The Validity of a Scale Designed to Measure Changes in Students’ Self-perceived Attitudes, Values and Ways of Learning as a Result of Curricular Reform at a Mexican University

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Abstract

In order to evaluate a reform project at the ITESM Guadalajara, an assessment instrument (AAV) was designed for measuring changes over time in students’ abilities, attitudes and values. On this scale, students indicate their level of agreement with operationalized behaviors representing certain values and ways of learning identified from the ITESM’s mission statement. To assess the AAV’s concurrent validity, graduating seniors completed the scale and then responded to an open-ended question regarding self-perceived changes as a result of their academic program. A k cluster analysis of scores determined subgroups of students on the AAV scale, and through a multiple discrimination analysis, characteristics were identified for each subgroup. The students’ open-ended responses were analyzed in such a way that separate categories emerged from the data. The description of these categories was compared through a simple correspondence analysis to the description of the profiles derived from the multiple discrimination analysis of the students’ AAV scores. The results lend support to the concurrent validity of the AAV instrument.

In 1997 the Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM) in Mexico, a privately funded university, developed a program of curricular reform to improve the academic quality of its preparatory and undergraduate programs. The ITESM based this reform on its Mission 2005 (1996, p. 2), which has as its goals, the “formation of people who are committed to community development, that work towards the improvement of the nation and that are change agents in bringing about greater freedom and more justice in society.” In order to achieve these lofty ideals, the Institute asked all professors to find ways of promoting the attitudes and values stated in the Mission in their classes. A curriculum redesign was envisioned to promote such abilities and values as collaborative learning, critical thinking, autonomous learning, self-evaluation, honesty, responsibility, respect for others, and social commitment, among others. Additionally, professors were asked to design an online component to their courses. All administrators and professors at the Institute have been required to attend intensive training over the past several years in order to fully incorporate these curricular changes, and the Institute has enhanced its technological infrastructure to support the program.

The Center for Innovation and Educational Technology at ITESM’s Campus Guadalajara was asked to evaluate the effectiveness of this curriculum reform process at its campus. It was thought that by evaluating outcomes, it could be determined if the Institute’s efforts were effective in promoting the Mission’s goals. As a result, a study was begun focusing on one aspect of the reform, the inclusion of activities related to abilities, attitudes and values in the curriculum. Through a longitudinal study begun in August of 1998, changes in students’ abilities, attitudes and values have been measured over time. On a scale developed by researchers at the Center, baseline scores are obtained for students in each cohort as they enter the ITESM in August of each year, then a second administration takes place after a three-year period of time,
and then finally, the students are surveyed again upon graduation. The current paper is based on findings regarding changes in the abilities, attitudes, and values of the first cohort of students upon their graduation from ITESM Campus Guadalajara.

Previous results from the longitudinal study: 1998 to 2002

A Likert-type scale, known as AAV (Abilities, Attitudes and Values) was developed in Spanish to measure the students' level of agreement with behaviorally operationalized statements corresponding to the abilities and values promoted by the ITESM mission statement. Through the use of this scale, we have already determined that changes have occurred over time at the ITESM, Campus Guadalajara in both undergraduate and preparatory students. In our study comparing students' responses from August 1998 to these same students' responses in May of 2001 (Greybeck, Gomez, & Mendoza, 2001), we found that students expressed more agreement with notions of collaborative learning, self-evaluation, and critical thinking, and they indicated that they were applying what they learned to a greater extent outside of the classroom.

On the other hand, this follow-up study of the first cohort after three years, shed light on the difficulty of measuring personal values such as “honesty,” “responsibility” and “respect for the dignity of others.” Students did not show significant gains in these areas, but it is not clear if this result was due to problems with the measuring instrument, or if in fact, the students did not change over time in their values.

In the current phase of the project, the research team is attempting to resolve this dilemma by carrying out a study of the validity of the instrument. Although we already have determined from a study conducted in 2002 that the scale has predictive validity in terms of academic performance (Greybeck, Gomez, & Mendoza, 2002), we are still concerned about its concurrent validity. In other words, how well do scores on the scale compare to other types of criteria? In this case, we are comparing students' scores on the scale upon graduation with what they themselves state as perceived changes in their abilities, attitudes and values as a result of their program at the ITESM.

Method

Sample and Procedure

All students entering the Professional (undergraduate) program at the ITESM, Campus Guadalajara in August of 1998 were asked to complete the AAV scale mentioned earlier, during one of their classes. The scale was administered a second time to this same group in late November 1998 to measure changes after the first semester, then again after three years in March 2001 and finally in December 2002. In the 2001 and 2002 administrations of the scale, a representative sample was chosen from the entire population of students, stratified according to subdivision and degree program. Upon graduating in December of 2002, this sample of students was also asked to respond in writing to the question, “Has your way of thinking or acting changed as a result of your program at the ITESM? If so, in what way?” Results from this open-ended question, allow us to compare the written statements of graduating seniors with their profiles from the AAV scale, in order to test the scale's validity for measuring abilities, attitudes and values.

Data Analysis

Overall scores were determined for each student based upon their mean level of agreement (1-5) on the AAV scale and then converted to equivalent scores between 0 and 100, to make interpretation easier. There are nine categories of abilities, attitudes and values measured by the scale, and students' scores were also calculated for each of these nine categories (see Table 1 below).

A k-means cluster analysis was performed from the students’ scores to determine if students could be classified into homogenous subgroups based upon these scores. This analysis consists of sorting the sample into k clusters which are based on the shortest distance between the k cluster means (Lorr, 1983). Four profiles emerged from this analysis.

Students' written statements were then qualitatively analyzed by assigning to the same category, any trait, ability or value mentioned at least twice, even if this trait, ability or value was not measured on the items of the AAV scale. Thus, for example, a category emerged for “open-mindedness,” even though no item on the scale specifically addressed that trait. Twenty-two categories emerged from the analysis, in addition to a category of “no response.” These 23 categories were then again sorted into four groups, and the total number of student comments within each group was calculated for each profile. A Simple Correspondence Analysis was used to determine the relationship between students' profiles on the AAV scale and their self-professed changes in abilities, attitudes and values.

Results

Results from the k cluster analysis of the scale yielded four groups or profiles as shown in the first row of the table below.
Table 1. Students' total scores and category scores by profile.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Redesign</th>
<th>Other</th>
<th>Self</th>
<th>Resisters</th>
<th>Tot 02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honesty</td>
<td>82.1</td>
<td>81.4</td>
<td>77.3</td>
<td>69.6</td>
<td>77.7</td>
</tr>
<tr>
<td>Responsibility</td>
<td>90.1</td>
<td>93.5</td>
<td>87.4</td>
<td>78.3</td>
<td>86.8</td>
</tr>
<tr>
<td>Dignity</td>
<td>85.5</td>
<td>89.7</td>
<td>81.6</td>
<td>62.3</td>
<td>78.9</td>
</tr>
<tr>
<td>Group work</td>
<td>75.2</td>
<td>71.0</td>
<td>66.4</td>
<td>70.3</td>
<td>71.7</td>
</tr>
<tr>
<td>Self-evaluation</td>
<td>80.1</td>
<td>74.9</td>
<td>74.0</td>
<td>69.6</td>
<td>76.5</td>
</tr>
<tr>
<td>Self-direction</td>
<td>73.5</td>
<td>40.6</td>
<td>57.2</td>
<td>59.2</td>
<td>62.6</td>
</tr>
<tr>
<td>Authentic learning</td>
<td>82.1</td>
<td>84.7</td>
<td>79.9</td>
<td>72.1</td>
<td>79.3</td>
</tr>
<tr>
<td>Social Commit.</td>
<td>80.6</td>
<td>83.5</td>
<td>49.7</td>
<td>69.6</td>
<td>72.4</td>
</tr>
<tr>
<td>Critical Thinking</td>
<td>73.2</td>
<td>65.0</td>
<td>70.7</td>
<td>75.1</td>
<td>72.3</td>
</tr>
<tr>
<td><strong>Total Score</strong></td>
<td>79.7</td>
<td>74.8</td>
<td>72.1</td>
<td>69.8</td>
<td>75.0</td>
</tr>
</tbody>
</table>

Based on the k-cluster analysis, a description was compiled of each of the four resulting profiles. These descriptions should be interpreted with respect to the abilities, attitudes and values promoted by the ITESM mission statement, rather than in terms of general personality traits. It should also be pointed out that each group is described in relation to the other groups rather than in absolute terms.

**Other oriented.** These students are more in agreement with the ideals of equality and concern for the well being of others, as well as with gaining a better understanding of the conservation of natural resources. They are more traditional in their style of learning, as they are less in agreement with collaborative work, self-evaluation and autonomous learning (Greybeck, Gomez, & Mendoza, 2001).

**Redesigned.** This group of students is most in agreement with the abilities, attitudes and values set forth in the ITESM mission statement. They are progressive in their learning style and demonstrate a high degree of social commitment and agreement with ethical behaviors (Greybeck, Gomez, & Mendoza, 2001).

**Self-oriented.** Students in this group are less in agreement with social concerns and teamwork, and they are mainly academically oriented (Greybeck, Gomez, & Mendoza, 2001).

**Resisters.** These students are the least in agreement with the ITESM’s mission statement in terms of both personal beliefs and learning styles. They are less in agreement with making social commitments and with collaborative learning. They are also less in agreement with notions of self-direction and self-reflection. These students are less apt to use the knowledge they have gained in their classes in other settings outside of the Institute (Greybeck, Gomez, & Mendoza, 2001).

Open-Ended Response Categories

The four categories derived from the students' open-ended responses (in the left-hand column below) and the number of students by profile who indicated changes in each of these categories are listed in Table 2.

Table 2: Number of students indicating changes in abilities and values by profile.

<table>
<thead>
<tr>
<th></th>
<th>Redesigned</th>
<th>Other</th>
<th>Self</th>
<th>Resisters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work/Academic Abilities</td>
<td>34</td>
<td>8</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Personal Abilities</td>
<td>18</td>
<td>7</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Social Abilities</td>
<td>17</td>
<td>5</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Values</td>
<td>17</td>
<td>2</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total number of students</strong></td>
<td><strong>68</strong></td>
<td><strong>20</strong></td>
<td><strong>29</strong></td>
<td><strong>44</strong></td>
</tr>
</tbody>
</table>

Students’ comments having to do with “Work/Academic Abilities” ranged from improvement in the use of technology, to greater ability to work in teams, to greater understanding of the importance of work, for example. Comments such as greater independence, higher level of maturity, improved leadership and critical thinking were categorized as “Personal Abilities.” “Social Abilities” included comments regarding open-mindedness, social commitment and ability to relate to others. Finally, the “Values” category included comments regarding honesty and responsibility.
Simple Correspondence Analysis

Because the number of responses was below 5 in some of the cells in Table 2, the data could only be analyzed descriptively. A Simple Correspondence Analysis was performed to determine the relationship between profile and qualitative category. Figure 2 shows the results of that analysis.

Component 1 indicates the type of change occurring in the student, on a continuum from “abilities” in the left quadrants to “values” in the right quadrants. Component 2 indicates whether or not these changes were more related to “personal” abilities (bottom quadrants) or to “work/academic” abilities (top quadrants). From this analysis, we can then describe the self-professed changes for each profile of students in the following way:

Other-oriented. Students in this profile indicate that they changed more in terms of abilities than values and more in terms of social and personal abilities than those related to work or academic areas.

Self-oriented. In this profile the changes indicated are more related to work/academic abilities than to either personal or social abilities or to values.

Resisters. Changes among students in this profile are mostly related to values, and not to abilities.

Redesigned. This profile fell near the center of the graph indicating an equilibrium among changes with respect to values and abilities, and in terms of personal, social and work/academic areas.

Discussion

The results of the study provide preliminary evidence for the concurrent validity of a Likert-type scale (AAV) developed for the measurement of abilities, attitudes and values among students at the ITESM. That is, for the cohort of students entering in August of 1998, how they scored on the scale in December of 2002 tends to be related to how students themselves say they have changed over time, as a result of their academic program at the ITESM, Campus Guadalajara. For example, the description of students in the “Other-oriented” profile based on scores from the scale, indicates that these students are less in agreement with the learning strategies promoted by the ITESM, but more in agreement with regard to social concerns. The graph in Figure 2 clearly demonstrates that this profile of students commented less about work/academic abilities, and that their self-professed changes were more related to personal abilities and social skills.

The “Self-oriented” profile of students was less in agreement with social concerns on the scale and more in agreement with those items related to academic work, just as their own comments suggest from the qualitative analysis. In fact, in a previous study in which students’ grades were compared to their profiles (Greybeck, Gomez, & Mendoza, 2002), the “Self-oriented” students tended to have higher grades than either the “Other-oriented” or “Resisters” profiles, suggesting that they indeed, may have a more academic orientation than these two groups.

Students in the “Resisters” profile are those least in agreement in general with the attitudes, abilities and values promoted by the ITESM as measured on the AAV scale, and their own comments to some extent corroborate this resistance. Figure 2 indicates that they are further away from the “abilities” side of the graph than any other group. However, students do indicate changes in terms of honesty and responsibility as a result of their stay at the ITESM. Interestingly, these are the two areas on the AAV scale found to be questionable in an earlier study because of the nature of the items (Greybeck, Gomez, & Mendoza, 2001).
Finally, the students in the “Redesigned” profile are most in agreement with the abilities, attitudes, and values of the ITESM, according to their scores on the AAV scale. The qualitative analysis of their comments suggests that this group is the most balanced in terms of what they perceive as changes in themselves.

**Conclusion**

The purpose of this study was to validate through the use of a concurrent criterion, a Likert-type scale, known as AAV, designed to measure university students’ abilities, attitudes and values. The scale was found to have validity for predicting academic performance at the ITESM in 2002, but there was still a concern as to whether the scale was able to accurately measure personal values such as “honesty” and “responsibility.” Students entering in August of 1998 showed gains in areas related to learning strategies (authentic learning, cooperative learning, self-evaluation) when surveyed in May of 2001, but did not show gains in personal values. The question arose as to whether the instrument was able to adequately measure those personal values. It should be pointed out that students’ scores in personal values were already quite high when entering the ITESM in 1998, so that it might be argued that change in those values would be less likely.

The current study lends support to the validity of the instrument for measuring “abilities,” that is, the learning strategies, cognitive and social abilities, promoted by the ITESM model. Students’ profiles upon graduation tended to be related to how they described themselves in those terms. However, the scale did not detect the importance of personal values, such as “honesty” and “responsibility” indicated in the open-ended responses of students in the “Resisters” profile.

Because of these results, a further study is warranted in which gains between 1998 and 2002 are determined for each profile in each of the nine areas of the AAV scale. In this way, it can be seen which profile showed greatest gains in each area. If in fact, the “Resisters” showed greatest gains in “honesty” and “responsibility,” the scale might still be considered as having validity for measuring change in these two areas. We might also conclude that the resistance of students in this profile occurs more in terms of the teaching-learning model at the ITESM, rather than in terms of personal values.

Nonetheless, the findings from this study are quite positive and suggest that by identifying the profile of students on our AAV scale, we can predict their likelihood of academic success, based upon how easily they will adjust to the learning model at the ITESM, Campus Guadalajara. Additionally, the scale appears to be valid at this particular university for measuring changes over time at least with respect to abilities. Further analysis is recommended for determining the scale’s validity for measuring changes in values.
References