A Multi Level Formative Assessment of Autonomous College English Learning Based on Analytic Hierarchy Process

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Abstract. Autonomous learning as a part of college English teaching system has long been a focus for the researchers. The important key to the autonomous English learning is autonomous learning ability. It is an urgent need to establish a reasonable and feasible system to evaluate the autonomous ability with some objective methods. On the basis of literature analysis and questionnaires, a multi level formative assessment scheme different from examination evaluation is designed to monitor autonomous learning ability. The weight of each evaluation index is more objectively determined though analytic hierarchy process than expert scoring method. In the teaching practice, surveys have shown that this multi level formative assessment scheme can improve the objectivity and satisfaction of the evaluation, and the autonomous learning ability is improved by multi level indexes.

Introduction

As the information technology goes further into the development of education, autonomous learning under network environment has attracted high attention of domestic and foreign educational researchers. Now the mode of autonomous learning is widely adopted in English language teaching and we have seen some practical effects. However, as far as the current situation of English Teaching in Colleges and Universities concerned, some blind implementation still present in the autonomous learning. The role of teachers is ignored. Teachers let students take their own course and students find no way to construct the knowledge hierarchy. All of these results are lack of a scientific and feasible evaluation method.

Compared with summative assessment, formative assessment is directed towards promoting learning and pays more attention to learning processes, such as the details of content and performance. It is therefore part of teaching. The application of it to autonomous learning may not only help students monitor their own progress and improve their academic records but cultivate their ability of autonomous learning. Formative assessment is a key to establishing autonomous learning system. Therefore, by taking the English learning in a university as the object, this study discusses how to establish a tentative formative assessment scheme monitoring autonomous learning ability.

Multi-Level Formative Assessment

Formative assessment is carried out during the whole autonomous learning process in which both teachers and students play an important role. It helps students to find out their personalized methods of English learning and promotes the development of their autonomous learning ability. At the same time, formative assessment helps students and teachers to move focus away from scores onto sustainable English learning. The characteristics of English learning require the cultivation of students’ learning ability and autonomous learning is one of effective ways. Thus, the formative assessment which is suited for autonomous learning is the guarantee of the sustainable development of English learning.

According to the literature available, the research of formative assessment started quite early in China. However, it mainly focuses on the advancement of academic performance and a formative assessment system of autonomous ability is rarely seen. For students it is more important to improve
their autonomous learning ability than exam scores. The lack of autonomous learning ability is always a serious problem that hinders autonomous learning process. On the basis of previous research, autonomous learning ability includes learning ability, cooperation ability and autonomous inquiry. As an evaluation scheme, the abilities need specific evaluation indexes to measure. Scientific and reasonable evaluation indexes constitute the main part of the evaluation system. In the descriptive study, the researcher has made questionnaire surveys of the autonomous learning ability of 106 second-year undergraduates and 5 English teachers from a University. The questionnaires answered by students and teachers contained 18 items, and covered three aspects of autonomous learning ability: learning ability, cooperation ability and autonomous inquiry. Eleven evaluation indexes are selected from eighteen alternative indexes by the questionnaires survey. The structure of multi level formative assessment is shown as below

![Multi Level Formative Assessment](image)

Figure 1. Multi Level Formative Assessment.

The first-level indexes include learning ability, cooperation ability and autonomous inquiry, which weights are expressed as $w_i$, ($i=1, 2, 3$). Each first-level index is composed of a number of second-level indexes, which weights are expressed as $w_{ij}$, ($j=1, 2, ..., n$).

For example, the index of autonomous inquiry can be calculated by the following equation

$$s_i = \sum_{j=1}^{4} r_{ij} \times w_{ij}$$  \hspace{1cm} (1)

where, $s_i$ is the comprehensive performance of this ability; $r_{ij}$ are the measurements of the four indexes belong to the ability, which are obtained by learning logs, homework and learning notes. In order to unify dimension, $r_{ij}$ are used by the same grading system.

The comprehensive performances of other abilities can be calculated through the same method, which are expressed as $s_2$ and $s_3$. If a total performance is needed to describe the learner autonomy, the calculation equation can be written as below

$$score = \sum_{i=1}^{3} s_i \times w_i$$  \hspace{1cm} (2)

These performances have reflected the students’ autonomous learning ability from three aspects to a certain extend. By the multi level formative assessment, students can be guided to build up their own learning strategies and it can be realized that learner autonomy is improved through the multi level formative assessment scheme.

Weights of Evaluation Indexes

For this multi level formative assessment, weights of indexes play a very important role in evaluation results. The traditional way is expert scoring method, which easily leads to the interference of subjective factors. As an analysis method, analytic hierarchy process (AHP) is usually used to
determine the weights of the multi level and index system. In this research, analytic hierarchy process is used to calculate the weight of each index of formative assessment for college English. The procedure based on analytic hierarchy process is simple and easily implemented by computer programming. At the same time, the influence of subjective factors is greatly excluded.

Taking the ability of autonomous inquiry as an example, its four evaluation indexes include textbook study, literature consultation, homework completion and self-organization. The weights can be determined by analytic hierarchy process.

First of all, the judgment matrix must be build by T.L.Satty scale method. After two rounds assessments of experts, the matrix is written as

\[
A = \begin{bmatrix}
1 & 1/2 & 1/3 & 1/5 \\
2 & 1 & 1 & 1/3 \\
3 & 1 & 1 & 1 \\
5 & 3 & 1 & 1 \\
\end{bmatrix}
\]  

(3)

Then the multiplication equation of elements in each row of \( A \) matrix is gotten by

\[
B(i) = \prod_{j=1}^{4} A(i, j), (i = 1, 2, 3, 4)
\]

(4)

In analytic hierarchy process, final result can be calculation by varied methods such as summation and root mean square. Due to the characteristics of the evaluation indexes, summation method is used to calculate result and the equation is written as follow

\[
W(i) = B(i) / \sum_{j=1}^{4} B(j), i = 1, 2, 3, 4
\]

(5)

Finally, the calculation results must be tested by consistency check. The equations are expressed as

\[
CI = (\lambda_{\text{max}} - m) / (m - 1), \quad \lambda_{\text{max}} = \frac{1}{m} \sum_{i=1}^{m} \left( A \cdot W(i) \right), m = 4
\]

(6)

Due to the limitation of space, the test result is directly given as follow

\[
CI = (4.1053 - 4) / (4 - 1) = 0.0351,
\]

\[
CR = CI / RI = 0.0351 / 0.90 = 0.0390 < 0.10
\]

(7)

The results have passed the test and the weights can be given as

\[
W = [0.0926, 0.1958, 0.2852, 0.4264]^T
\]

Based on analytic hierarchy process, the weights of indexes are determined in the following table.

<table>
<thead>
<tr>
<th>First-level Index</th>
<th>weight</th>
<th>Second-level Index</th>
<th>weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous Inquiry</td>
<td>0.42</td>
<td>Textbook Study</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Literature Consultation</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Homework Completion</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-Organization</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Other weights can be obtained by the above process. So far, the operational multi level formative assessment with certain weights has been built.

**Analysis and Conclusion**

Compared with summative assessment, formative assessment gives attention to “formative” processes including students’ knowledge and learning ability. It moves focus away from achieving grades onto learning processes and evaluates students by continuously recoding their work and performance. The domestic and foreign research has shown it’s powerful for promoting English
teaching. It’s helpful for efficiently monitoring students’ learning processes and encouraging their positive learning.

After the multi-level assessment scheme was applied to autonomous learning of three units of college English, some surveys to the students have been done in the ways of interview and questionnaire. They are required to answer some questions or talk about the objectivity, participation, satisfaction and ability improvement of multi-level assessment.

<table>
<thead>
<tr>
<th></th>
<th>Great</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectivity</td>
<td>63%</td>
<td>24%</td>
<td>9%</td>
<td>0</td>
<td>4%</td>
</tr>
<tr>
<td>Participation</td>
<td>83%</td>
<td>15%</td>
<td>2%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>68%</td>
<td>19%</td>
<td>11%</td>
<td>2%</td>
<td>0</td>
</tr>
<tr>
<td>Ability Improvement</td>
<td>66%</td>
<td>13%</td>
<td>12%</td>
<td>3%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Whether it is objective enough is very important for an assessment and different students have different psychological feelings to it. As Table 2 shows compared with summative assessment which focuses on scores and examinations, the multi-level formative assessment is approved by most students. Students tend to accept constructive criticism more from a fellow student than from a teacher. The self and peer assessment helps them to participate more in both the learning process and the assessment. At the same time, the self and peer assessment provides students some constructive feedback which is the central function of formative assessment. The timely feedback provides high quality information to students about their learning and gives them opportunities to close the gap between current and desired performance. Therefore, most students are satisfied with the formative assessment and gradually develop their ability of autonomous learning, as shown in Table 2. The complexity of multi-level formative assessment tells its own story. Too many evaluation indexes in the assessment process increase greatly the working load of students and teachers. However, the application of analytic hierarchy process eases off the working load of multi-level formative assessment and makes it possible for evaluation weights to be more scientific and feasible.

In summary, based on the related theoretical discussion about formative assessment, this study proposes a multi level formative assessment scheme for autonomous college English learning. Results from classroom practice show that students are satisfied with it and the assessment results promote students’ improvement in autonomous learning ability. This study is an attempt to explore the ways of improving formative assessment and it is referential to the continual study, since the formative assessment plays a significant role in the reform of college English teaching.

References


