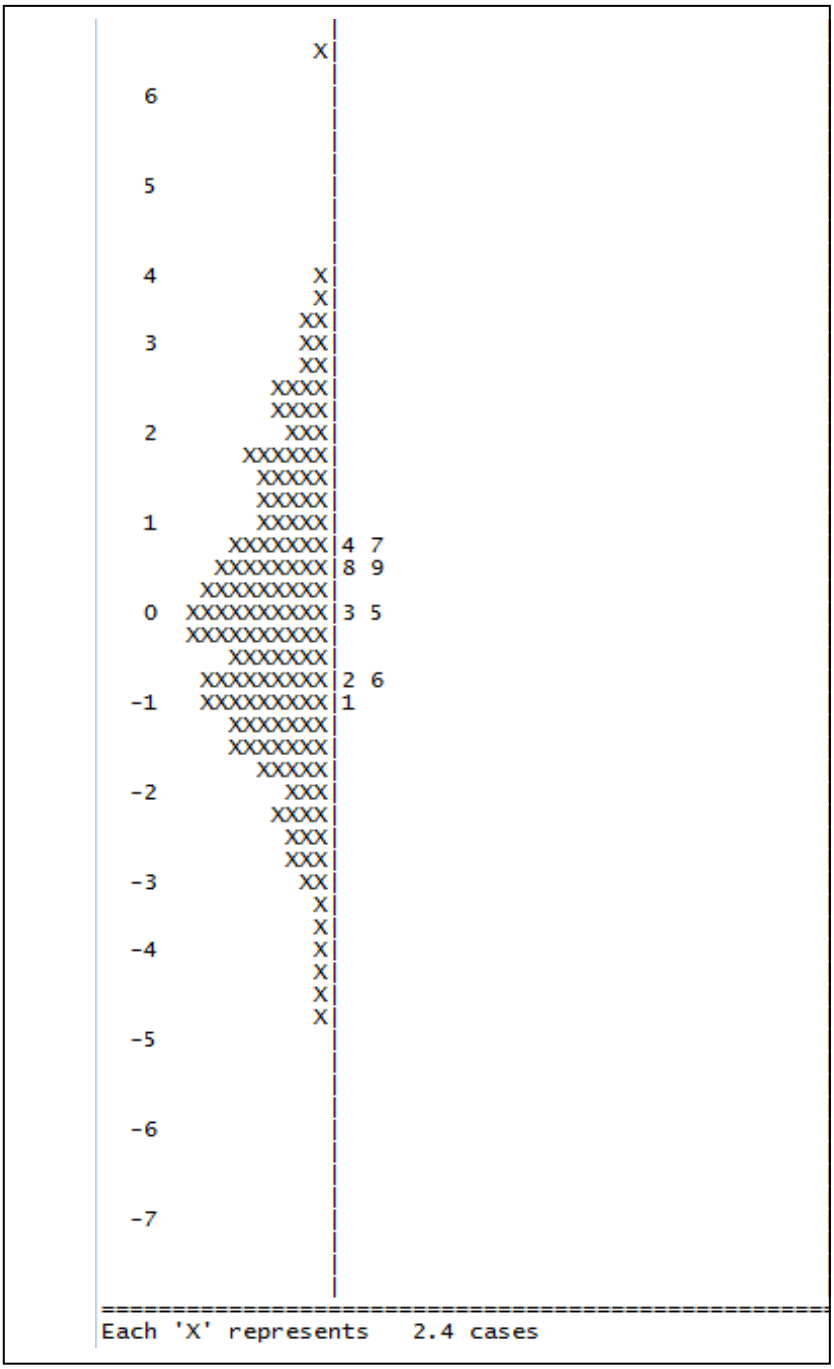

Figure 15. Variable Map for [PPFENUS]

Figure 15 illustrates that the items for the [PPFENUS] scale are distributed between ±1 logits. Three items are distributed both above logit scale 0 and four below. 'Ppfenus3' and 'ppfenus5' are located at the mean of the difficulty level of the items, thus conveying very little information about both item difficulty or person ability. Students' ability and item difficulty are evenly distributed. Based on these justifications, none of the items are dropped from [PPFENUS].

The analysis continues with the [PPFEDCM] scale. The fit indices are presented in Table 19.

Table 19

Fit Indices for [PPFEDCM]

Item	Estimate	Measurement Error	Infit MNSQ	Infit *t*	Outfit MNSQ	Outfit *t*
ppfedcm1	0.058	0.065	1.00	-0.0	1.01	0.1
ppfedcm2	0.336	0.065	1.05	0.6	1.02	0.3
ppfedcm3	0.608	0.065	0.85	-2.0	0.85	-2.2
ppfedcm4	0.518	0.065	0.92	-1.1	0.90	-1.3
ppfedcm5	-0.623	0.065	0.93	-0.9	0.91	-1.2
ppfedcm6	-0.084	0.065	0.93	-0.9	0.92	-1.1
ppfedcm7	-0.582	0.065	1.06	0.8	1.03	0.5
ppfedcm8	-0.186	0.065	1.12	1.5	1.10	1.3
ppfedcm9	-0.045	0.183	**1.52**	6.0	**1.54**	6.3

*** The deviant values are in bold**

The infit and outfit MNSQs for all but one item are in the acceptable range of 0.6 and 1.4. Item 'ppfedcm9' demonstrates an infit MNSQ of 1.52 and outfit MNSQ of 1.54. The infit and outfit *t*-values for 'ppfedcm9' are also a high 6.0 and 6.3, which are clearly > +2. This demonstrates that the students' responses are haphazard and that there is too much of variation, thus reflecting an underfit of data to the model. However, the discrimination indices for the nine items are in the 0.70 to 0.81 range, hence, implying that the items are obviously discriminating between the high ability and low ability students. Additionally, with a separation index of 0.981, it is apparent that the measurement error is low, as well. Low measurement errors contribute to high reliability. The item deltas for all the nine items are also ordered. This motivates the examination of the latent variable map for [PPFEDCM]. Figure 16 presents the variable map for [PPFEDCM].

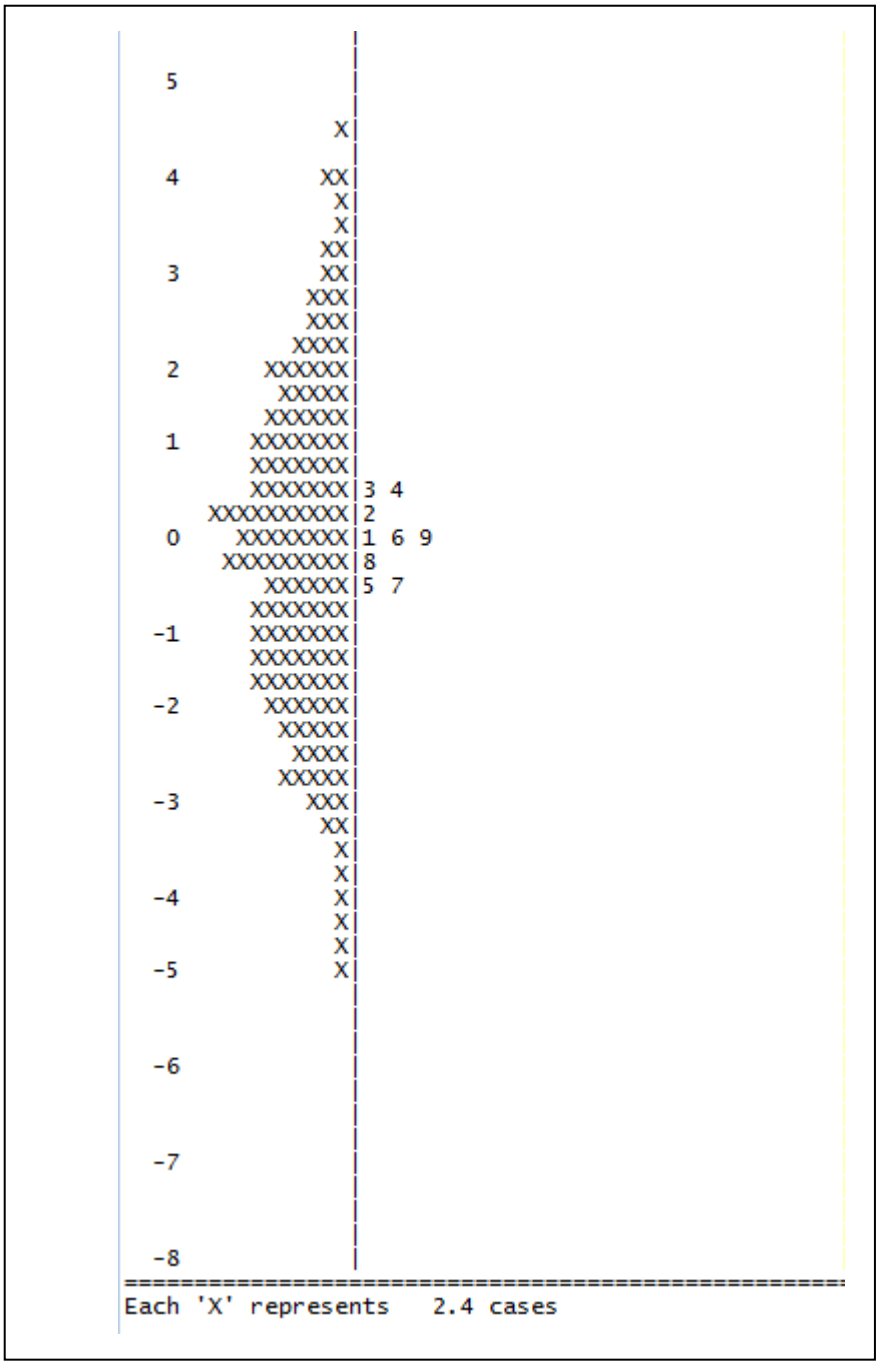

Figure 16. Variable Map for [PPFEDCM]

Figure 16 demonstrates that the nine items in the [PPFEDCM] scale are bunched around the mean of the difficulty level of the items. Not much information can be derived about item difficulty or person ability for 'ppfedcm1', 'ppfedcm6' and 'ppfedcm9'. Student ability range from logit scale -5 to ±5, thus indicating that the respondents' abilities are well distributed. The items are moderately discriminating between the high ability and low ability students. Based on these features of the [PPFEDCM] scale, none of the items are dropped from this scale.

Validation of the Multimodal and Language Proficiency questionnaire indicates that at the item level, most of the items are moderately fitting the model. Thus all but three of the items in the six scales are maintained. The final structure of the Multimodal and Language Proficiency Questionnaire is presented in Table 20.

Table 20

Nallaya's (2009) Multimodal and Language Proficiency Questionnaire Structure

FACTOR	ITEM
USETEC	usetec1, usetec2, usetec3, usetec4, usetec5, usetec6, usetec10
FRMENG	fremng1, frmeng2, frmeng3, frmeng4, frmeng5, frmeng6, frmeng7, frmeng8, frmeng9, frmeng10, frmeng11, frmeng12, frmeng13, frmeng14, frmeng15, frmeng16, frmeng17, frmeng18, frmeng19, frmeng20, frmeng21, frmeng22, frmeng23, frmeng24, frmeng25, frmeng26, frmeng27, frmeng28, frmeng29
FRENGUS	frengus1, frengus2, frengus3, frengus4, frengus5, frengus6, frengus7, frengus8, frengus9,
PPFMEN	ppfmen1, ppfmen2, ppfmen3,ppfmen4, ppfmen5, ppfmen5, ppfmen6, ppfmen7, ppfmen8, ppfmen9, ppfmen10, ppfmen11, ppfmen12, ppfmen13, ppfmen14, ppfmen15, ppfmen16, ppfmen17, ppfmen18, ppfmen19, ppfmen20, ppfmen21, ppfmen22, ppfmen23, ppfmen24, ppfmen25, ppfmen26, ppfmen27, ppfmen28, ppfmen29
PPFENUS	ppfenus1, ppfenus2, ppfenus3, ppfenus4, ppfenus5, ppfenus6, ppfenus7, ppfenus8, ppfenus9
PPFEDCM	ppfedcm1, ppfedcm2, ppfedcm3, ppfedcm4, ppfedcm5, ppfedcm6, ppfedcm7, ppfedcm8, ppfedcm9

Summary

In this chapter, the validation procedures employed for the Multimodal and Language Proficiency (MMLP) questionnaire are discussed. The chapter begins with a detailed description of the questionnaire with reference to the observed as well as latent variables. The discussion proceeds with the description on CFA conducted to test three models to "determine the way in which observed measurements are mapped to particular factors" (Diamantopolous & Siguaw, 2000, p. 18). The strictly confirmatory framework (SC) framework is employed to test the Two-Factor USETEC, Five-Factor FRMENG, One-Factor PPFMEN and Five-Factor PPFMEN, One-Factor FRENGUS, One-Factor PPFENUS and One-Factor PPFEDCM to investigate if the observed variables were truly measuring the latent variables they set out to measure.

It is found that factor loadings for the One-Factor PPFMEN model are low but high for the One-Factor PPFENUS, One-Factor FRENGUS, Five-Factor FRMENG, Five-Factor PPFMEN and One-Factor PPFEDCM models. The discussion continues with reference to comparison of the tested models in relation to fit indices. The researcher then goes on to employ the alternative model (AM) framework to investigate if there are alternative models that are compatible with the data. The Three-Factor NEMPPF, Hierarchical as well as Nested Models are tested. The Nested Model although positively loads onto the first order factors, does not demonstrate the same with the nested factor. As the Three-Factor NEWMPPF Model and the Hierarchical Model share similar indices, they are chosen to guide further analysis of the data. Furthermore, these models reflect model parsimony. The Nested Model is a complex model and according to literature, the more complex the model, the more 'noise' the analysis produces.

The next section of this chapter focuses on Rasch analysis. The Rasch Model is used to test six scales: 'USETEC', 'FRMENG', 'FRENGUS', 'PPFMEN', 'PPFENUS' and 'PPFEDCM'. The discussion continues with a focus on fit indices as well as the latent variable map. Three items are dropped from the [USETEC] scale due to low factor loadings as well as fit indices.

Thus in reporting about the Multimodal and Language Proficiency, students' perceptions in the six areas, vis-à-vis, 'use of technology', 'frequency of multimodal texts use in English', 'frequency of English use for university activities', 'perceptions on how students rate their English language proficiency for the 29 listed activities'; 'perceptions regarding English language proficiency for nine listed university activities'; 'perceptions of English language proficiency in everyday communication' is provided'.

PLSPath MV-Correlations

	years	sex	emalay	echinese	eindian	eindign
years	1.000					
sex	-.017	1.000				
emalay	-.003	.004	1.000			
echinese	-.069	-.026	-.358	1.000		
eindian	.049	.030	-.206	-.006	1.000	
eindign	.021	.000	-.898	-.024	-.014	1.000
northern	-.018	.073	.113	.086	-.035	-.151
central	.005	-.009	.004	.080	.174	-.080
southern	-.058	.058	.093	-.033	-.019	-.084
eastern	.101	-.099	.125	-.073	-.042	-.096
east	-.064	-.001	-.371	-.044	-.026	.433
fsscihum	.216	.091	-.034	-.104	.053	.068
fcscihdv	-.240	.001	-.028	-.047	-.027	.057
fict	.045	.037	.044	-.016	-.009	-.040
fbusecon	-.213	-.044	-.031	.240	-.023	-.061
fartmus	.164	-.114	.100	-.036	-.021	-.090
bckgrnd	-.014	.024	.056	.022	.013	-.074
mlevel	-.089	.013	-.130	.100	-.027	.108
nagrwkcm	-.057	.010	-.026	.110	.042	-.028
nalrnst	-.042	.025	-.028	.032	.035	.008
namotstr	-.054	-.040	-.081	.108	.008	.042
natccap	-.052	.019	-.007	.026	.041	-.013
nacullng	.023	-.031	-.005	-.007	.054	-.005
nadiflnp	.017	-.015	-.058	.046	.041	.035
nastcap	.008	-.062	-.010	.111	.009	-.037
persnl	-.095	-.024	.038	-.084	-.049	.006
uni	-.081	-.079	.031	-.039	-.082	.003
frmm1	.038	.021	-.005	.050	.057	-.029
ppmmu1	.022	.027	.054	.006	.082	-.061
ppfenus	.057	-.014	.079	-.043	.022	-.074
ppfedcm	.004	.019	.030	.056	.056	-.070
frengu	.014	.078	.079	-.027	.028	-.082
escore	-.059	.077	-.101	.092	.010	.070
persnl2	.050	-.064	-.029	.018	-.052	.036
uni2	-.019	-.061	-.021	.010	-.047	.030
frmm2	-.030	.027	.005	-.046	-.005	.015
ppmmu2	.031	-.023	.059	-.011	-.226	-.006
ppfenus2	.021	.027	.041	-.075	-.199	.035
ppfedcm2	-.002	.033	.016	-.039	-.189	.045
frenus2	-.034	-.008	-.036	-.001	-.006	.042
escore2	-.083	.104	-.071	.018	-.018	.075
persnl3	-.043	-.080	-.016	.094	-.074	-.004
uni3	-.128	-.020	-.063	.015	-.066	.079
frmm3	.080	.073	.037	-.012	.060	-.050
ppmmu3	-.001	-.035	.108	-.009	.028	-.121
ppfenus3	-.065	-.044	.124	-.026	.044	-.136

	northern	central	southern	eastern	east	fsscihum
northern	1.000					
central	-.200	1.000				
southern	-.210	-.111	1.000			
eastern	-.457	-.240	-.253	1.000		
east	-.280	-.147	-.155	-.336	1.000	
fsscihum	-.028	.003	-.092	.104	-.026	1.000
fcscihdv	-.004	-.100	-.031	-.015	.128	-.507
fict	.081	-.052	.077	-.035	-.073	-.171
fbusecon	-.048	.115	.098	-.094	.007	-.431
fartmus	.062	.016	.037	-.023	-.087	-.386
bckgrnd	.071	.022	-.070	.010	-.057	-.002
mlevel	.005	.008	-.007	-.073	.087	-.112
nagrwkcm	.029	-.030	.066	.057	-.137	.003
nalrnst	-.011	-.054	.102	.028	-.063	-.055
namotstr	.026	.008	.017	.000	-.051	-.014
natccap	.016	.108	-.029	.034	-.123	-.044
nacullng	-.041	.077	-.032	.015	-.004	-.070
nadiflnp	-.006	.055	.004	-.060	.038	-.144
nastcap	-.111	.123	.005	.027	-.002	-.083
persnl	-.035	-.124	.075	.033	.035	-.052
uni	-.005	-.095	.001	.012	.063	-.002
frmm1	-.179	.012	.056	.117	.010	-.062
ppmmu1	-.150	-.005	-.014	.123	.038	-.017
ppfenus	-.112	-.040	.044	.083	.024	.031
ppfedcm	-.059	-.057	.118	-.037	.065	-.073
frengu	.065	.028	-.013	.012	-.104	.032
escore	.058	.003	.012	-.114	.065	-.361
persnl2	.007	-.012	-.066	.040	.004	-.040
uni2	.019	.013	-.008	.014	-.043	-.150
frmm2	-.026	-.013	.060	.039	-.056	-.030
ppmmu2	.054	-.079	.047	-.036	.004	-.079
ppfenus2	.057	-.110	.060	-.031	.009	-.047
ppfedcm2	.044	-.074	.049	-.055	.037	-.023
frenus2	.011	.117	.014	-.038	-.067	.074
escore2	.074	-.004	.020	-.144	.083	-.341
persnl3	-.024	-.089	-.021	.066	.030	.017
uni3	-.125	-.057	.115	.042	.046	.047
frmm3	.027	.049	-.010	-.050	.002	-.021
ppmmu3	.031	.142	-.105	-.021	-.035	.012
ppfenus3	.017	.123	-.042	-.052	-.015	.032
ppfedcm3	.029	.084	-.109	-.005	-.005	-.012
frenus3	.023	.071	.042	-.070	-.028	.074
escore3	.045	.005	-.002	.048	-.116	.041
ppfedcm3	-.018	-.020	.100	.003	-.005	-.109
frenus3	-.032	.121	-.056	-.042	.043	.069
escore3	-.021	-.058	.128	-.073	-.053	-.098

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	fcscihdv	fict	fbusecon	fartmus	bckgrnd	mlevel
fcscihdv	1.000					
fict	-.077	1.000				
fbusecon	-.195	-.066	1.000			
fartmus	-.174	-.059	-.148	1.000		
bckgrnd	.031	-.059	.006	-.011	1.000	
mlevel	.077	.044	.132	-.084	-.072	1.000
nagrwkcm	-.023	.105	-.029	.004	-.021	.094
nalrnst	.027	.158	-.025	.003	-.100	.072
namotstr	.031	.132	-.051	-.026	-.050	.070
natccap	-.040	.120	.042	.013	-.086	.135
nacullng	.027	.175	-.041	.034	-.017	.052
nadiflnp	.041	.043	.087	.060	.096	.083
nastcap	-.001	-.047	.126	.016	.022	.011
persnl	.035	.031	.040	-.021	.000	.077
uni	.040	-.052	-.024	.006	-.019	.127
frmm1	.003	-.125	.095	.051	.039	.020
ppmmu1	.007	-.042	.043	-.009	.031	.019
ppfenus	-.002	-.071	-.001	-.010	-.028	.025
ppfedcm	.050	.019	.084	-.048	.009	-.018
frengu	-.017	.064	-.004	-.057	.013	.058
escore	.173	-.118	.140	.256	-.009	.168
persnl2	-.051	-.064	.005	.149	.024	-.040
uni2	.103	-.039	.069	.051	.070	.034
frmm2	.067	-.116	-.015	.040	.009	.048
ppmmu2	.041	.026	.060	-.005	.015	.085
ppfenus2	.040	-.017	.002	.031	.020	.074
ppfedcm2	.030	-.001	.002	-.002	-.029	.125
frenus2	-.052	-.028	-.008	-.028	-.055	-.072
escore2	.160	-.056	.156	.192	.031	.259
persnl3	-.043	.027	.050	-.042	.022	-.036
uni3	-.004	-.063	.016	-.054	-.074	-.041
frmm3	.032	.015	.031	-.047	-.005	-.030
ppmmu3	-.046	.021	.033	-.009	.041	.011
ppfenus3	-.099	-.001	.076	-.012	.042	.026
ppfedcm3	-.011	-.028	.047	-.006	.051	.016
frenus3	-.097	.000	.023	-.022	.035	.009
escore3	.039	-.061	-.049	-.027	-.028	-.104

	nagrwkcm	nalrnst	namotstr	natccap	nacullng	nadiflnp
nagrwkcm	1.000					
nalrnst	.565	1.000				
namotstr	.539	.536	1.000			
natccap	.450	.600	.501	1.000		
nacullng	.265	.361	.339	.269	1.000	
nadiflnp	.141	.222	.121	.243	.261	1.000
nastcap	.057	.068	.030	.088	.072	.045
persnl	-.012	.050	.027	.021	.007	.011
uni	.044	.069	.080	.096	.054	.012
frmm1	.064	.172	.087	.074	.043	-.048
ppmmu1	-.017	.083	.028	-.001	.020	-.069
ppfenus	-.042	.026	.018	-.010	.015	-.109
ppfedcm	.032	.035	-.007	.026	-.080	-.042
frengu	.006	-.052	-.092	.034	-.040	.051
escore	-.001	.068	-.028	.053	-.015	-.035
persnl2	.055	.028	-.014	.056	-.025	.174
uni2	.089	.083	.109	.026	.127	.222
frmm2	.008	-.076	-.056	-.018	-.041	.022
ppmmu2	.030	-.004	-.037	.045	.006	.016
ppfenus2	.054	-.001	-.017	.020	.037	-.010
ppfedcm2	.057	-.010	-.056	.035	.038	-.027
frenus2	-.099	-.134	-.099	-.038	-.126	-.034
escore2	.018	.060	.004	.090	.043	.022
persnl3	-.038	-.054	.071	-.047	-.026	-.063
uni3	-.028	-.033	-.003	-.009	.063	-.028
frmm3	.147	.119	.061	.127	.048	.139
ppmmu3	.078	.142	.050	.119	.103	.128
ppfenus3	.093	.126	.017	.088	.155	.149
ppfedcm3	.069	.129	-.022	.060	.105	.169
frenus3	.039	.048	.008	.023	-.066	.027
escore3	-.090	-.086	-.044	.030	.054	-.029

	nastcap	persnl	uni	frmm1	ppmmu1	ppfenus
nastcap	1.000					
persnl	.041	1.000				
uni	-.032	.248	1.000			
frmm1	.005	-.089	-.019	1.000		
ppmmu1	-.013	-.218	-.134	.581	1.000	
ppfenus	-.018	-.216	.000	.402	.710	1.000
ppfedcm	-.041	-.271	-.121	.342	.629	.692
frengu	-.045	-.041	-.008	-.085	-.106	-.093
escore	.075	-.004	-.015	.074	.067	.010
persnl2	.023	-.040	-.003	-.026	-.041	.000
uni2	.015	-.014	.059	.036	.074	.005
frmm2	-.058	.044	.005	.025	.065	.103
ppmmu2	.030	.149	.079	.086	-.004	.049
ppfenus2	.021	.093	.091	.055	.009	.038
ppfedcm2	.096	.117	.054	.007	.009	.046
frenus2	-.067	.049	-.027	-.106	-.054	-.064
escore2	.053	.015	.010	.033	.029	-.015
persnl3	.040	.112	.124	-.043	.024	.040
uni3	-.056	-.020	-.017	-.034	.026	.076
frmm3	.011	-.030	-.071	.088	.017	.008
ppmmu3	.036	-.014	-.066	.041	-.004	-.052
ppfenus3	-.014	.032	-.030	.001	-.011	-.024
ppfedcm3	-.026	-.075	-.048	.027	.016	-.007
frenus3	-.040	-.045	.027	.009	-.022	.008
escore3	-.010	-.079	-.046	-.084	.054	.079

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	ppfedcm	frengu	escore	persnl2	uni2	frmm2
ppfedcm	1.000					
frengu	-.028	1.000				
escore	.050	-.019	1.000			
persnl2	.054	.054	-.014	1.000		
uni2	.035	-.007	.041	.217	1.000	
frmm2	.029	.089	.088	.009	.038	1.000
ppmmu2	-.051	.021	.061	-.059	.035	.374
ppfenus2	-.072	-.031	.028	-.085	.091	.294
ppfedcm2	-.037	.004	.017	-.088	.030	.274
frenus2	-.049	.101	-.040	-.018	.030	.039
escore2	.043	.034	.646	.000	.052	.012
persnl3	-.001	-.057	-.104	-.166	-.019	-.012
uni3	.023	-.044	-.134	-.086	-.049	.122
frmm3	-.008	.016	.049	.012	-.079	.050
ppmmu3	-.015	-.036	-.036	-.012	.046	-.034
ppfenus3	-.014	.038	-.070	-.025	.050	.000
ppfedcm3	.013	-.014	.039	.002	.033	.050
frenus3	.010	.014	.002	-.063	-.061	-.133
escore3	.061	.082	-.029	.028	-.060	.129

	ppmmu2	ppfenus2	ppfedcm2	frenus2	escore2	persnl3
ppmmu2	1.000					
ppfenus2	.782	1.000				
ppfedcm2	.751	.765	1.000			
frenus2	.117	.060	.093	1.000		
escore2	.067	.028	.033	-.029	1.000	
persnl3	.083	.085	.096	.061	-.050	1.000
uni3	-.065	-.025	-.059	.006	-.121	.362
frmm3	.040	.047	.063	-.058	.026	-.059
ppmmu3	-.010	.034	.039	-.037	.017	-.158
ppfenus3	-.025	.041	.071	-.019	-.015	-.104
ppfedcm3	.022	.094	.067	-.017	.023	-.111
frenus3	.044	.086	.068	.082	-.025	.034
escore3	.015	.043	.011	.029	-.008	-.034

	uni3	frmm3	ppmmu3	ppfenus3	ppfedcm3	frenus3
uni3	1.000					
frmm3	-.064	1.000				
ppmmu3	-.050	.376	1.000			
ppfenus3	.001	.306	.788	1.000		
ppfedcm3	-.009	.265	.759	.759	1.000	
frenus3	.017	-.015	-.052	-.064	-.063	1.000
escore3	.099	.090	.099	.096	.122	-.014

	escore3
escore3	1.000