A Study of The Most Influencing Factors in the Preliminary Test of the GEPT - Based on GM(0,N)

Hsiao-Ching Chen
Department of Applied Foreign Language,
Chien-Kuo Technology University
No.1, Chieh Shou N. Rd., Changhua City, 500
Taiwan
TEL:+886-4-7111111#3718
E-mail: hsiaochi@cc.ctu.edu.tw

Ting-Hui Hsu
Department of Industrial Engineering and Management
Chienkuo Technology University
No.1, Chieh Shou N. Rd., Changhua City, 500
Taiwan
TEL:+886-4-7111111#3504
Email: hsuth@ctu.edu.tw

Abstract- The main purpose of this paper is to apply GM(0,N) model to weigh problem on the topic of a study of the most influential part in the first stage of the GEPT. “English proficiency” plays key role in facilitating communicating, teaching, learning and even job operating. General English Proficiency Test (GEPT) – set by The Language Training and Testing Center (LTTC) in 1999 in Taiwan – has been practiced for 10 years; it has been commonly used not only by schools to measure Taiwanese students’ English proficiency but businesses to determine employees’ ability. Many universities and institutes set up a graduation threshold of English competency by means of the GEPT. Does this test properly evaluate students’ English proficiency of their four skills? This attracts a lot of attention. Therefore, there is an urgent need for English teachers to know which influences the final grade of the GEPT most and which part should be strengthen in class. First, this paper adopted the Preliminary Test (the first stage) of the GEPT Elementary Level, including listening and reading, as tools to evaluate students’ ability of listening and reading comprehension. This paper divided the preliminary test into 2 input components (6 factors) and 1 output component (1 factor) based on the GEPT. 150 students in Chienkuo Technology University had taken preliminary test of the Elementary level. Second, applied GM(0,N) model to help the calculation of the whole data. Also, a Matlab toolbox had developed to weigh the problem. Finally, this study got two results. One, students’ listening ability is worse than their reading ability. Students may be careless about those pronunciations, stuck in listening predicament, or dependent on context when decoding the meaning of words while reading. The other is the factor of reading comprehension influences the final score least. This is indicative of students’ good accessibility when making guesses and using context in the process of reading. Then, this paper adopts a new approach and can extend it into other relative fields.

Keywords: GEPT, GM(0,N), Matlab

1. Introduction
With the rapid development of technology, a majority of countries are connected by High-Tech to form a Global Village. There is no denying that in the communicating system, the most important communicating tool is English. English learning is becoming an important issue of educational policy in non-English speaking countries. Taiwan is no exception. To face intense competition under globalization, “English proficiency” has become a
crucial skill in today’s globalized world. To promote English to become an official language of Taiwan, the relevant ministerial agencies will develop sound measure to improve our population’s English proficiency [1]. In the past two decades, Taiwanese English education has been dramatically changed and the English learning environments – English cram schools, movies, pop songs, magazines, and etc. – have mushroomed all over Taiwan with this trend. However, the results of English teaching in universities and institutes are not as effective as expected. In order to react to the educational trend of globalization, the government offers many acts such as the innovation of Nine-year Integrated Curriculum, the reforms of entrance exam in senior high school as Basic Competence for Junior High School Students (BCET), and the Ministry of Education commissioned the Language Training & Testing Center (LTTC) to develop a fair and reliable English test, called the General English Proficiency Test (GEPT), for students of English at all levels of proficiency [2]. It is obviously observed that Taiwanese college students’ English ability is commonly impoverished. Su indicates that the students are, by and large, lack of experiences in joining standardized English proficiency tests and the rate of passing the tests is extremely low[3]. Take CTU for example, the passing rate of GEPT in 2007 is 0.46%, which is 46 out of 11,046 students. Recently, Taiwan forms a trend that more and more institutions evaluate students’ English competency and even set up a graduation threshold for English competency by means of standardized English proficiency tests [3]. Besides, Ministry of Education in Taiwan carries out the evaluation system for higher education to maintain the standard for higher education and the quality for teaching and learning [4], the students’ English proficiency is one of the evaluation factors verified by the Ministry of Education every four years to promote English teaching and learning quality. Therefore, many scholars suggest that there is an urgent need to improve students’ basic English learning ability in institutes and technology universities. This research adopted the first stage of the Elementary level to evaluate students’ listening and reading ability to know which part should be strengthened and proposed advice for further studies. In other words, we found out which is the most and least influential factors of the GEPT to help students to improve their English proficiency on the one hand, and on the other to have valuable discoveries in students’ difficult in English learning.

2. The Research Structure

According to the official website [5], the LTTC GEPT is administered in five levels, Elementary, Intermediate, High-Intermediate, Advanced, and Superior, and includes listening, reading, writing, and speaking components. Each of the first four level is administered in two stages. Examinees must pass the preliminary test (the first stage) before proceeding on to the second. An examinee who passes both stages is awarded a certificate of achievement. The Superior Level is an integrated test of all four skills, and is administered upon request. The applicant can choose to take whichever level suits him/her best. An examinee who passes Elementary level has basic ability in English, which means that he/she can understand and use rudimentary language needed in daily life. His/her English ability is roughly equivalent to that of a junior high school graduate in Taiwan. As only a minority of CTU students are able to pass the Elementary level of GEPT, this study adopts the level 1 Test paper, not level 2 or level 3 to solicit students answers.
A Study of The Most Influencing Factors in the Preliminary Test of the GEPT - Based on GM(0,N)

The first stage of the Elementary level divided the test into two parts, listening and reading, and each part composed three parts too.

1) Listening part: It has thirteen questions and is divided into picture description, question or statement response and short conversation.
2) Reading part is partitioned into vocabulary and structure (10 questions), cloze (10 questions) and reading comprehension (10 questions)

After having the students completed the test twice, we would like to know which is the most influential part is and which part should be strengthened. The structure of the research and the process of the research are shown as Fig. 1 and Fig. 2.

Based on Fig. 1, the study applied GM(0, N) model to find out which is the most and least influential factor to influence the final grade.

3. Mathematics Model

The grey relational grade is the most important topic in relational analysis. Its main function is the measurement between two discrete sequences, and the result may be said to be a very objective weighting in the system[6].

A. GM(0,N) model

The GM(0,N) model is the special state in the of GM(h,N) model, the function is the same as the GM(1,N)model. According to the definition of GM model, the GM(0,N) model is defined as:

\[
a^1_{i}(k) = \sum_{j=2}^{N} b_{ij} x^1_j(k) = b_{i2} x^1_2(k) + b_{i3} x^1_3(k) + \ldots + b_{iN} x^1_N(k)
\]

(1) where:

\[
z^1_i(k) = 0.5 x^1_i(k-1) + 0.5 x^1_i(k), \quad k = 2,3,4,\ldots, n
\]

1. Substituting the AGO value, then we have
Comparing the value of influencing sequences also can be found by the relationship between the major sequence and the

\[ a_1z_1 = b_2x_2(2) + \Lambda + b_Nx_N(2) \]
\[ a_1z_1 = b_2x_2(3) + \Lambda + b_Nx_N(3) \]
\[ a_1z_1 = b_2x_2(4) + \Lambda + b_Nx_N(4) \]
(2)
\[ \Lambda \Lambda \Lambda \Lambda \Lambda \Lambda \Lambda \Lambda \Lambda \]
\[ a_1z_1 = b_2x_2(n) + \Lambda + b_Nx_N(n) \]

2. Dividing \( a_1 \) in both sides, then translate into matrix form

\[
\begin{bmatrix}
0.5x_1^{(1)}(2) + 0.5x_1^{(2)}(2) \\
0.5x_1^{(1)}(2) + 0.5x_1^{(3)}(3) \\
0.5x_1^{(n-1)} + 0.5x_1^{(n)}(n)
\end{bmatrix}
= \begin{bmatrix}
x_2^{(1)}(2) & x_2^{(2)}(2) \\
x_2^{(1)}(3) & x_2^{(3)}(3) \\
x_2^{(n-1)}(n) & x_2^{(n)}(n)
\end{bmatrix} \begin{bmatrix}
b_2 \\
b_3 \\
b_n
\end{bmatrix}
\]

(3)

2. Building the AGO sequences

\[ \hat{b}_m = \hat{x}_m \] where \( m = 2,3,4,A,N, \) then equation (5-14) can be rearranged into

\[
\begin{bmatrix}
0.5x_1^{(1)}(2) + 0.5x_1^{(2)}(2) \\
0.5x_1^{(1)}(2) + 0.5x_1^{(3)}(3) \\
0.5x_1^{(n-1)} + 0.5x_1^{(n)}(n)
\end{bmatrix}
= \begin{bmatrix}
x_2^{(1)}(2) & x_2^{(2)}(2) \\
x_2^{(1)}(3) & x_2^{(3)}(3) \\
x_2^{(n-1)}(n) & x_2^{(n)}(n)
\end{bmatrix} \begin{bmatrix}
b_2 \\
b_3 \\
b_n
\end{bmatrix}
\]

(4)

3. Using the inverse matrix method \( \hat{b} = (Y^TY)^{-1}Y^TX \) to solve the values of \( \hat{x}_m \) where

\[
\begin{bmatrix}
0.5x_1^{(1)}(2) + 0.5x_1^{(2)}(2) \\
0.5x_1^{(1)}(2) + 0.5x_1^{(3)}(3) \\
0.5x_1^{(n-1)} + 0.5x_1^{(n)}(n)
\end{bmatrix}
= \begin{bmatrix}
x_2^{(1)}(2) & x_2^{(2)}(2) \\
x_2^{(1)}(3) & x_2^{(3)}(3) \\
x_2^{(n-1)}(n) & x_2^{(n)}(n)
\end{bmatrix} \begin{bmatrix}
b_2 \\
b_3 \\
b_n
\end{bmatrix}
\]

(5)

The study targeted the preliminary test of the GEPT taken by 150 students who took practical English in fall semester in 2007 as the source material. Based on the mathematic method and the toolbox developed for this study, the results of the test are shown in Table I.

**4. Results**

From Table 1 and the theory of equal weighting, \( H_1 \) is \( \sum_{i=1}^{3} Q_i \), \( H_2 \) is \( \sum_{i=1}^{3} Q_i \). The results are shown in Table II.

**B. Analysis steps:**

1. Building the original sequences

\[ x_1^{(0)} = (49.3,39.1,..52.7) , \]
\[ x_2^{(0)} = (10.2,10.2,..11.9) , \]
\[ x_3^{(0)} = (11.9,3.4,..10.2) , \]
\[ x_4^{(0)} = (8.5,10.2,..6.8) . \]

2. Building the AGO sequences

\[ x_1^{(1)} = (49.3,88.4,132.6,..7780.9) , \]
\[ x_2^{(1)} = (-44.2,21.65,45.05,..49.3) , \]
\[ x_2^{(2)} = (10.2,20.4,34,..1642.2) , \]
\[ x_3^{(2)} = (8.5,18.7,27.2,..1358.3) \]

3. Substituting equation (4)

\[
\begin{bmatrix}
44.2 \\
41.65 \\
... \\
49.3
\end{bmatrix}
= \begin{bmatrix}
9.12 \\
10.24 \\
... \\
1358.3
\end{bmatrix}
\]

we use \( \hat{b} = X^{-1}X \) to solve the values of \( |\hat{b}_2| \leq |\hat{b}_7| \)

each value is \( |\hat{b}_2| = 0.9426, \)
\( |\hat{b}_3| = 1.0732, \ldots \)
\( |\hat{b}_7| = 0.4404 \)

**TABLE I. THE RESULTS OF THE PRELIMINARY TEST**

<table>
<thead>
<tr>
<th>Component</th>
<th>Factor</th>
<th>Weighting</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening (H1)</td>
<td>Picture Description</td>
<td>0.9426</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Question or Statement Response</td>
<td>1.0732</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Short Conversation</td>
<td>1.0129</td>
<td>4</td>
</tr>
<tr>
<td>Reading (H2)</td>
<td>Vocabulary &amp; Structure</td>
<td>1.0823</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Close</td>
<td>1.6114</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Reading Comprehension</td>
<td>0.4404</td>
<td>6</td>
</tr>
</tbody>
</table>

**TABLE II. WEIGHTING FOR COMPONENTS**

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>3.0287</td>
</tr>
<tr>
<td>H2</td>
<td>3.1342</td>
</tr>
</tbody>
</table>
A Study of The Most Influencing Factors in the Preliminary Test of the GEPT - Based on GM(0,N)

Then, we got Fig. 3 to see which component influences the final grades most.

Fig. 3 The result of components

From Fig. 3, we can easily find out that H₂ – Reading – influences the final grades more than H₁. Then, we got Fig.4 to find out which factor influences the final grade most.

Fig. 4 The result of influencing factors

Fig. 4 shows that students got the highest grade of Cloze test; however, reading comprehension is their weakest part when taking the preliminary test of the GEPT.

5. Conclusion

The GEPT is becoming an important tool to evaluate students’ English proficiency in the modern Taiwanese educational system and determine employees’ working ability in Industry. This situation makes it necessary to further understand how the final grades are influenced by the factors. By applying the GM(0,N) model, the present paper aims to weigh factors under an uncertain environment. The Preliminary Test of the GEPT has been used to illustrate the proposed approach. The 7 factors × 150 students = 1050 data records were calculated under a self-development Matlab toolbox for data analysis.

The study matched current educational trends and the result pointed which factor influenced the final grades most. The study found that the most important influencing component is reading. This result matched our original thought that listening skill is beyond students’ ability. One of the important elements may be the test types of Joint University Entrance Examination set by the Ministry of Education mainly measure students’ reading and writing skills. Thus, listening and speaking comprehension have usually been ignored in the curricular designs. However, the weakest factor is reading comprehension. Reading requires a mastery of vocabulary terms, syntax, structure and above all, it is related to context or situation.

From the results we got some conclusion that teachers should create more authentic situations and settings, expose students to English listening scenarios, play more English CDs in class, and try to conduct class in simple English. Students surrounded by a culture that speaks English is a major factor in successful second-language acquisition.

However, the respondents of this study came mainly from the Changhua County in Taiwan. A lack of participants from metropolitan areas might make the study less representative. A formal statistical procedure was not implemented due to insufficient participants. Besides, the study adapted the preliminary test (the first stage) of the GEPT could be expanded to contain both the first and second stages for further study. Further more, if we combine this method to other traditional methods, we can also
provide more generalized results for the related research in the future.

References


A Study of The Most Influencing Factors in the Preliminary Test of the GEPT - Based on GM(0,N)

Title: Application of GM(0,N) Mathematical Model in the Preliminary Test of GEPT - Influence Factor Evaluation

Authors: Chen Xiaochi, Stircraft, Hsiu Chung

Affiliations: National Taiwan University of Science and Technology, Department of Foreign Languages, No. 1, Jieshui Road, Zhehuan City, TEL: 04-7111111, Extension 3718, Email: hsiaochi@cc.ntu.edu.tw

Abstract:

This study aims to use GM(0,N) mathematical model, with the assistance of computer tools, to analyze the preliminary test scores of GEPT (listening and reading) to identify the most influential test types. English language ability plays a significant role in communication, teaching, and job search among people. GEPT, established by the Language Training Center in 1999, has been in operation for 10 years in Taiwan. Since then, it has been widely applied in schools to measure students' English language abilities and is also recognized by various business organizations as a benchmark for employees' English language skills. Many universities use GEPT as a standard for students' graduation requirements. However, can this test truly effectively evaluate students' four basic English skills? This question has sparked widespread discussion. Therefore, it is crucial to understand which GEPT test type most affects students' scores and which part needs to be strengthened.

This study uses 150 students' scores from the National Taiwan University of Science and Technology to analyze the preliminary test scores of listening and reading using the GM(0,N) model. The study reveals two main findings: first, students' listening ability is weaker than their reading ability, and they may neglect pronunciation and fall into a listening dilemma. Secondly, reading comprehension is the weakest factor affecting the total score. This indicates that students are easily influenced when they refer to context or guess the answer.

Finally, the study introduces a new method and hopes that this research method can be applied to other academic fields.

Keywords: GEPT, GM(0,N), Matlab

119