ASSESSMENT AND FUZZY COMPREHENSIVE GRADING OF STUDENTS' ENGLISH COMPETENCE

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Abstract
In light of the traditional teaching method used in English classes in China and many other places, this article states the importance of linking instruction and assessment in the English teaching process and presents different approaches to linking instruction and assessment in classroom teaching, which are proven effective in solidifying students' knowledge of English and improving students' comprehensive English competence. Then, based on the results from the assessments, a Fuzzy Comprehensive Grading Approach is adopted in calculating students' final grades. The Approach is based on the fuzzy set theory of fuzzy mathematics and it considers diverse factors and assigns proper weight to different factors in grading using fuzzy matrix operation in calculating students' grades. Therefore, it is comprehensive and reliable and can avoid the influence of odd scores and give a truer and more balanced measurement of students' English ability.

Key words
assessment, student, English competence, fuzzy comprehensive grading

Up to now, I can still find in some classrooms that instruction and assessment are separated instead of being integrated. Instruction is seen as something that happens during the term and assessment is seen as something that happens at the end of the term. They seem independent of one another. As a result, neither the teacher nor the students are aware of how they are doing in their teaching and learning during the term. Also, when the final exam is given at the end of the term, the student feels some of the questions on the test are unfamiliar and it is hard to recall some of the language points he has learned during the term because it has been too long since he learned them. However, this single final exam determines students' final grade. This has led to students' low motivation and interest in English learning and proven to be an inefficient way of teaching. E.W. Eisner has pointed out, 'Simply knowing the final score of the game after it is over is not very useful.' What we need is a vivid rendering of how that game is played'. Hedge 2000. In fact, assessment is a continuous process and inseparable from instruction. It is integral to the whole process of teaching and learning. However, how can we use assessment to improve English teaching? And how should I link instruction with assessment and final grading? The following formative assessment approaches and Fuzzy Comprehensive Grading Approach are found to be helpful in teaching English to non-English major students. The purpose of this approach is to measure students' achievement fairly in order to stimulate their motivation in learning English and improve their learning outcomes.

Assess from teaching objective
A teacher's role in linking instruction with assessment is to find a proper combination of instruction and assessment to help students actually learn what they are supposed to learn and through the teacher's elaborate design and preparation of the class to obtain a good teaching
and learning outcome. According to RedDickins assessment should be prepared and carried out by the teacher of the class as a routine part of teaching and learning and it should be directly related to what has been taught content is in harmony with what has been taught 2000 277 First of all the objective should be clear in both the teacher and students' minds. It is important that the teacher emphasize the objective and clarify it to the class at the beginning of the class so that the students are aware of what they are going to learn and can concentrate on the objective during the class and then an assessment follows to check if the objective has been reached. The assessment does not need to be a long and complicated one but the teacher should make sure that it is in accordance with what he or she has taught the student. In this way both the teacher and the students can find out through the feedback from the assessment in which part they should put more effort. Normally there should be an after assessment discussion between the teacher and the students about some questions which the students found difficult. This is helpful for the students in better understanding and learning the language knowledge and improving the language skill.

4 Give continuous assessment

Instruction and assessment should be in combination assessment should be arranged to follow instruction in a timely manner. As English teaching and learning is a continuous process assessment should also be a continuous process in order to meet the teaching objective Bail 1998 376 used the phrase "continuous assessment" to express the same idea. A simple investigation has been conducted on two classes of freshmen non-English major students to see the influence of continuous assessment on students' motivation and performance in English study. One class was given different and continuous assessments during the term while the other class was given only the final exam. The results of final exam showed that the class with no assessment during the term had relatively lower final exam performances. Their average score was 71 6 and the class with different and continuous assessments had an average score of 81 6. This investigation shows that continuous assessment does help to improve students' English learning. It can help students master what they learn and be aware earlier of where they need to concentrate their effort instead of waiting till the end of term. Since the result from each assessment is part of the term grade the students are very conscientious in studying and preparing for the assessments in order to receive a good grade. Since assessment is a continuous process in teaching it leads to students continually working hard in their English study. This in turn leads to a better learning outcome. Though increasing the use of assessment can be helpful there are limits to its usefulness. Too many assessments may take too much class time. Therefore the teacher must balance instruction and assessment according to the teaching tasks.

4 Give multiple forms of assessments

A lot of tests used in English teaching are paper and pencil tests featuring multiple choice questions. However a multiple choice test can represent students' comprehensive ability in English especially the ability to use English in practical situations. Multiple choice tests have emphasized the assessment of discrete skills but the knowledge and skill students will need to function effectively in a future technological and complex society are inadequately represented in the multiple choice tests. O'Malley Pierce 1996 That is why so many students are found to be good at multiple choice tests but poor in practical use of English. Assessment should be a multiple faced concept. The paper and pencil test is only one form of assessment. There are many other forms of assessments especially those focusing on assessing students' communicative language ability.

In order to avoid students developing in only a single direction assessment should be varied in form depending on the teaching content. The assessment can be either formal or informal. It can be a test quiz presentation discussion role-play news report participation in instructional activities homework vocabulary test reading or translation. In teaching Business English my students were asked to design an advertisement for a new refrigerator design a business card and write a business letter a notice a circular and a fax. In English for Science and Technology class my students were asked to write in English an abstract of a science paper a summary of a reading a paper for a simulated international conference and a technical report. They were all very helpful in improving students' English knowledge and ability. A vocabulary test can encourage students to remember the new words and phrases in each text and a discussion on an interesting topic is a good way to assess students' ability to use English as well.
as develop students' imagination and oral ability. Asking students to give "News report" is also a good assessment of students' performance. One student gives a report to the whole class at the beginning of each class. The students take turns being the reporter telling the weather of the day and the latest news giving an introduction of their hometown or a famous person telling an interesting story or a joke reciting a poem or present their opinions on some social problems. In order to give a good report the students work hard to prepare it organizing their information writing their report and memorizing and expressing the report in English all of which are helpful in improving their English ability. Besides in each report the reporter gives different news or information and all the students can gain a lot from this assessment. It should be noted though that the assessments should not be limited to individual skills.

In teaching I see that some students are good at reading but not good at listening and speaking others are good at listening but not good at speaking and another group are good at speaking but not good at reading and writing. However modern society requires individuals who have comprehensive competence in English not those only good at one of the skills. Therefore the teacher should help students to meet this challenge. One way of developing students' comprehensive competence is to give students integrated assessment of different skills. For example I do the assessing listening and speaking together as Murphy 1991 pointed out "Listening and speaking are interdependent oral language processes and need to be taught and assessed in an integrated manner." I can also assess students' reading and speaking and speaking and writing together instead of assessing only a single skill.

Give student final grade by Fuzzy Comprehensive Grading Approach

Having considered different methods of assessment I now turn to grading. If the results of assessment do not link with the final grade students will not participate actively in the assessments. The teacher then needs to consider how to combine all the results of the various assessments into a single grade which accurately reflects the students' competence. The final grade should be a combination of the grades the learner received for various assignments during the course. Ur 2000 Cohen 1994 Since the assessments have taken different forms and assessed different skills there are different factors to be considered in determining students' final grade. And also according to the teaching task different weight should be assigned to different factors in the final grade calculation instead of giving an average weight. All these have made students' final grade calculation a complex one. Fuzzy Comprehensive Grading Approach is just a proper way to be used here. It is based on the theory of Fuzzy Sets Zadeh 1965 in fuzzy mathematics. It considers diverse factors and proper weight to the different factors in grading. Since it uses the fuzzy matrix operation the influence by odd scores very high or very low scores can be avoided. It is a comprehensive and scientific way of grading.

As an example I can calculate a student's English final grade using this approach. The concrete procedure is as follows.

Firstly determine the factor set for grading. Besides the diverse classroom assessments a final exam and a series of unit tests are given to the students immediately on completion of the unit. Since the final exam is a general measurement of the knowledge the students have acquired during the whole term it is considered an important component of the final grade. So it constitutes 40% of the final grade. The average of the unit tests accounts for 20% of the final grade and the other 40% comes from the assessments.

Therefore the factor set for grading is

$$F = f_1, f_2, f_3$$

Where $f_1$ is the score from final examination, $f_2$ is the average score of the unit tests and $f_3$ is the score of student's comprehensive competence from the various assessments. The weight of each factor is

$$w_1 = 40, w_2 = 20, w_3 = 40, w_4 = 40, w_5 = 40$$

It should be noticed that $f_1$ and $f_2$ are just from the final and unit examinations but $f_3$ is a factor set of many factors including the competence in listening and speaking, reading comprehension, writing and translation. If

$$f_{12} = f_1, f_{23} = f_2, f_{34} = f_3$$

$$f_4 = f_{31}, f_{52} = f_{32}, f_{13} = f_{33}, f_5 = f_{13}$$

The weight of each of these factors is chosen according to China College English Teaching Syllabus as follows.
Based on objectives given to teachers I have assigned the following weights:

The scores of different factors and their weights are shown in Figure 1.

![Figure 1](image_url)

**Figure 1** Layout of factors, scores and weights for fuzzy comprehensive grading of student English competence

Secondly determine the grading set $E$ in my system the students' English grades are classified into four classes:

$E = \{ e_1, e_2, e_3, e_4 \}$

$A = \{ A, B, C, D \}$

The membership functions of different scores are as follows: Feng 1998

$e_{A} = \begin{cases} \frac{1}{15} & f \leq 85 \\ \frac{1}{15} & 85 < f \leq 100 \end{cases}$

$e_{B} = \begin{cases} \frac{1}{15} & f \leq 70 \\ \frac{1}{15} & 70 < f \leq 85 \end{cases}$

$e_{C} = \begin{cases} \frac{1}{15} & f \leq 60 \\ \frac{1}{15} & 60 < f \leq 70 \end{cases}$

$e_{D} = \begin{cases} \frac{1}{15} & f \leq 50 \\ \frac{1}{15} & 50 < f \leq 60 \end{cases}$

According to the teaching objectives the weights of $f_{311}$, $f_{312}$ and $f_{313}$ are assigned to $e_{A}$, $e_{B}$ and $e_{C}$ respectively. $
$ $w_{311} = 0.5$, $w_{312} = 0.5$, $w_{313} = 0.1$

Now the fuzzy comprehensive evaluation of $f_{311}$, $f_{312}$ and $f_{313}$ which is called the fuzzy vector $A_{311}$ can be obtained as follows:

$A_{311} = \begin{pmatrix} 0 & 0.87 & 0.13 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0.5 \end{pmatrix}$

Calculate by the fuzzy matrix composition method see Appendix II and obtain:

$A_{311} \begin{pmatrix} 0 & 0.5 & 0.13 & 0 \end{pmatrix}$

Below I will calculate a student's final English grade with Fuzzy Comprehensive Grading Approach. The calculation is based on the factors and scores in three levels. For the first level based on the scores in the factors $f_{311}$, $f_{312}$ and $f_{313}$ in Figure 1 and through the membership functions above, the corresponding fuzzy evaluation relations $R_{311}$, $R_{312}$, $R_{313}$ can be obtained.

See Appendix II as follows:

$R_{311} = \begin{pmatrix} 0 & 87 & 13 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$

$R_{312} = \begin{pmatrix} 0 & 87 & 13 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$

$R_{313} = \begin{pmatrix} 0 & 87 & 13 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$

$A_{311} = \begin{pmatrix} 0 & 0.5 & 0.13 & 0 \end{pmatrix}$
In the same way $A_{132}$ which is the fuzzy comprehensive evaluation of $f_{31}$ and $f_{32}$, $A_{133}$ of $f_{33}$, and $A_{134}$ of $f_{341}$ and $f_{342}$ can be obtained as follows:

$$
A_{132} = [0 4 5 6 0] \quad A_{133} = [4 4 5 4 0] \\
A_{134} = [4 4 6 0 0]
$$

Now I get the second level fuzzy evaluation relation $R_{13}$:

$$
R_{13} = 
\begin{pmatrix}
A_{131} & 0 & 5 & 13 & 2 \\
A_{132} & 4 & 5 & 14 & 0 \\
A_{133} & 4 & 6 & 0 & 0 \\
A_{134} & 5 & 5 & 0 & 0
\end{pmatrix}
$$

According to the goal of teaching as noted above, the weights of $f_{31}, f_{32}, f_{33}$, and $f_{34}$ are $4$, $25$, $15$ and $1$ respectively as shown in Figure 1.

$$
W_{13} = [0 4 25 15 1]
$$

Now the fuzzy vector $A_{13}$ which is the fuzzy comprehensive evaluation of $f_{31}, f_{32}, f_{33},$ and $f_{34}$ can be obtained as follows:

$$
A_{13} = W_{13} \cdot R_{13} = [4 4 15 14 4]
$$

When I calculate by the fuzzy matrix composition method, we obtain:

$$
A_{15} = [25 4 25 4 4]
$$

From Figure 1 it can be seen that the final grade is composed of three factors. According to the scores given and the fuzzy membership function above, the fuzzy evaluation relation for the final grade can be obtained as follows:

$$
R_f = \begin{pmatrix}
0 & 1 & 0 & 0 \\
33 & 67 & 0 & 0 \\
75 & 25 & 4 & 25 & 2
\end{pmatrix}
$$

The weight of $f_1, f_2, f_3$ are $4, 25, 4$ and $4$ respectively as shown in Figure 1.

$$
W_f = [0 4 4 2 4]
$$

The final grade of the student is:

$$
A_f = W_f \cdot R_f = [33 67 0 0] \\
= [25 4 25 2]
$$

Calculating by the fuzzy matrix composition method, I obtain the final grade of the student:

$$
A_{15} = [25 4 25 4 4]
$$

Normalize the values and get:

$$
A_f = \{23, 36, 23, 18\}\bigg| e_1, e_2, \ldots, e_5 \bigg|
$$

According to the "Principle of Maximum Membership" see Appendix III.

$$
M \begin{pmatrix} A_1 \end{pmatrix} = M \begin{pmatrix} A_2 \end{pmatrix} = \ldots = M \begin{pmatrix} A_5 \end{pmatrix} = \begin{pmatrix} 23, 36, 23, 18 \end{pmatrix}
$$

So I determine that the student's final grade is level "B". This result is different from the one obtained through calculating the average of all the scores a student gets from different items. The latter is $83$ which falls in grade "A" range because it does not give different weight to different factors which means all the factors have the same weight in each calculation.

5 Conclusion

Linking instruction with assessment is very important in the English teaching and learning process. It can help both teacher and students to be aware in a timely manner of what is going on how they are progressing and into what they should put more effort. It can also encourage students' motivation in learning English and can help students to develop a comprehensive ability in English. Fuzzy Comprehensive Grading Approach is a scientific and reliable way of grading. It can avoid the unfairness of one final test grading and consider the student's English ability in terms of different components which are given different emphasis. Therefore, it is objective and can give an accurate and more accurate reflection of student's English competence. The whole system can improve the teaching and learning effects.

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Appendix I

The scores of $f_{311}$, $f_{312}$, and $f_{313}$ are 83, 85, 86 respectively. Take the score of $f_{311}$ which is 83 into the membership functions $\mu_1$, $\mu_2$, $\mu_3$ of $\mu$, respectively and obtain

$$R_{311} = 0.074, 0.134$$

In the same way, $R_{312}$ and $R_{313}$ can be obtained

$$R_{312} = 0.010, 0.070$$

$$R_{313} = 0.000, 0.043$$

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