Using Cluster Analysis to Segment Students Based on Self-Reported Emotionally Intelligent Leadership Behaviors

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Abstract

Using emotionally intelligent leadership (EIL) as the model, the authors identify behaviors that three levels of leaders engage in based on a self-report inventory (Emotionally Intelligent Leadership for Students-Inventory). Three clusters of students are identified: those that are "Less-involved, Less Others-oriented," "Self-Improvers," and "Involved Leaders for Others." EIL behaviors that most differentiate the highest self-ranking group of involved leaders are the extent to which cluster members work to *resolve conflicts* in a group situation, work to build a *sense of team*, and consider *the needs of others*. The underlying constructs of consciousness of context, self, and others are investigated and discussed. Discriminant analysis is used to validate the cluster solution. Cluster analysis is found to be useful tool for helping leadership educators categorize students and by doing so, program architects have an opportunity to design and develop interventions tailored to better meet the needs of individual students.

Introduction

Numerous student leadership development programs exist on college campuses and multiple books have been published that focus on this population (e.g., Komives, Lucas, & McMahon, 2007; Kouzes & Posner, 2008; Northouse, 2009;

Shankman & Allen, 2008). One basic tenet for program architects is that for a leadership development process to have benefit it should be viewed as a long-term endeavor and the time required to develop leadership skills is a topic consistently addressed in the literature (e.g., Avolio, 1999; Avolio 2005; Avolio & Gibbons, 1989; Conger & Benjamin, 1999; Fulmer, 1997). Conger (1992) suggests, "Most would agree that to seriously train individuals in the art of leadership takes enormous time and resources" (pp. 38-39).

Avolio (2005) proposes the concept of the life stream which is defined as "events you accumulate from birth to the present that shape how you choose to influence others and yourself" (p. 12). According to Avolio (2005), the "natural tendencies" which are at times attributed to a leader may not be "nature," but are learned along the way. Avolio and Gibbons (1989) emphasize that development is the result of many smaller life experiences that accumulate over time and suggest that "the most successful development programs are those that reflect the individual and his or her unique needs and strengths" (p. 291).

The assertions proposed by Conger (1992) and Avolio and Gibbons (1989) have implications for leadership development. First, they emphasize the importance of the experiences an individual brings to developmental process and the need to examine those experiences (Posner, 2009). Second, they emphasize the long-term nature of leadership development. Third, and the focus of this study, their assertions highlight the importance of creating development experiences that meet the needs of individual students. This necessity is clearly a "next level" opportunity for leadership educators who often design "one size fits all" interventions. By using the process we explore in this paper, leadership educators have an opportunity to identify where students are in their leadership development and better design interventions to meet an individual's specific needs.

The present study uses cluster analysis to segment students based on a self-report tool, the Emotionally Intelligent Leadership for Students – Inventory (EILS-I). The authors briefly describe the model of emotionally intelligent leadership, then discuss and apply the two-step method of cluster analysis, (SPSS 16.0). The article continues with a description of the research question, methods, and results, and concludes with a discussion regarding application.

Literature Review

Emotionally Intelligent Leadership (EIL)

Research suggests that effective leadership (e.g., Bass, 1990) and emotional intelligence (e.g., Barbuto & Story, 2010; Bar-On, 2006; Goleman, Boyatzis, &

McKee, 2002) are valuable to both organizational and personal success. The integration of these concepts with a specific focus on college students allows leadership educators to better understand postindustrial perspectives of student leadership development (Rosch, Joseph, & Newman, 2011).

The EIL conceptual model encompasses three facets of emotionally intelligent leadership – consciousness of context, consciousness of self, and consciousness of others. It is based on 21 specific capacities across these three facets (Shankman & Allen, 2008). Emotionally intelligent leadership assumes that effective leadership (and followership) is a relational process (Komives, Lucas, & McMahon, 2007) and thus, core awareness and regulation of the emotions in self/others is a foundational tenet of emotional intelligence and effective leadership (Goleman, 2000).

Consciousness of context houses two capacities (e.g., environmental awareness and group savvy) and involves awareness of the larger environment in which leadership occurs and is a combination of the *setting* and *situation*. This facet of EIL draws heavily from the work of Fiedler (1972) who suggested that leadership is more than simply a great man or woman. Sometimes overlooked in models of leadership, the context has received increased levels of importance in the literature (Liden & Antonakis, 2009) and in contemporary models such as authentic leadership development (Avolio & Gardner, 2005).

The consciousness of self facet houses nine EIL capacities (e.g., honest self-understanding, emotional self-control) that represent inner or self oriented capacities. These capacities focus upon the inner work of leadership (Posner, 2009). Consciousness of self represents and involves awareness of one's abilities, limitations, and emotions. This facet integrates several capacities that closely align with various models of emotional intelligence (Bar-On, 2006; Goleman, Boyatzis, & McKee, 2002; Mayer, Salovey, & Caruso, 2000; Petrides & Furnham, 2000) and effective leadership (Avolio & Luthans, 2006; Goleman, Boyatzis, & McKee, 2002; Kouzes & Posner, 2007; McCauley & Van Velsor, 2004).

Consciousness of others house ten capacities (e.g., capitalizing on differences, empathy, teamwork) and emphasizes the important role that group members/followers have in the leadership process (Burns, 1978; Bennis, 2000). Likewise, the model assumes that followers (others) are an active part of the process (Chaleff, 2003) and that due to the fluid nature of leadership, individuals may switch between leadership and followership in a moment's notice. As Kelley (1998) suggests "the reality is that most of us are more often followers than

leaders" (p. 143). Thus, leaders and followers can display emotionally intelligent leadership.

Cluster Analysis to Segment Students on Leadership Behaviors

Cluster analysis allows the researcher to take a different perspective on the data, with no preconceived notions regarding profiles, similarities, or performance measures. This analysis simply aims to segment the college student leadership data into meaningful clusters. Then these clusters are reviewed, evaluated and discussed to better understand the behaviors that link those within a cluster, and differentiate them from those in other clusters.

The clustering method used is a two-step cluster program in SPSS 16.0 which gives the user the ability to determine the appropriate number of clusters, and then classify them using a nonhierarchical routine. The procedure is relatively new, and as recommended by Hair et al. (2010), it is useful in this particular study due to the sample size (more than 500 cases) and the number of variables being analyzed. Garson (2009) also encourages the use of the two-step method for large datasets using both continuous data and categorical variables with three or more levels. The two-step clustering method offers a particular advantage to leadership educators because of its ability to handle categorical variables such as gender, class rank and level of involvement, as well as continuous variables such as self-reported leadership behaviors.

The two steps are a pre-clustering step where cases are divided into small sub-clusters, followed by a second clustering of the sub-clusters into the desired or pre-defined number of clusters. An automatic selection of clusters is optional, but results in only two clusters given the leadership dataset. This does not yield the interpretability being sought. Thus, the appropriate number of clusters must be determined.

The two-step procedure in SPSS is based on Banfield and Rafferty's (1993) work with clustering methods for continuous variables based on the reduction in log-likelihood when two clusters are merged. Further, the two-step procedure extends the work of Melia and Heckerman (1998) who took a similar probabilistic approach to clustering categorical variables. Zhang et al. (1996) developed BIRCH clustering for larger datasets, reducing them to sub-clusters which are analyzed in a second step much like traditional clustering methods. The two-step procedure in SPSS innovatively combines these works, resulting in an effective clustering solution for the leadership dataset due to its size and the number and types of variables being investigated.

Research Question

How can cluster analysis help leadership educators segment students based on self-reported emotionally intelligent leadership behaviors?

Data Collection

A total of 566 students from 139 colleges and universities in the United States completed an online assessment of their leadership skills in the spring of 2009. The authors sought the assistance of leadership educators who then mentioned the opportunity in their courses, training programs, and organizations. The authors emailed a description of the research with a link to the online survey to leadership-oriented educators on membership lists including the International Leadership Association and the Association of Leadership Educators. Assessment authors Shankman, Allen, and Facca (2010) composed the research tool as a supplement to their book, *Emotionally Intelligent Leadership*: *A Guide for College Students* (2008). Students were asked to use a five-point scale to indicate the extent to which they *intentionally* participated in or focused on a total of 24 behaviors (items representing EIL capacities). The prompt was stated as "When serving in a formal or informal leadership role, I…." The scale was assigned as 1=never, 2=infrequently, 3=sometimes, 4=frequently, and 5=always.

Table 1
Sample Questions from EIL Students Inventory

When serving in a formal or informal leadership role, I…
Take time to understand the informal traditions of the group
Learn the expressed and implicit values of the group
Monitor how my emotions affect my interactions with others
Work on my limitations
Tailor my leadership style to the situation

Twenty-four questions captured three constructs: consciousness of context, consciousness of self, and consciousness of others. Students simply added their scores for the variables that fell into each construct category, arriving at a self-score between eight and 40 on each of the three constructs, assuming they responded at least to each of the questions (see Table 2).

Table 2
Construct Mean Scores

Consciousness of Context	30.85
Consciousness of Self	32.86
Consciousness of Others	32.26

In part one of the Emotionally Intelligent Leadership for Students-Inventory (EILS-I) (Shankman, Allen & Facca, 2010) Cronbach's alpha was used to assess the internal consistency reliability of the three constructs. Reliability of the assessment tool ensures that the facets of emotionally intelligent leadership are statistically reliable constructs, measured appropriately with the items on each scale. Final items for each scale in the EILS-I were selected based on results from a pre-test, where the combination of items yielding the highest alpha coefficient without redundancy were kept and represent the final 24 items on the EILS-I. Each scale (eight questions) achieves a strong level of internal consistency reliability (Consciousness of Context, ÿ=.81; Consciousness of Self, ÿ=.73; Consciousness of Others, ÿ=.82).

Participant Sample

Thirty-one percent of the sample of college students was male, and 69% female. A substantial proportion (87%) reported that they were White (Caucasian). A reasonable distribution of class ranks participated. Given the varied ages that potentially comprise each class rank, student respondents also provided their age category, with 92% aged 23 years old and under. Students were asked to provide the number of campus student organizations in which they were currently involved. Only 5% were not involved in any on-campus student organizations, with 54% involved in at least three organizations. Further, 86% reported that they were currently in some type of leadership role within an organization (see Table 3).

Table 3
Demographics

Demographic		
Gender	31% Male 69% Female	
Ethnicity	Caucasian Hispanic Asian Multiracial African-American Middle Eastern	87% 4% 3% 3% 2% 1%
Class rank	Freshman Sophomore Junior Senior Grad	10% 28% 32% 22% 7%
Age	18-19 20-21 22-23 24-26 26+	21% 55% 16% 2% 6%
Involvement	0 orgs. 1 2 3 4+	5% 10% 31% 25% 29%
Leadership Role	86% Yes	14% No

Data Analysis Procedure

Determining the Number of Clusters

The two-step clustering method was used on the college student leadership data because of its ability to handle both continuous and categorical data, as well as its flexibility with larger sample sizes. By default, to determine the optimal number of clusters, SPSS uses an algorithm which is based in part on Bayesian (BIC) or Akaike (AIC) information criteria loss. This automatic determination results in only two clusters which is not preferred given the leadership application.

Ultimately, to determine the appropriate number of clusters, the option was overridden and a random sample of 100 cases tested through several variations of hierarchical clustering procedures (Garson, 2009).

To validate the appropriate number of clusters, the agglomeration schedule was reviewed, looking for substantial changes in heterogeneity (i.e., how different observations in one cluster are from those in another) (Hair et al., 2010). The agglomeration coefficient measures the increase in heterogeneity occurring from the combination of two clusters. Hair et al. suggest a reasonable approach to determining the number of clusters is to measure the percentage change in heterogeneity. A 27% change in the agglomeration coefficient is evident between three and four clusters. Thus, the three cluster solution was selected.

Variable Importance

The relative contribution of each variable to the cluster can be computed for both categorical and continuous variables. For categorical variables, the importance measure is chi-square distributed and for continuous variable the measure is based on Student's (1908) t-test. Variablewise importance plots from SPSS 16.0 are used to graphically display the variables' impact in differentiating the cluster discussed. On the X axis is chi-square for categorical variables, and Student's t-test for continuous variables. On the Y axis is the variable list. Bars longer than the critical value line indicate variables important in differentiating the cluster.

Results

Cluster Profiles

The cluster analysis yields three uniquely profiled groups, with membership distributed in a reasonable manner with 22% in cluster 1, 54.3% in cluster 2, and 23.7% in cluster 3.

Based on the profiles to be discussed, the clusters are nicknamed as follows: Cluster 1 (22%) – *less involved*, *less others-oriented*, cluster 2 (54%) – *self-improvers*, and cluster 3 – (24%) *involved leaders for others*. In the following section, the top five most important variables contributing to cluster membership will be discussed. While others do contribute significantly, five is a manageable number to recall for reference and discussion. Construct mean scores by cluster are reported in Table 4. Demographics, involvement, and holding a leadership role are reported by cluster in Table 5.

Table 4
Construct Mean Scores by Cluster

Construct	Cluster 1	Cluster 2	Cluster 3
Self	28.70	32.65	37.08
Others	26.91	32.24	37.35
Context	25.63	30.67	35.87

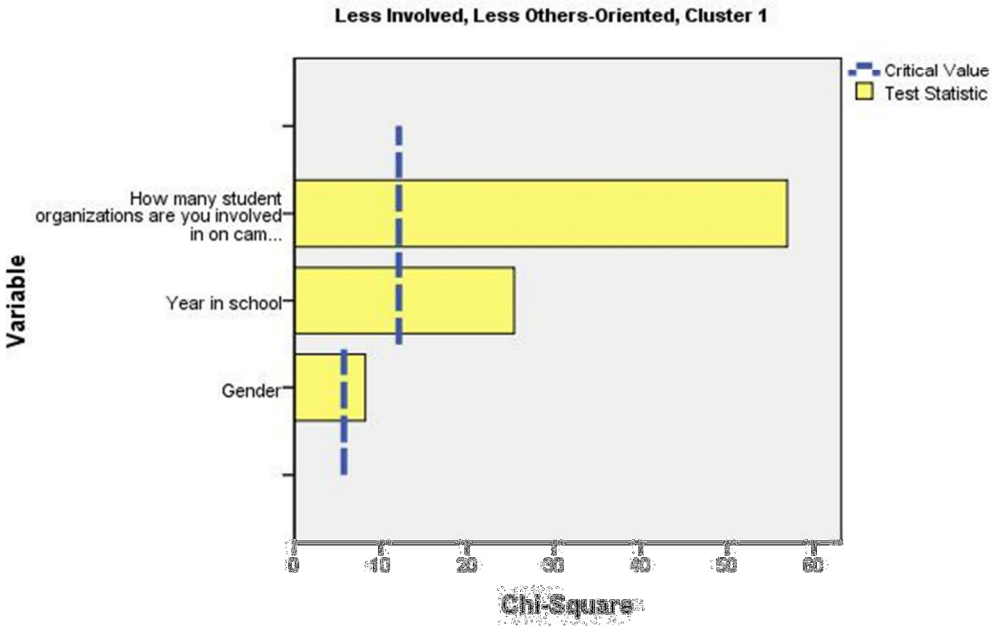
Table 5
Demographics, Involvement and Leadership Role by Cluster

Demographic	Cluster 1		Cluster 2		Cluster 3	
Gender	43% Male, 57% Female		27% Male, 73% Female		26% Male, 74% Female	
Class rank	Freshman Sophomore Junior Senior Grad	10% 27% 18% 28% 18%	Freshman Sophomore Junior Senior Grad	11% 25% 38% 21% 4%	Freshman Sophomore Junior Senior Grad	14% 31% 30% 20% 5%
Involvement	0 orgs. 1 2 3 4+	20% 9% 34% 25% 12%	0 orgs. 1 2 3 4+	1% 10% 33% 26% 30%	0 orgs. 1 2 3 4+	0% 12% 26% 22% 39%
Leadership Role	79% Yes	21% No	87% Yes	13% No	89% Yes	11% No

Cluster 1 – Less Involved, Less Others-Oriented

The first cluster is profiled as "less involved, less others oriented." Figure 1 identifies significant chi-square values for the categorical variables in the analysis, level of involvement, year in school and gender. The most differentiating impact from categorical variables is from involvement level. This group holds nearly 85% of the students who were not involved in any student organization. Members tend to be seniors and graduate students which may explain a lower level of involvement in on-campus student organizations.

Figure 1. Cluster 1 – Categorical discriminators for less involved, less others-oriented group



Considering this same group, or cluster, the most discriminating continuous variables (see Table 6) are those on which this cluster rated significantly lower than the other groups, and the top two are both variables related to consciousness of OTHERS. This group is most differentiated by their low scores for thinking about how their *decisions are received* by others in the group, as well as being concerned about *resolving conflicts* within the group. Next in discriminatory impact are two CONTEXT variables on which cluster 1 members rate significantly lower than members of the other clusters. These are thinking about how the *environment influences leadership style*, and *tailoring leadership style* to the situation. The next four discriminating variables are all OTHERS oriented variables on which this group rated significantly lower than their student counterparts (see Figure 2). Thus, this group is deemed "less involved, less others-oriented."

Figure 2. Continuous variables differentiating cluster 1 – "Less involved, Less others-oriented"

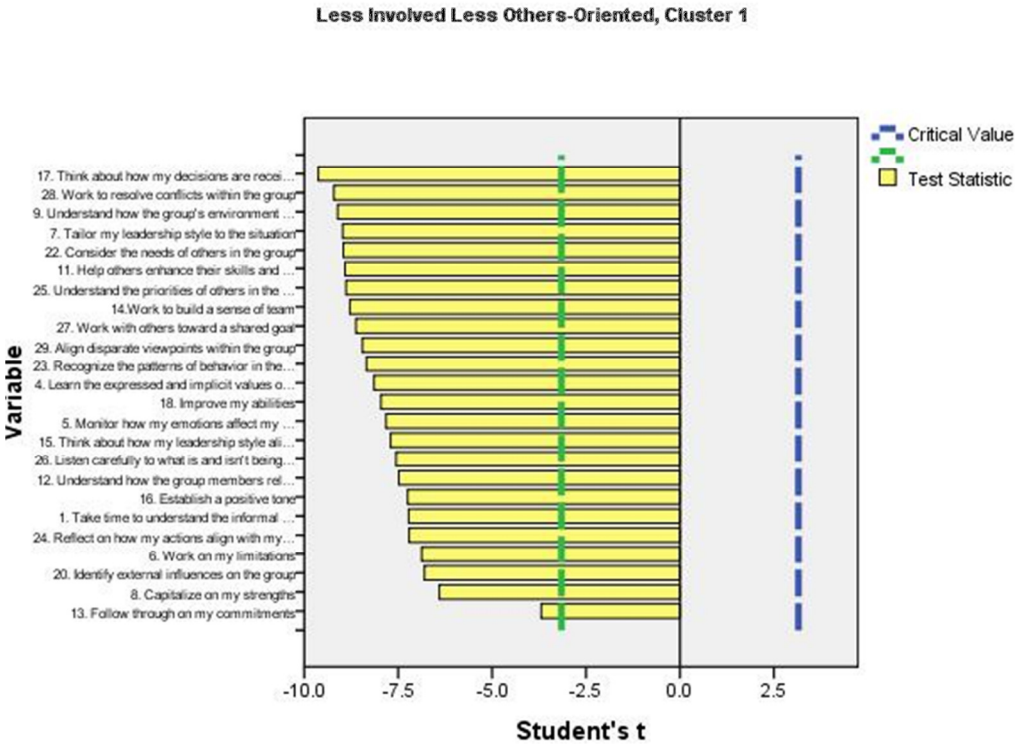


Table 6
Variables Most Significantly Contributing to Membership in Cluster 1

Less Involved, Less Others-Oriented Cluster	**Construct**	***t*-statistic**	***p*-value**
Think about Decisions Received	Others	-9.6	.000
Resolve Conflicts	Others	-9.2	.000
Environment Influences Style	Context	-9.1	.000
Tailor Style to Situation	Context	-9.0	.000
Help Others Enhance Skills	Others	-8.9	.000

Cluster 2 – Self Improvers

This group is more self-oriented, *working on limitations, improving abilities, capitalizing on strengths*, and *following through*, all variables of the SELF construct. None of the categorical or continuous variables (see Figure 3 and Figure 4) serve as significant discriminators of group membership, but the variablewise importance plots offer a view into the respective importance of each variable within the cluster. The second most important variable is thinking about how one's *leadership style aligns with group culture*, a consciousness of CONTEXT variable. This second cluster of self-improvers rates significantly lower on their mean scores for all these variables compared to their cluster 3 counterparts.

Figure 3. Categorical variables differentiating "Self Improvers" – Cluster 2

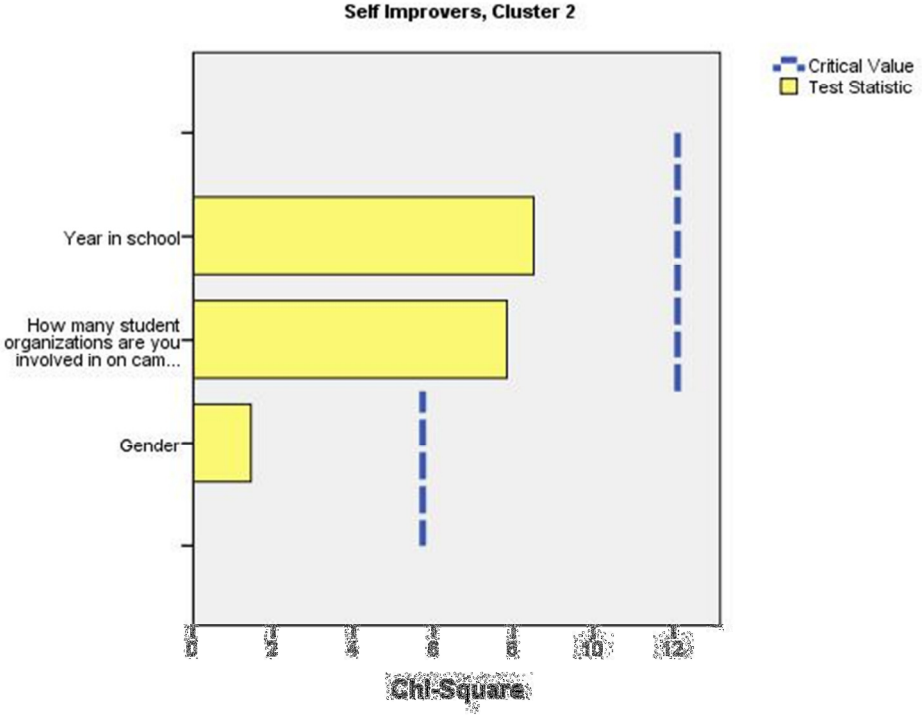
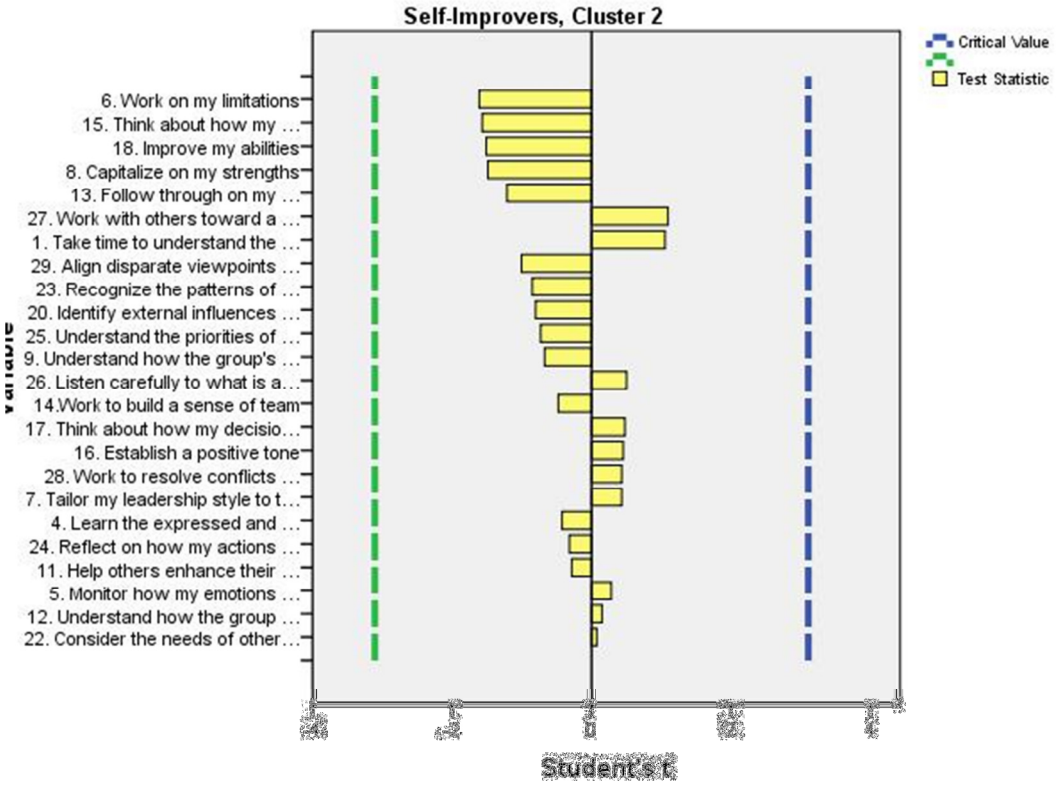


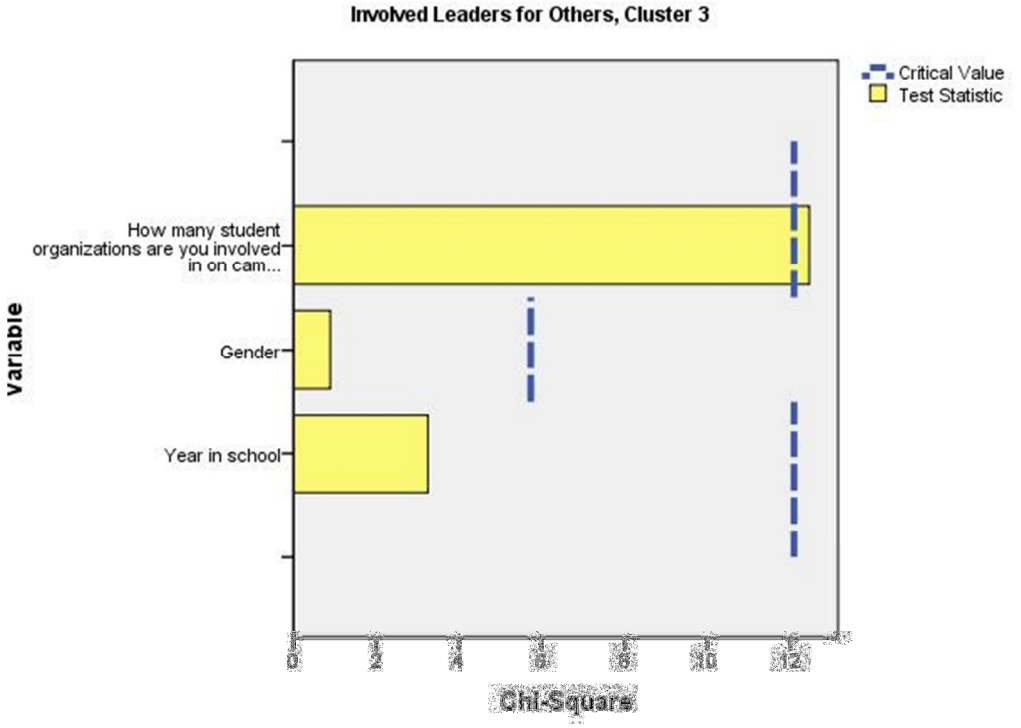
Figure 4. Continuous variables differentiating "Self Improvers" – Cluster 2



Cluster 3 – Involved Leaders for Others

Members of the third cluster, "Involved Leaders for Others" are significantly differentiated by their high level of involvement in student organizations on campus (see Figure 5).

Figure 5. Categorical variables differentiating cluster 3 – "Involved leaders for Others"



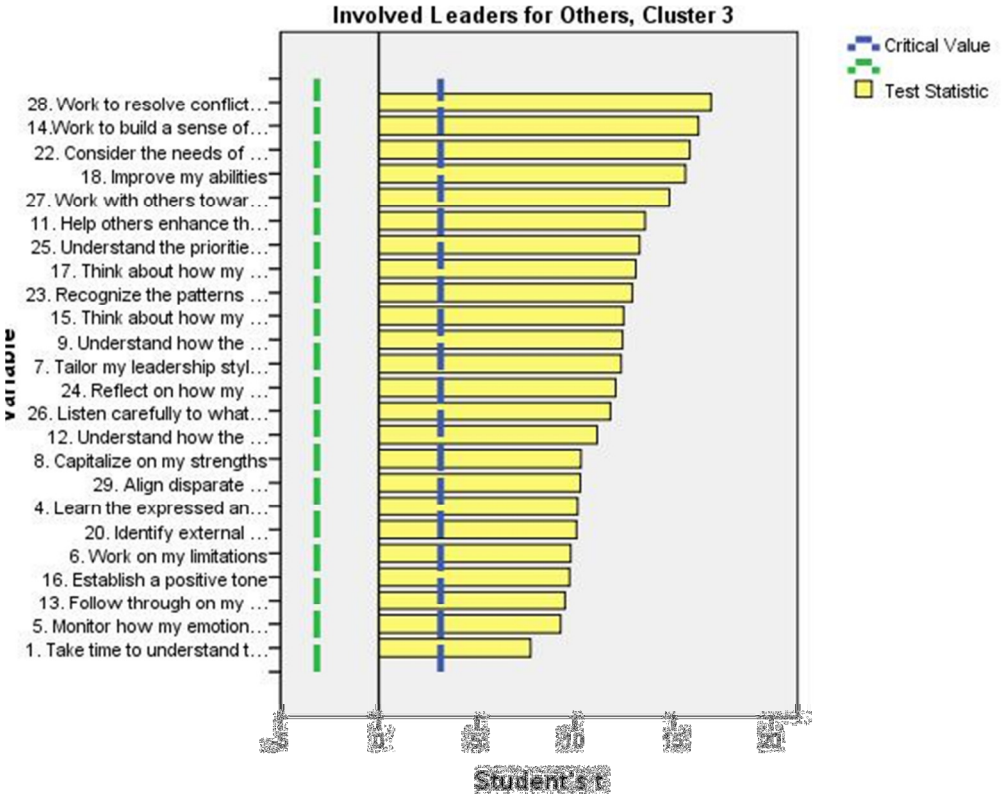
The group is distinguished by their others-centeredness including *working to resolve conflicts within the group*, *team-building*, and *considering the needs of others in the group,* all variables from the OTHERS consciousness construct. They think about how they might *improve their abilities* and *establish a shared goal* (SELF) (see Table 7).

Table 7
Variables Most Significantly Contributing to Membership in Cluster 3

Involved Leaders for Others Cluster	Construct	t-statistic	p-value
Resolve Conflicts	Others	16.9	.000
Work to Build Team	Others	16.3	.000
Consider Needs of Others	Others	15.8	.000
Improve my Abilities	Self	15.6	.000
Work Toward a Shared Goal	Self	14.8	.000

The variablewise importance plot (see Figure 6) suggests the others-oriented leader also looks outward at helping others enhance their skills, understanding the priorities of others in the group, thinking about how one's decisions are received. These variables fall on the OTHERS construct. Members of this cluster consider several CONTEXT variables, specifically recognizing patterns of behavior in the group, considering how one's leadership style aligns with the group culture, understanding how the group's environment influences one's leadership style, and tailoring leadership style to the situation.

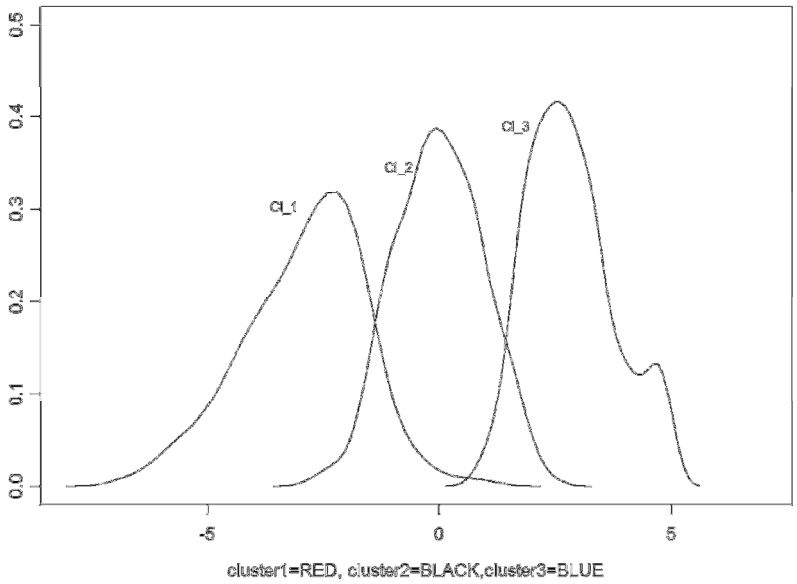
Figure 6. Continuous variables differentiating cluster 3 "Involved Leaders for Others"



Validating the Cluster Solution with Discriminant Analysis

Cluster membership can be used as the grouping variable in discriminant analysis as a means for validating the final cluster solution (Garson, 2009; Punj, 1983). Punj (1983) suggests that after developing the cluster solution on one sample, discriminant functions are derived and applied to a second (hold out) sample. Figure 7 shows the distribution of the discriminant scores for the first discriminant function applied to each of the three clusters derived in the two-step cluster analysis. The distribution of discriminant scores for each cluster is substantially separate.

Figure 7. Discriminant scores for each cluster from first discriminant function



To assess model fit, consider Wilks' ÿ=.186 for the first discriminant function, which suggests that the model separates cases into groups effectively with the proportion of total variance in the discriminant scores not explained by differences among the groups at only 18.6%. Smaller values of lambda suggest greater discriminatory power of the function.

The stepwise procedure was used, where at each step, the variable that maximizes the Mahalanobis distance between the two closest groups is entered into the solution. Interestingly, *work to build a sense of team* is the first variable entering the procedure, followed by *considering the needs of others in the group*. These two variables, elements of the consciousness of OTHERS construct, serve to differentiate clusters 1 and 2. This supports the profiling of cluster 1 members who tended to be significantly less conscious of others given the attribute importance ratings supplied by the two-step cluster procedure.

Substantially separating cluster 2 (Self-Improvers) and cluster 3 (Involved Leaders for Others) are propensity to *improve one's abilities* and *monitoring how emotions affect interactions with others*, both SELF construct variables. A simple tally of the variables and the clusters they differentiate reveals that the Less Involved, Less Others-Oriented members of cluster 1 were differentiated from cluster 2, Self-Improvers, primarily on OTHERS and CONTEXT variables. It is primarily CONTEXT and SELF variables that distinguish Self-Improvers (cluster 2) from the Involved Leaders for Others (cluster 3). Extent of organizational

involvement on campus further discriminates between Self-Improvers and Involved Leaders for Others.

In classification tests using the discriminant function to predict cluster membership, 92% of the cases from which the function was built are classified correctly, and 87% of the holdout sample is correctly classified. Overall, the discriminant analysis approach to validating the clusters proves worthwhile, and suggests the clusters are stable.

Discussion

A clear contribution of this work to leadership education is its ability to link statistical methods and useful technology to leadership development. The approach presented here can help leadership educators better identify where students are in their development, and tailor individually-suited interventions. Rather than "one size fits all" results, a program can be developed to provide students with results that focus on their immediate needs for development and growth. For example, in a classroom setting, the EILS-I could be administered to students, and using cluster analysis, one can determine which students belong to each of the three clusters – Less Involved, Less Others Oriented; Self-Improvers; Involved Leader for Others. Based on this information, group activities can be designed by cluster membership. This allows an instructor the opportunity to tailor the experience based on learning objectives for individual clusters, and track student progress more effectively.

A second contribution is that this work provides a method for helping students progress in their understanding of leadership. For instance, an emerging leaders program on campus (designed for freshmen/sophomores) may focus on a different set of ideas and activities (required membership in an on-campus organization for instance) than a retreat or course designed for positional or seasoned leaders on campus. The former is expected to have greater impact if it focuses on the individual and self while the latter will help positional/seasoned leader focus on their specific needs. Here we underscore the suggestion that "*the most successful development programs are those that reflect the individual and his or her unique needs and strengths"* (Avolio & Gibbons, 1989, p. 291).

As a case in point, cluster analysis enables the division of respondents into meaningful clusters based on specific, self-reported behaviors. In leadership settings, those who are more involved are also more others-oriented (cluster 3). They prioritize resolving conflicts within the group, and work on team-building. Considering the needs of others plays a key role as does improving one's abilities. Working toward a shared goal further contributes to students being categorized as

Involved Leaders for Others. Members of cluster 1 on the other hand, tend to be less involved and less others-oriented. Thinking about how one's decisions are received and working to resolve conflicts should be the primary focus of development for members of this cluster. Considering the context is critical to development or intervention plans, particularly understanding how the group environment influences one's style, then tailoring the leadership style to the situation. Once these skills have been addressed and improved, helping others enhance their skills should be the focus for members of cluster 1.

Finally, it is important to note that the *process* of cluster analysis itself is applicable to any number of assessments that focus on leadership development. For instance, the same process could be used with the Emotional-Social Competence Inventory-University (ESCI-U), the Socially Responsible Leadership Scale (SRLS), or the Student Leadership Practices Inventory (SLPI). By doing so, leadership educators can design and implement programs for individuals at different places in development and growth.

Limitations and Future Research

This study uses non-probability sampling (purposive) which has similar limitations to a convenience sample (e.g., self selection error). Therefore, it may not be appropriate to generalize the current findings to a larger, uninvolved student population. A second limitation of the present study is the self-report nature of the inventory used to gather data. Again, well documented challenges exist regarding self-report instruments (Donaldson & Grant-Vallone, 2002).

One might interpret the findings from this specific dataset as a bit curious, given that the clusters are basically low, middle and high rankings on the self-reported leadership behaviors. The low group, with a higher representation of seniors and graduate students, may be more self-critical and honest. This demographic may be less "others-oriented" at this juncture in their lives due to academic and career obligations. Future research might also investigate the larger proportion of males in the first cluster.

Validating a student's potential for moving from one cluster to another requires a longitudinal approach in future research. A second study with the same participants would likely yield information on common transitions from one cluster to another and the EIL behaviors surrounding the transition.

Conclusion

Cluster analysis was implemented to segment college students based on self-reported EIL behaviors. Three underlying constructs including consciousness of context, self and others were examined. The data was used to suggest areas for improvement in the consciousness constructs, reflective of the behaviors of more involved, and others-oriented leaders. Cluster analysis was presented as a useful tool for leadership educators and is conveniently available in common statistical analysis packages. Understanding the EIL behaviors within a given cluster helps leadership educators plan and tailor developmental opportunities.

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