

# Methods for Pedagogical Success with The Millennium Man

Stephen F. Ledoux

SUNY Canton

**Abstract:** The collecting of student outcome data resulting from pedagogical changes is described. This type of data collection is then used to evaluate the relative success of different pedagogical methods for using the novel *The Millennium Man* by W. Joseph Wyatt.

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Changes that faculty make in the methods they use to teach their courses are best evaluated using data-based measures. Without such data, one would have little confidence in statements about whether or not the changes were successful and so should be retained. Fraley (1980) examines a range of measures relevant to answering such questions for both faculty and administrators.

The measure most useful to faculty is the percent of a student's possible gain that was actually achieved by that student in a particular term. This measure is simply called the percent of possible gain achieved (Ledoux, 1995). Fraley called it the attained percent of possible or desired gain (Fraley, 1980). Its particular value to faculty inheres in the selective effect it can have on enhancing faculty production of pedagogical changes that effectively improve instruction.

Using pre-test and post-test scores, the possible gain is calculated by subtracting the pre-test score from the maximum possible score, while the actual gain is calculated by subtracting the pre-test score from the post-test score. Then, the percent of the possible gain that is actually achieved is calculated by dividing the actual gain by the possible gain and then—to change the resulting fraction into a percent—multiplying by 100 (i.e., the percent of possible gain achieved = [post-test score minus pre-test score] divided by [maximum possible score minus pre-test score] with the result multiplied by 100).

To compare across terms, one calculates the percentage of students in each term who reached some specific level of possible gain. The pedagogical techniques that were used in the term with the most successful student outcomes should be retained for further improvement and evaluation in an ongoing cycle.

Ma (1999) used the percent of possible gain achieved measure to evaluate the success of a particular pedagogical change across semesters in his "Introduction to Chinese History and Culture" course. He provided the same study questions for his texts in both terms, but he *did not require* the students to write out their answers to these questions in the first term. His change was to require the students in the second term to write out the answers to the study questions. Ma found that in the first term only 25% of his students achieved at least 60% of their possible gain while in the second term 67% of his students achieved at least 60% of their possible gain. Consequently he has continued to require the students to write out the answers to the study questions.

While no specific level is as yet generally accepted as a minimum standard for across-term comparisons, Ma (1999) held his evaluation to a minimum standard of how many students in each term achieved at least 60% of their possible gain. He did this because he "wanted to judge effectiveness at a higher standard" (p. 3) than the more common minimum standard of how many students in each term achieve at least 50% of their possible gain (Ledoux, 1995).

The present study evaluates student outcomes resulting from two different pedagogical methods for using the novel, *The Millennium Man* (Wyatt, 1997), and its booklet of study questions (Ledoux, Wyatt, & Bias, 1999), in two different terms. This study uses the percent of possible gain achieved measure, and it reports the data at both the 50% and 60% minimum standards.

## Method

In the second term, the basic pedagogy for the students' coverage of the *Millennium Man* novel and its study questions was changed with respect to the pedagogy that was used in the first term. In the first term, due to schedule constraints outside the professor's purview, (a) only one class period was available to discuss the novel and its study questions and answers in class, and (b) only one other class period was available to assess the students, so the whole novel and all its study questions were covered by one long post-test. In the second term, with schedule constraints eased, (a) three class periods were available to discuss the novel and its study questions and answers in class, so the work was divided into three roughly equal parts following the three parts into which the study questions already divided the work, and (b) three other class periods were available to assess the students, so the previous long post-test was also divided into three shorter quizzes whose scores were later combined to provide the post-test score for each student.

Pre-test scores for both terms were obtained by giving the students the same long test (the one used for the first term post-test) as a “repertoire assessment” on the first day of the term to see what novel-related material they had already learned elsewhere and so were bringing with them into the course. The course could then not be credited with teaching them this material.

In both terms, percent of possible gain achieved data were collected to measure which pedagogy had the most beneficial effect on student outcomes. To compare across terms, the percentage of students in each term who reached or exceeded 50% and 60% of their possible gain was calculated. The most beneficial pedagogy would be retained (and, in an ongoing cycle, improved further.)

## Results

Table 1 shows that of the 122 first-term students (who had only one class period for discussion and one class period for a single test) 12% achieved at least 60% of their possible gain while 22% achieved at least 50% of their possible gain. Table 1 also shows that of the 93 second-term students (who had three class periods for discussion and three class periods for three separate quizzes) 56% achieved at least 60% of their possible gain while 76% achieved at least 50% of their possible gain. Across terms, the percentage of students doing better increased.

Achieved at least:    In first term:    In second term:

60% of possible gain      12%                      56%

50% of possible gain      22%                      76%

**Table 1:** Percent of students achieving at least 50% or 60% of their possible gain in each term.

## Discussion

These results confirm that merely requiring students to write out answers to the *Millennium Man* study questions while studying that novel generates some student success, but not a lot of it. (In an earlier term, students used only a book report to answer the questions posed for students in a review of the novel [see Ledoux, 1998]. Though not formally evaluated, the book report assignment seemed to produce far less learning than the study questions alone produced.) The additional allocation of six class periods per term—three for discussion and three for assessment—to work with *The Millennium Man* demonstrably boosts student success.

While these methods had a beneficial effect, there is always room for further pedagogical improvement. The allocation of six class periods along with requiring written out study question answers should be retained while other methods are also tried in the effort to boost student success even further. Additional changes can be introduced and evaluated using the same measure. If evaluation shows a further change to be effective, it should be retained. This kind of cycle encourages professors to devise and try new methods, including combinations of methods, while keeping those that prove to work.

## Conclusion

The behaviorological evaluation method used in this study is useful across courses, curricula, and campuses. Pedagogical changes must be tested. Their retention must be supported by scientific data. Indeed, the soundness of any educational innovation must be established through the kind of scientific measure used in this study.✻

## Endnotes

The material reported here was part of a larger work with W. Joseph Wyatt as coauthor. That work was presented under the same title at the twenty-sixth convention of the Association for Behavior Analysis, Washington, D.C., 26–30 May 2000.

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