

The Importance of Confidence in Improving Educational Outcomes

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Introduction

Educational institutions have struggled for years with ways to assess and evaluate student learning, and the educational model is still burdened with inefficiencies in delivering effective learning to students. For years we have been teaching and assessing using traditional models that encourage guesswork in the testing process. There are even strategies on test taking provided to students to maximize their score rather than gain an understanding of their knowledge, or lack of knowledge. We test and assess the student to determine if he/she has the appropriate level of knowledge acquisition, skills and competency to perform. But even when students pass these assessments, they lack the necessary skill set to perform well in the workplace. The challenge we face is how to improve educational outcomes so that students can succeed in school, work and life.

One-Dimensional Assessments

While many institutions recognize the ineffectiveness of standard assessment processes for measuring individual knowledge, they have had a difficult time identifying better solutions. Typically we have improved the technical aspects of assessment (testing) processes, yet we are still unable to overcome the “guesswork” factor involved in assessment outcome. In fact, this cannot be avoided in a one-dimensional assessment approach. As one educator stated, ‘what is difficult to discern is what lies beneath the bubble on the answer sheet’.

The guesswork factor comes into play with multiple-choice, true/false and yes/no answers that force students to make a *decision* about what they consider to be the correct answer. This forced-choice approach naturally leads students to guess an answer even if they don’t really know the right one. One can make the case that typical human behavior encourages guessing, but the stakes are getting higher in the both education and business. In the workplace, individuals are given responsibilities – sometimes considerable responsibilities – based on assessment or certification scores. However, in current assessment models an individual who has correctly answered a question and really *knows* that it is correct is indistinguishable from a person who *guessed* correctly and arrived at the same answer by sheer luck. Common logic would suggest that the performance of both individuals will be strikingly different – even if their scores are identical. (Bruno, 1993)

The Guesswork Factor

One of the most important questions in education is how to be assured that students really understand what they need to know in order to apply the learning and perform *quickly, confidently* and *reliably*. Current multiple-choice tests, providing only a score of how many questions someone answers correctly, fail to measure the degree of confidence that students have in their knowledge or the amount of information they retain. This means that institutions may find themselves in situations where educational

outcomes are dependent on individuals who guessed their way through a multiple choice test or learned just enough to answer a question correctly but not enough to apply it quickly, confidently, and reliably.

In the current right/wrong assessment, a wrong answer is interpreted simply to mean that the student is uninformed about the material and does not have the correct information. However, there is another outcome that can be even more damaging to the student and present numerous problems to the institution. A student may be wrong about an answer; however, he/she strongly believes that the wrong answer which he or she selected is correct. This high level of confidence in incorrect information is referred to as '*confidently held misinformation*.' Such misinformation leads to poor decisions and mistakes in the application of learning. (Bruno, 1987)

Handful of Researchers

There have been a handful of researchers over the past twenty-five years who have attempted to address this issue and have concluded that *confidence* and *knowledge* are *correlated* and are both critical determinants in evaluating future performance. The more confident a student is in his or her knowledge, the more likely that the student will demonstrate this confidence in the classroom.

Many researchers have developed approaches to measure both knowledge and confidence, but the conventional approaches have had their challenges. In most implementations, the traditional question/answer format has remained intact with a new scale being added to each question requiring the learner to specify how confident he or she is about each answer. While this two-dimensional approach proved valid, it was still a subjective process when it came to measuring confidence. (Hunt and Frusting, 1989)

Confidence-Based Assessment & Learning

Dr. James Bruno, professor of education at UCLA, examined this problem and realized that there had to be a way to measure both confidence and correctness (knowledge) simultaneously. His research led to the creation of a *Confidence-Based Assessment & Learning methodology*, originally referred to as Information Reference Testing, or IRT. The process is both an assessment and learning methodology that accomplishes two critical goals. First, it extracts the individual's response to a query; second, and most critically, it also identifies the confidence level associated with that response in order to generate a *true knowledge profile*. The true knowledge profile helps individuals identify areas of misinformation.

As shown in figure 1, the methodology measure both the knowledge scale as well as the confidence metric simultaneously to determine the information quality of the student and divides the knowledge accordingly into each quadrant. In Dr. Bruno's two-dimensional assessment model, the approach

1. Identifies the student's certainty of information as an essential element in defining a student's knowledge; and
2. Employs a method of testing, scoring and interpreting the test results that evaluates both the confidence a student has in the information and the correctness of their answer.

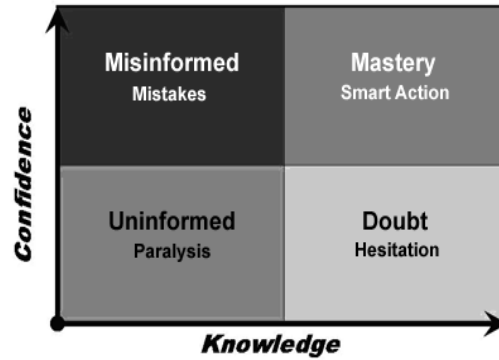


Figure 1

As shown in Figure 2, the student is asked to declare both confidence and correctness simultaneously. The confidence categories are predefined categories being "100% confident or sure," "50% confident or partially sure" or "I don't know." Additionally, Dr. Bruno's approach was focused on the knowledge quality of the student and not the score, so a student could declare that they had no knowledge by selecting 'I am not sure'. This provided an opportunity for the student to learn the material and allowed educators to distinguish what the students needed to learn, rather than teaching them topics they already knew.

I AM SURE	I AM PARTIALLY SURE	I AM NOT SURE
<input type="radio"/> A <input type="radio"/> B <input type="radio"/> C	<input type="radio"/> A or B <input type="radio"/> B or C <input type="radio"/> A or C	<input type="radio"/>

Figure 2

The two-dimensional process and selection set provided an approach to link the *logical* answer choice or correctness with the *emotional* state of declaring how confident a student was. The studies that followed in this area showed a higher retention of knowledge acquisition over longer periods of time. This process plays into the cognitive research of Dr Darwin Hunt, in his "the Concept of Knowledge and how to measure it" journal article. (Hunt, 2003)

Dr. Bruno's research further noted that traditional multiple-choice testing techniques that are used to assess the extent of a person's knowledge often include varying numbers of possible choices. For example, a typical multiple choice test might include questions with four or five possible answers, where one of the answers can be eliminated by the student as incorrect as a matter of first impression. This process lends itself to focus more on the distracters and not enough on the knowledge. In order to focus on the knowledge that the student needed to learn, the question set in the methodology consisted of only three answer choices in the two-dimensional answering pattern.

Once a knowledge profile is created, the quadrants determine which learning materials each student should focus on. The learning materials include detailed explanation about the correct answer, as well as information about the incorrect answers including common assumptions as to why students think those answers might be correct. The learning also provides direct links to other learning materials to reinforce understanding of the subject area.

Confidence Link to Retention

As stated earlier, the research of Dr. Darwin Hunt showed that the retention of newly learned material is systematically related to "how sure" people are about the correctness of their answers when they learn it. Specifically, if people are "not sure at all" of their correct answer, then a week later they can only

remember (and apply) 25% of the material. According to Dr. Hunt, if individuals are "extremely sure" of their correct answer, they retain 91% of the information they have learned.

There were three other studies conducted to show how the effect of confidence in the answer process, helped the student retain information longer. In one study conducted at the University of Illinois Chicago, the results of using a confidence-based assessment and learning methodology showed the students had a 15-20% more effective knowledge acquisition and retention than traditional learning methodologies. This study is currently being published. (Hunt, 2003)

In two additional studies, a law academy has shown the average pass rate on certification exams go from 79% passing to 100% pass rate across five academies. The use of the confidence-based methodology has shown better knowledge retention and knowledge acquisition. In a follow up study, the students were re-examined a year later with the average knowledge retention of 79% of the material. This improved performance has allowed for a re-examination of approaches and a wider adoption of using the methodology for knowledge transfer and the classroom for application.

Conclusion

Confidence-Based Assessment and Learning is a unique methodology, in which the *learning truly begins with the assessment process*. By understanding what a student knows or does not know, and then linking the student's *confidence* in his or her answers to a knowledge profile that *presents learning content* based on specific information quality quadrants; this allows the student to connect both logical and emotional senses to learning for longer retention of the material. The students continue to work through the learning until they have achieved "*mastery*" in the material – 100% correct and 100% confident.

The confidence-based assessment and learning methodology provides numerous benefits to educational institutions by accelerating the student's *time to competency and knowledge mastery* and allows knowledge transfer to take place through the technology, which allows educators more time to work on application of knowledge and critical thinking in the classroom through projects and a collaborative learning environment. The connection of confidence and knowledge provides an acceleration of learning and improves student performance by creating a more confident and productive student.

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Author Summaries

Tim Adams, is Chief Academic Officer for SatorieEDU, a technology company focused on educational assessment and learning. He is responsible for the intellectual property and patent behind Confidence-Based Learning, as well as the theories behind the methodology, taxonomy and technology. He has been instrumental in the development of several online universities and has consulted with numerous organizations on global eLearning projects. Mr. Adams has presented at numerous conferences and authored numerous articles on learning methodologies. Tim has a BS degree in Organizational Behavior from University of San Francisco and MS in Organizational Development and Leadership from Regis University.

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