

CHOOSING APPROPRIATE ASSESSMENT TOOLS AS AN AID TO THE ENHANCENENT OF ADULT STUDENTS'LEARNING

by

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ABSTRACT

The influx of GIs after World War II to colleges and universities under the GI bill gave birth to "adult education." The Johnson-Brownlow Assessment Model was used to assess tools for evaluation of learning outcomes. Analysis of data collected show the following: Students and faculty showed strong correlation in understanding education as more than an accumulation of facts. Students and faculty differ in significant ways in evaluation preferences: students were found to favor assessments in the first components of the JBAM (more direct examination of facts); faculty were found to prefer evaluation that assess the latter components of the model (evaluations of more abstract learning). Results indicate that the JBAM has validity for improving both the educational and evaluation processes. further work is warranted to determine how best to involve adult learners in educational processes specified at the higher-level skills addressed in the JBAM.

Introduction

Adult learners have returned to the classroom in ever-increasing numbers since the introduction of the G I Bill at the end of World War II. With the passage of each year, thereafter, more and more adults have accepted the concept that higher education is not exclusively the domain of students just out of high school. A change of such magnitude made it clear that motivation for adult learners to return to the classroom differed markedly from that of students who enrolled immediately after graduation from high school.

The influx of adult learners into the classrooms and campuses of the nation's colleges and universities impacted many aspects of college life. Married student housing became available. Class scheduling incorporated the concept of increasing the availability of evening classes to accommodate working adult learners. Course content began to reflect the more specific needs of the adult learner with credit given for knowledge and skills already in place.

Many colleges and universities added Adult Education Extension offices and services. This, in turn, led to the establishment of classrooms located in closer proximity to the population centers of the adult student enrollees. The advent of commuter universities with little or no available student housing was likely influenced by the desire of adult learners who had less need for socializing and networking with peers and a greater need for fulfilling degree requirements in a timely and an economically feasible manner. Less obvious is the impact of adult learners as active participants in higher education on delivery of course content and assessment of student learning.

Nonetheless, during the last several decades much thought, study and research has been dedicated to delivery of course content for all students with the goal of utilizing advancing technology to enhance delivery of course content and to prepare students to take their places in a increasingly technologically driven workplace. Assessment of student learning, as might be expected, has also been the subject of much concern and research among those in academia. Policies and guidelines related to assessment of student learning have been passed by board members among the nation's local, county, and state school boards.

Frequently, the purpose of such actions reaches beyond the measurement of student learning: policies and guidelines are established to avoid penalties and sanctions that can be imposed against “under performing schools” as defined by the state and federal agencies that provide educational funding. Politicians from the local to the national levels have discussed, postulated, and enacted legislation addressing assessment of the results of student learning with emphasis on students from kindergarten through high school.

Statement of the Problem

Despite the nation's near obsession with assessment of students, little research of a longitudinal nature is available or has been directed toward the assessment of adult learners' academic performance. Even less data are available to determine whether the choice of assessment tools used to evaluate the academic performance of adult students actually measures performance at the level necessary to enhance learning.

Thus, it becomes necessary to extrapolate from existing assessment data that which has application to the evaluation of the academic performance of adult learners and to supplement that data with practical experience in such an academic setting. In addition, informal anecdotal results, although not validated by formal statistical analyses, may offer insights into assessment of adult learners' performance as well.

The desirability of using appropriate assessment to enhance the academic performance of adult learners is a shared dream of instructors and some students. Certainly, adult learners who opt for accelerated schedules for completion of a

degree program are desirous that every aspect of the academic program including assessment moves them toward the successful completion of their respective academic goals. The intensity of the expression of such a desire by the more vocal students is the result of continuously striving to balance the demands of work, family and/or community involvement with academic goals.

Further examination of the needs of adult learners with regard to utilizing assessment to enhance academic performance reveals that no model exists that marries an appropriate type of assessment to the expected and/or desired educational outcomes. Nor is a model in use that specifically targets the assessment needs of adult learners.

To construct such a model requires familiarity with what is being tested, to what degree mastery is required, and which assessment tool is likely to provide an accurate measure of cognitive or other performance. One begins to formulate questions that lead to the development of model that offers assessment for a variety of purposes. Additionally, such a model should take into account the strengths and weaknesses of various assessment tools that reflect the following:

- measurement of recognition and/or recall of vocabulary, concepts, etc.;
- desired level of mastery of concepts;
- higher level critical thinking and/or analysis skills; and,
- application of knowledge in a defined or open-ended scenario (Johnson, 2001).

Such a model should provide a means for assessment based on the preceding considerations. In addition, the model should be flexible enough to measure unique skills not normally evaluated by traditional instruments. Input from

instructors and students is necessary to facilitate the development of a model that is an efficient and effective alternative to a random or “grab bag” approach. Questionnaires for gathering data from instructors as well as students were developed and administered to representative samples of both populations. The Johnson-Brownlow Assessment Instrument Model (JBAM) was developed and used as a basis for the results of this study.

The JBAM is based on the four Critical Thinking Level Skills Sets developed several years ago by Dr. Frances Johnson (2001) as presented at the College of Career Education’s Ninth Annual Symposium on Teaching Effectiveness in Daytona Beach. The Critical Thinking Level Skills were organized into four parts. Skills Set One emphasizes the necessity of building a foundation through the acquisition of basic or core knowledge. Skills Set Two involves the processing of acquired knowledge. Skills Set Three involves comprehension of stated and implied meanings, underlying assumptions and abstractions. Finally, Skills Set Four addresses utilizing/applying meaning or information.

JBAM provides the framework to determine the appropriateness and suitability of an assessment tool for various skills levels. Data gathered were analyzed to determine whether there exists a correlation between the JBAM and instructor choices for assessment instruments. Furthermore, data were examined to determine whether there exists a correlation between the JBAM and student preferences with regard to assessment tools. Data gathered were also analyzed to determine whether there exists a correlation between instructor choices of assessment tools and student preferences.

The pragmatic motivation for developing the JBAM is that adult learners are enrolling in numbers never dreamed of when the GI Bill was implemented five plus decades ago. The purpose is to recognize and address such needs in a manner that enhances academic performance. Furthermore, such an assessment model is designed to provide assistance to the instructor in the classroom who, likewise, is focused on the needs of the adult learner.

Review of Literature

National and State Assessment of Student Learning

Tools used to assess students' learning come in a variety of formats. Standardized examinations are used at many grade and age levels. State mandated and/or state developed assessment tools designed to determine the outcome of student learning exist in a number of states including: Arkansas, Florida, Georgia, South Dakota, Tennessee and Texas. Public institutions of Higher Education in Missouri and Oklahoma operate under a state mandate to assess the outcome of student learning through the exercise of local choice to select from among available nationally-normed tests.

Hawaii, Iowa, Kansas, Louisiana, Maryland, Nevada, New York, and North Carolina operate under state mandated assessment that may be locally developed or locally selected instruments with a reporting requirement in place. State mandated assessment that may either be locally developed or locally chosen is required in the following: Illinois, North Dakota, Oregon, Washington, and Wisconsin; for these states at this time, there is no reporting requirement. Colorado, Connecticut, Kentucky,

Massachusetts, New Mexico, Rhode Island, Utah and Virginia were in the process of developing a common approach to outcomes assessment in 2000. At that time, no state requirement existed for assessing student outcomes in the states that follow: Alabama, Alaska, Arizona, California, Delaware, Idaho, Indiana, Maine, Michigan, Minnesota, Mississippi, Montana, Nebraska, New Hampshire, New Jersey, Ohio, Pennsylvania, South Carolina, Vermont, West Virginia and Wyoming (Miller, 2002).

Much attention is focused on Assessment of Student Learning by such organizations as the National Center for Public Policy and Higher Education. Ewell and Ries (2000) have extrapolated several challenges to statewide testing that include both organizational and political factors that hinder the search for a broad-based comprehensive assessment of student learning. Maintaining consensus about what college level educational performance ought to be implies that consensus has occurred which is frequently not true. When consensus has occurred, it is both difficult to implement because of the complex nature of the task and expensive as few assessment tools exist at the postsecondary level. Furthermore, institutions may oppose it for -these as well as other reasons. In addition, political instability may dilute the will to follow through with a statewide testing program.

Diverse institutions produce diverse outcomes, especially at the postsecondary level. Difficulties with maintaining consensus arise precisely because of the diversity offered at the postsecondary level. Consequently, raw scores are not significant sources of information related to student learning and do

little to account for the differences in context. Such is true of highly specialized postsecondary schools such as Embry-Riddle University.

Additional organizations involved in the assessment of the postsecondary education include: American College Testing Program (ACT), American Association for Higher Education (AAHE), American Council on Education (ACE) and Association for Institutional Research (AIR), College Board (SAT), Education Week (50 state report card), Indiana University-Center for Postsecondary Research and Planning—National Survey of Student Engagement (NSSE), National Center for Education Statistics (NCES), National Assessment of Educational Progress (NAEP), National Postsecondary Education Cooperative (NPEC), National Center for Postsecondary Improvement (NCPI) , and the National Center for Teaching, Learning, and Assessment (NCTLA) (2002).

Nine Principles for Assessing Student Learning

That such postsecondary organizations are concerned highlights the importance of assessing student learning. The American Association of Higher Education has established “nine principles of good practice for assessing student learning” (Astin, Banta, Cross, El-Khawas, Ewell, et.al., n. d.) that address:

- educational values as the foundation for assessing student learning;
- educational values including multidimensional and integrated learning revealed in performance over time;
- clearly and explicitly stated purposes;
- outcomes and the experiences responsible for outcomes;
- ongoing rather than episodic assessment;

- fostering improvement across the educational community;
- issues with answers to questions that concern people;
- assessment that leads to improvement and promotes change; and,
- assessment that meets educators' responsibilities to students and the public.

The emphasis of the principles is that it is desirable to determine what students are learning, but the preceding principles do not resolve the issue of how to measure student learning.

Implementation of Principles

The difficulty of implementing the principles requires both interpretation and application within the framework of current processes used to assess student learning. "Performance over time" is the only standard of competency included in the "nine principles of good practice for assessing student learning." How long is "over time"? What criteria are needed to ensure that the assessment tool used is measuring learning "over time"? What is the desired level of competency to be measured? Which assessment instruments are best suited to measure student learning at the desired skills levels?

"Ongoing rather than episodic assessment" speaks to the desirability of frequent assessment of student learning. Few are likely to disagree with the rationale inherent in such a statement. However, the inherent implication is that assessment encompasses more than a standardized, normed examination or a designated, course content examination given at mid-term and/or the end of the term.

None of the “nine principles of good practice for assessing student learning” address whether assessment of student learning might enhance student learning. Although a plethora of assessment tools exist and are used from K through postgraduate levels in both public and private institutions, little current research addresses the impact on student learning. Research that examines the impact of assessment on student learning can be found under the umbrella of the “Hawthorne Effect” with emphasis on the impact of change on the learning of the students.

Standardized, normed assessment tools tend to be multiple choice, limiting the student to the selection of one of several possible answers. Often such assessments are used to obtain a percentile rank for an individual within the parameters of the specific instrument. Other assessment instruments are used to rank the effectiveness of schools within a district, state, region or the nation. Right or wrong, ranking rather than enhancement of student learning and/or ranking of educational institutions becomes the primary goal.

Assessment in the Classroom

According to Brookhart (1999) in *The art and science of classroom assessment: The missing part of pedagogy*, the basic methods of assessment are paper-and-pencil, performance assessments, oral questions and portfolios. Paper-and-pencil tests are the most commonly used.

Underscoring this is the emphasis by Kaur (2003) of Malaysia on using student journals for evaluating course experience. His position is with English Studies in the School of Humanities at the Universiti Sains Malaysia.(UltiBASE,

2003). The student journals are, in fact, student learning journals. Of the 40 journals analyzed, nine students (22.5%) made positive comments about the teaching quality. Negative comments focused on behavior traits of some of the course lecturers. The greatest degree of dissatisfaction (74.3%) was with feedback to students.(Kaur). This suggests that providing feedback to students is a time consuming task that may hinder timely feedback to students.

Elbow (1994), of the University of Massachusetts, values writing for learning as opposed to writing to demonstrate learning. Elbow categorizes writing as follows: in-class writing, journal writing, think pieces, essays that count, term papers, and portfolios.

In addition, Elbow (1994) provides the following choices to respond to the preceding styles of writing: no response, sharing without feedback, peer feedback or student response groups, and teacher responses or comments. The detailed explanation for providing timely feedback is useful in courses that require much writing (Elbow). However, group activities such as panel discussions, oral presentations, demonstrations, etc., do not lend themselves to Elbow's feedback methods.

Another proponent of student journals is Muirhead (2002), who emphasizes the use of reflective journals as an aid to memory, to create new perspectives, improve critical thinking, increase empathy, improve comprehension of books/materials, develop the discipline necessary for self-directed study, and to foster psychological/emotional growth. Muirhead acknowledges that such an alternative form of assessment requires an excessive amount of administrative

time but promotes academic development as well as the individualizing of the learning process (Muirhead).

In his online article *Assessment that Promotes Learning*, Lowe (2001) indicates that instructors view tests as a measure the flow of the process of learning whereas students view tests as the process. Underscoring this is the importance attached to grades and grade point averages by both the military forces and civilian companies or corporations that provide full or partial financial assistance to its members who choose to acquire a degree.

Lowe (2001) contends that the “most important factor influencing learning is what the learner already knows. The second factor to remember is that awareness of learning motivates learning.” The first factor requires students to integrate prior knowledge and skills with current course content. The second factor is normally assessed through standard testing procedures. Lowe advocates that self-assessment by the students be incorporated as an integral part of course assessment. Examples of tools useful for assessment that enhances student learning are included. While the assessment strategies recommended are staples, the structure and organization provide a direct method for ensuring student involvement in the assessment of learning.

Lowe’s (2001) opening day questionnaire ensures that students examine educational backgrounds, study habits, and commitment to the course of study. Other questionnaires encourage self-examination of performance on examinations. Lowe’s techniques include the use of “in-class problems” (a practice used by many in the adult education arena), written lab reports, and other performance based active-ties (Lowe).

Hiemstra (2002), in *The Lifelong Learning Reader* indicates that research

shows that adult learners have a significant preference for instructional methods other than lecture. Hiemstra reports that Knowles is an advocate of the theory of *andragogy*, “the name that has been given a teaching and learning process designed for the adult learner and the adult education teacher. The process is predicated on beliefs that the adult aged person is capable of self-direction, has unlimited potential, and possesses ever changing learning needs.”

So what does all this mean? First, there are the implications for both the adult learner and the adult education instructor based on the following:

- the teaching/learning process is predicated on student needs,
- the adult learner is actively involved in the process; and,
- the learning is problem centered. (Hiemstra, 2002)

One may conclude that class activities initiated by students to explore solutions to problems or concerns enhance students' learning. Specific tools for assessing student learning outcomes using the preceding criteria include the following: reports, presentations, demonstrations, projects, group activities, video tapes of performances, as well as more traditional examinations and/or certifications.

Alexander (2002) asserts that “grading in higher education has been based on a competitive/ranking model. As students become more vocation driven in their decision to attend college and as specific vocational domains become more performance centered, a new form of assessment is needed...A mastery learning, mastery orientation model is recommended as the model for assessment to be used in all areas of higher education.”

A Brief Summary of the Best Practices in Teaching by Drummond (2002) is a compilation of 12 practices with guidelines regarding implementation of each. Under the heading Goals to Grade Connections subheading Criterion Referenced Grading is the statement, "Learner achievement is measured with respect to a specified standard of quality, on a continuum from zero to perfection, not against other learner's achievements. Performance on each instructional objective is measured at the appropriate level on Bloom's Taxonomy. Included are a pre-assessment and alternative learning activities for those failing to meet criteria." Criterion-referenced assessment tools including pre- and post- tests are used to measure mastery of course content.

Although both Alexander and Drummond believe that mastery of course content has a place in assessment of student learning, it is Alexander (2002, p.54) who adds that "A mastery orientation must be fostered and a performance orientation avoided. Our main task is not to compare students, making winners or losers out of them..." He also advocates a "massive reorganization to address the issue of competence in a domain specific way..." However, Atherton (2002) expresses a different point of view that faults criterion-referenced mastery assessment of student learning as a failed attempt to promote *absolutes* where none exist (Atherton).

Atherton's (2002) rationale, while not widely supported by those who legislate accountability for student learning outcomes, has validity if mastery is the only assessment employed to measure student learning outcomes. The problem Atherton addresses is not inherent in the assessment tool itself but in its misuse. A

problem can occur if criterion-referenced mastery assessment is implemented as the favored or only assessment tool used to measure the outcome of student learning. Certainly, it is an appropriate tool to determine whether basic vocabulary and concepts have been mastered by students.

In extreme learning situations, the desired degree of mastery may be 100%. However, other more appropriate means of assessment are needed to determine whether knowledge mastered has utility for higher skills levels such as critical thinking, solving problems, and creativity. Thus, choosing an appropriate assessment tool requires that consideration be given to the course content, skills level to be measured, desired level of knowledge to be acquired, and, in many circumstances whether the students can apply the knowledge learned for problem-solving, developing new concepts, ideas, theories, etc.

Experiential learning, according to Smith (2001), is advocated by David Kolb. Concrete experience, observation and reflection, forming abstract concepts, and testing in new situations provide the foundation on which experiential learning rests. Atherton (2005) is also a proponent of experiential learning. Both credit Kurt Lewin and his experiential learning circle theory as the precursor to the experiential learning theory. Although assessment of experiential learning is not discussed at length in sources cited, performance assessment is a logical choice for many courses in which experiential learning is the preferred method of instruction.

Universities such as ERAU and Pace have extended the meaning of experiential learning to include providing credit for college level learning acquired outside of a credit-bearing institution. Pace University offers a course (2 credits) to

assist with the development of Portfolio Assessment of documented college level experience acquired in such a manner. Embry-Riddle Aeronautical University provides college credit for certain documented certificate and/or military training programs within the parameters of applicable degree programs.

Other articles that address enhancing the learning outcomes for the adult learner include: collaborative learning, ethical issues and adult learners. One other article has implications for adults as learners, i. e. teaching test taking.

In the article *Collaborative Learning in Adult Education*, Imel (1991) emphasizes the participatory nature of both the facilitators and learners in a collaborative learning environment. Advocates of collaborative learning, including Imel, cite Brookfield, Elias, and Merriam as proponents of collaborative learning who are said to have drawn heavily from the theories put forth by experiential theorists such as Lewin and his follower, David Kolb.

Atherton (2005) states that Kolb's descriptive model of the adult learning process is one of the most useful available. Kolb depicts Lewin's model as a circle containing four equidistant points on the circumference. First, is concrete experience moving clockwise are reflective observation, abstract conceptualization and, lastly, active experimentation (Atherton, 2005).

Others have expanded the works of Lewin and Kolb to include critical thinking and problem-centered learning as additional components. The underlying assumption is based on the concept that people are social by nature such that it follows learning is enhanced in a social environment. It also follows that the facilitator's role differs from the traditional role of instructor. The facilitator creates

a non-threatening and democratic environment that encourages open discussion as well as respect for different viewpoints. Mutual inquiry rather than argument or debate is the preferred technique for enhancement of student learning outcomes.

In universities such as Embry-Riddle Aeronautical University, problem-centered learning is approached through group projects or activities that are focused on real problems in the workplace. Students with common interests in a particular problem tend to form groups to perform background research, examine solutions that have been used elsewhere and/or propose their own. The enhancement of student outcomes is more easily observable if the group activities/projects have application in the workplace. Motivation is stronger and research is conducted in greater depth when such circumstances prevail.

Crowe (2000), in *Evaluation of Adult Learners: Ethical Issues* lists three ethical issues that are raised when comparing teacher-directed learning and self-directed learning: learner readiness, evaluation credibility, and the power issue. Crowe seeks the middle ground in learner-centered programs by suggesting "participants be given a choice of evaluation techniques" although "the facilitator usually has the responsibility for the ultimate assessment."

Resolving the ethical dilemmas requires adaptation for both the student and the instructor (Crowe, 2000). Learning contracts provide an opportunity for students to improve their level of independent learning. The degree of the student directed learning experience must be openly acknowledged and the specifics of grading policies discussed and justified. Crowe reports that in order to remove the power issue, Hammond and Collins devised the "triangulated assessment" that

utilizes a collaboration of the learner, peers and the facilitator is the recommended solution (Crowe).

However, such an approach requires more planning and coordination of effort the groups as well as a greater expenditure of instructor time to implement “triangulated assessment.” Such a model requires further adaptation to the meet the needs of the adult learner who likely has both family and career obligations and is taking accelerated courses in colleges/universities catering to the needs of the adult learner.

Previous Research and Anticipated Results

Previous research and anticipated results suggested that four levels of assessment are necessary to determine the outcomes of students’ learning. That research further indicated that a model for assessment should:

- validate acquisition of core/basic knowledge;
- indicate that core/basic knowledge has been processed and can be retrieved;
- evaluate comprehension; and,
- challenge students to utilize/apply knowledge.

It was anticipated that the model for testing the **recall/recognition** of knowledge would use one or more of the following.

- True-False
- Yes-No
- Matching items
- Fact-Opinion
- Lower level multiple-choice assessments

Strengths/Weaknesses

- Quick feedback
- Easy to score
- May indicate need for further instruction
- Limited choices
- May measure recognition not core knowledge
- Chance factor high

It was anticipated that the following might be used to assess **storage/retrieval** of information.

- Sentence Completion
- Multiple Choice
- Classification
- Identification

Strengths/Weaknesses

- More accurate results
- Greater degree of reliability
- Feedback to students enhanced
- More time intensive to create
- Takes more time to score
- Adult students may display anxiety during and after assessment

The expectation was that the assessment of **comprehension** would include:

Higher Level Multiple Choice

- Short Essays
- Longer Essays
- Written Explanations
- Discussions
- Illustrations
- Demonstrations.

Strengths/Weaknesses

- Greater degree of reliability
- More realistic assessment of student learning
- Greater accuracy for student feedback
- Time intensive in all aspects
- Rubric scoring/traditional methods
- Student expectations

Utilizing/applying information was the expected fourth level of assessment.

At this level many possibilities for assessment of the outcomes of student learning exist. Included, but not limited to, are the following:

- Short essay responses to hypothetical/real situations
- Long essay responses to hypothetical/real situations
- Research projects
- Problem/Solution projects and activities
- Proposals
- Predictions based on existing data
- Gather and perform analyses of data related to real/hypothetical situations

- Synthesize research results
- Apply preceding to resolve a problem
- Create a more practical resolution than currently exists

Strengths/Weaknesses

- Greater accuracy
- Increased reliability
- Greater validity of results of student learning
- Time intensive in all respects for instructors
- Adult students may favor less intensive forms of assessments

Research Results

Research results were obtained from surveys of adult students and instructors to determine whether there exists a correlation between student preferences and instructor assessments.

Data Analysis

Data were collected using questionnaires distributed to students and faculty involved in both undergraduate and graduate programs designed for adults. Adult learners were specifically targeted for this study; “traditional” undergraduate and graduate students were not included. The questionnaires are consistent with the Johnson-Brownlow Assessment Model (JBAM) to elicit student and faculty responses to the four major components of the JBAM:

- acquiring core knowledge,
- processing, linking, and integrating knowledge and concepts,
- applying, using concepts and interpreted meanings, and

- abstraction, comprehensive use of implied meanings, extrapolating concepts to broadened or new areas.

Student and faculty questionnaires presented similar questions formatted for the appropriate audience. Examples of the questionnaires are given in Appendix A. Each questionnaire was scored on a 0-4 basis. "0" for a question that was judged "not applicable," "1" for "never," "2" for "seldom," "3" for "sometimes," and "4" for often. Also, students and faculty rated from 1 to 14, preference for various evaluation types. As described below, these 14 items were used primarily for determining how students and faculty view education in general, and educational assessment in particular.

Correlation between Student and Faculty Responses

The first hypothesis associated with this research was that students and faculty viewed evaluation of learning in the same manner. More specifically, both adult learners and faculty were expected to understand education consistent with JBAM. Using factor analysis in the same manner that J. P. Guilford did in assessing the structure of human intelligence (*The Nature of Human Intelligence*), student and faculty preferences for educational evaluation were determined and compared.

Correlations between the responses of students and faculty were decomposed into factors; both student and faculty ranked preferences showed a structure that broke down into four components, consistent with JBAM. In this sense, student and faculty responses correlated well. This means that, as expected, students and faculty understand components of education in a similar manner.

It was expected that four main factors would fall out of the analysis, for both students and faculty, and that these factors would be consistent with the Johnson-Brownlow educational evaluation model. Results of the standard factor analysis done on the correlation matrices of the rank-responses for both students and faculty are indicated below.

Factor loading matrices, after vari-max rotation, are given in the appendix. The analysis shows, as expected, that educational evaluation as seen by both groups is consistent with that predicted by JBAM: four main concepts in evaluating educational performance were found for each group, and the four factors correlate well with JBAM. This means that adult learners and faculty correlate well in understanding the educational process. This means both understand the process consistent with what is predicted by JBAM.

First, analysis of the student and faculty data revealed that both groups did, indeed, find educational evaluation consists of essentially four factors. Student factors were broken down into the factors shown in Table 1.

TABLE 1

Student Factors

FACTOR	Student Evaluation components	Corresponding Johnson-Brownlow Model Component
1	Multiple Choice, Group Preference, Short Answer, Long Essay	#2: Process/link – integrate information conceptually
2	Recall, Recognize, deal with abstractions	#3 Apply information using meaning, or other information
3	Critical Thinking,	#4 Comprehensive use

	Abstractions, Apply information to new situations	of stated, implied meaning, abstractions
4	Demonstrate, show an application, multiple choice, T/F tests	#1 Core knowledge

It was interesting to note that the communality of “individual” choice and direct classification indicated these concepts were not, for students, anyway, part of the evaluation process.

Interpretation of instructor data was done in a similar manner with essentially the same results as shown in Table 2.

Table 2

Instructor Factors

FACTOR	Faculty Evaluation components	Corresponding Johnson-Brownlow Model Component
1	Apply knowledge to new situations, Abstractions, Long Essay, Classification, Critical thinking	#4 Comprehensive use of stated, implied meaning, abstractions
2	Individual Choice, Group Performance, Recall, Classification, Application to new situations	#2: Process/link – integrate information conceptually
3	Demonstration, Application, Individual Choice, short answer	#3 Apply information using meaning, or other information

4	Multiple Choice, True/False, Classification, Recognition,	#1 Core knowledge
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As might be expected, some differences in the factors were found; but these tended to be minor. Instructors tended to formulate student performance evaluation in more abstract, critical thinking terms than did students. This was apparent in the analysis of the preference (first part) data as well.

Differences in Student and Faculty Assessment Preferences

Just because both groups understood components of education and educational assessment in a similar manner does not mean that both groups view HOW student assessment is best accomplished in the same manner. It was hypothesized that students and faculty would differ in preference for educational assessment. This hypothesis was tested in two ways. Testing preferences expressed by each group were compared for specific differences; this used the first portion of the survey data.

Additionally, the covariance structures of the ranked evaluation preferences of students and faculty were compared, based on the assumption that there was no significant difference, using the multivariate Wishart distribution. The null and alternative hypotheses for this test were as follows:

H0: There is no difference between the covariance matrices of the questionnaire response between faculty and students

HA: There is a significant difference between covariance matrices of the questionnaire response between faculty and students.

The test is described in a paper by Cai (2001). It was found that although the correlation structures decompose in a similar manner, there are fundamental differences in the preference structure (well beyond $\alpha = 0.01$). This is consistent with what was expected.

Further, student and faculty responses were analyzed on a question-by-question basis. In terms of the JBAM, it was expected that the populations would show significant differences in assessment preferences.

Table 3 presents the results of the “question-by-question” comparison. Differences between faculty and student responses may be statistically different from each other, in which case the “direction” of the difference is given, or the differences may not be significant. The results for each question are given in the follow in the following table.

Table 3

Mean Differences in Learning Evaluation Response, Per Question

Question	Mean Student Response	Mean Faculty Response	Difference	Standard Deviation of the Difference / Significance.	
9- Group Performance Assessment	2.69	2.51	0.18	0.17	No difference
24- Peer Assessment Evaluation	2.42	1.89	0.52	0.18	Student preferred
23- Evaluate based on Demonstration	2.62	2.89	-0.28	0.19	No difference
8- Criterion-Referenced Tests	2.96	2.62	0.34	0.19	No difference

Question	Mean Student Response	Mean Faculty Response	Difference	Standard Deviation of the Difference / Significance.	
10- Project Development Assessment	2.77	2.43	0.34	0.18	No difference
4- Short Essay Tests	2.39	3.19	-0.80	0.14	Instructor preferred
31- Test for Understanding of Implied Meaning	2.78	3.43	-0.66	0.15	Instructor preferred
12- Portfolio Assessment	2.58	2.16	0.41	0.20	Student preferred
19- Test for Analytic Thinking Skills	3.11	3.38	-0.27	0.14	No difference
15- Test for Opinions	2.85	2.41	0.45	0.16	Student preferred
16- Test to Measure Acquired Knowledge Performance	3.43	2.92	0.51	0.19	Student preferred
21-Test for Creative Thinking Skills	3.12	3.00	0.12	0.16	No difference
20- Test to Measure Synthesizing Skills	2.76	3.19	-0.42	0.17	Instructor preferred
11- Testing to Measure Performance	3.12	3.16	-0.04	0.18	No difference
6- In-Class Tests	2.92	3.54	-0.62	0.16	Instructor preferred
22- Test for Recall of Information	2.93	3.22	-0.29	0.15	No difference
25- Test for Mastery of Subject Matter	2.63	3.76	-1.13	0.13	Instructor preferred
27-	2.60				
14- Test for Acquisition of Facts	3.23	3.00	0.23	0.17	No difference

Question	Mean Student Response	Mean Faculty Response	Difference	Standard Deviation of the Difference / Significance.	
30- Test for Extension and Synthesizing of Abstract Concepts	2.35	3.08	-0.73	0.15	Instructor preferred
2- Multiple Choice Test	3.57	2.70	0.87	0.17	Student preferred
5- Long Essay Tests	1.74	2.03	-0.29	0.18	No difference
1- T/F test	3.15	2.38	0.77	0.18	Student preferred
29- Test for Ability to Extrapolate Abstractions	2.35	3.03	-0.67	0.17	Instructor preferred
7- Take-Home Tests	3.35	2.46	0.89	0.18	Student preferred
32- Test for Critical Thinking Ability, understanding Assumptions	2.63	3.22	-0.59	0.15	Instructor preferred
13- Test for Recognition of Concepts	3.11	3.41	-0.29	0.15	No difference
3- Short Answer Tests	3.17	3.19	-0.02	0.14	No difference
28- Test for Ability in Abstract Thinking	2.45	3.14	-0.68	0.16	Instructor preferred
18- Test for Critical Thinking Skills	2.82	3.57	-0.74	0.15	Instructor preferred
17- Test for Application of Knowledge	3.29	3.59	-0.31	0.13	Instructor preferred
26- Test on Classification of Acquired Knowledge	2.95	3.05	-0.11	0.16	No difference

A negative difference means that the average faculty response put more importance on the concept, while a positive difference means that the average student response puts more emphasis on the concept. An average rating less than 2.5 means that the test evaluation method was, on average, not favored, an average greater than 2.5 means the evaluation method was, on average more preferred. Significant differences (at a minimum of alpha of 0.05) are shown in the last column.

As indicated earlier, this shows that differences between student and faculty preference for educational assessment can most succinctly be stated in terms of JBAM: students tend to prefer assessment methods in the first two components of the model; faculty tend to prefer assessment methods that fall into the last two components of the model.

Conclusions and Discussion

The first and most significant finding in this study was that both students and faculty view education and educational assessment in a manner consistent with JBAM. This provides a foundation for improving both the educational process and assessment. Significant differences between how students and faculty view the importance of the components of JBAM for assessment purposes implies that improvements in both teaching and evaluation methods can be made. How to accomplish significant improvement is another question.

Clearly, more work on how to effectively address the four components of JBAM in education for adult learners needs to be done. This is particularly important because adult learners are impacting the nation's educational institutions in ever increasing numbers. Research along these lines is limited and tends to

address where, and when to offer adult education programs, precious little had been done in determining how best to offer course content and evaluate student progress. The key goal is to make best use of the JBAM to maximize learning characteristics of the adult learner, and to improve assessment tools so that adult learning can be improved.

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