Assessment of Gregorc Style Delineators

Dr. Mysore Narayanan, Miami University

DR. MYSORE NARAYANAN obtained his Ph.D. from the University of Liverpool, England in the area of Electrical and Electronic Engineering. He joined Miami University in 1980 and teaches a wide variety of electrical, electronic and mechanical engineering courses. He has been invited to contribute articles to several encyclopedias and has published and presented dozens of papers at local, regional, national and international conferences. He has also designed, developed, organized and chaired several conferences for Miami University and conference sessions for a variety of organizations. He is a senior member of IEEE and is a member of ASME, SIAM, ASEE and AGU. He is actively involved in CELT activities and regularly participates and presents at the Lilly Conference. He has been the recipient of several Faculty Learning Community awards. He is also very active in assessment activities and has presented more than thirty five papers at various Assessment Institutes. His posters in the areas of Assessment, Bloom’s Taxonomy and Socratic Inquisition have received widespread acclaim from several scholars in the area of Cognitive Science and Educational Methodologies. He has received the Assessment of Critical Thinking Award twice and is currently working towards incorporating writing assignments that enhance students’ critical thinking capabilities.
Assessment of Gregorc Style Delineators

Abstract

Anthony F. Gregorc is a phenomenological researcher who is internationally recognized for his work in learning styles. In 1969, with the introduction of his *Energetic Model of Styles*, researchers were provided with a valuable tool for helping individuals gain a better understanding of Self and others. This work evolved into the *Mind Styles Model* in 1984. Gregorc Style Delineator is based upon a psychologically-formulated matrix of four descriptive words. Gregorc indicates that there are four combinations of the strongest perceptual and ordering ability in each individual:

1. Concrete Sequential (CS)
2. Abstract Random (AR)
3. Abstract Sequential (AS)
4. Concrete Random (CR)

Milton D. Cox, Anthony Grasha and Laurie Richlin had a *Town Meeting* in March 1997 at the Lilly Atlantic Regional Conference. Here they discussed the important differences between a *Teaching Model* and a *Learning Model*. This knowledge is extremely important while studying the impact and importance of *Gregorc Style Delineators*. The author has tried to examine and analyze *Gregorc Style Delineators* based on the *Learning Model* in one of his courses and has obtained feedback data. In this presentation, he presents an analysis of his data and tries to draw conclusions as to how to improve classroom teaching techniques.

Introduction

Gregorc Style Delineator is considered to be a powerful tool for assessment by various scholars and educational psychologists (Gregorc, 1979). In this paper, the author describes how he has tried to incorporate this widely used research-based, self-assessment instrument in an educational setting. Here, the author has examined the engineering educational accomplishments certain students who studied *Dynamics*, a junior level course. Based upon a psychologically-formulated matrix of 40 descriptive words, the *Gregorc Style Delineator* is an extraordinary tool for helping individuals gain a better understanding of Self and others (Gregorc, 1984).

The author has previously worked in this general area and has published and presented in several conferences. This research activity is a continuation, based on those papers and publications. While discussing *Gregorc Style Delineators*, one should not forget the
importance of VARK, proposed by Fleming and Mills of Christchurch, New Zealand. (Fleming and Mills, 1992). VARK is an acronym that stands for Visual, Auditory, Read (includes writing), and Kinesthetic sensory modalities that humans employ for learning and processing information.

American Association for Higher Education proposed certain guidelines for assessment and indicated that assessment requires attention to outcomes but also and equally to the experiences that lead to those outcomes. Therefore, there is a need to examine the The Gregorc Style Delineators in greater detail as it can be related to engineering education. The following represents a brief description of each of the four learning styles. The author has utilized this set previously and has presented at other ASEE and ASME conferences (Narayanan, 2007, 2009 & 2019). The author has reproduced Gregorc Style Delineators here for sake of clarification and completeness (Gregorc, 1984).

Gregorc Style Delineators

Anthony Gregorc obtained a B.S. degree from Miami University and an M.S. degree and a Ph.D. degree from Kent State University. The Gregorc Style Delineator Guide is supposed to increase style awareness in one's Self and also in others. It includes the research-based Gregorc Style Delineator instrument to aid individuals in recognizing and identifying specific channels though which they receive, process and express information. Gregorc Style Delineator is based upon a psychologically-formulated matrix of four descriptive words. Anthony Gregorc indicates that there are four combinations of the strongest perceptual and ordering ability in each individual.

Concrete Sequential (CS)

These learners prefer direct, hands-on experience. These learners exhibit extraordinary development of their five senses. They like touchable, concrete materials, and orderly presentations. Concrete Sequential’s actually enjoy faculty meetings! They are averse to change and do not oppose tradition. Here one may use the phrase: “They Don’t want to Rock the Boat.” They are habitual, punctual, and desire perfection. You would not see a Concrete Sequential wear flashy colors or mismatched outfits. They are organized, desire perfection, and give “practical” gifts.
Abstract Random (AR)

These learners have a capacity to sense moods, and they use intuition to their advantage. They prefer to learn in an unstructured environment such as group discussions and activities. Faculty meetings are viewed as a time to socialize! They prefer not to be restricted by unnecessary rules and guidelines. Because Abstract Random’s continuously discharge energy, they may appear “hyper” when indeed they are not. Abstract Random’s use hand and body movements when communicating. They dislike routine activities and cold, unemotional people.

Abstract Sequential (AS)

These learners have excellent abilities with written, verbal, and image symbols. Some researchers say: Visual, Verbal and Vocal Communication skills. They like to read, listen, and use their visual skills. They are highly verbal; therefore, you will never have a short conversation with another Abstract Sequential. They prefer a sequential presentation that is rational and substantive or they consider meetings a waste of time. Many people are of the opinion that Abstract Sequential’s are “fence straddlers” and are highly skeptical.

Concrete Random (CR)

These learners like to experiment using trial-and-error approaches. They tend to jump to conclusions and prefer to work independently or in small groups. They are gamblers and risk takers. Concrete Random’s may arrive late to meetings and leave early if they feel the meeting is boring or going nowhere. Concrete Random individuals are leaders, not followers. They love to take charge and be in charge. They refuse to accept the words “don’t” or “can’t.” These individuals thrive in a competitive atmosphere. Concrete Random’s are not overly concerned with making impressions or going out of their way to win over people. They are often the prime movers of change.

Assessment and the ‘ACORN’ Model

Some researchers may comment that talking about the ACORN model is totally off-tangent and is not relevant while discussing Gregorc Style Delineators. The author, however, disagrees. The use of ACORN model suggested by Hawkins and Winter (Hawkins & Winter, 1997) to conquer and mastering change, may indeed offer some helpful hints for the implementation of Gregorc Style Delineators.
Because these five ideas of Hawkins and Winter also provide certain helpful guidelines as to how an instructor can successfully try to implement *Gregorc Style Delineators* in a 21st century classroom. The author has discussed about the importance *ACORN* model in a variety of publications, including ASEE 2019 National Conference. It is reproduced here again for sake of clarity and completeness. Both *ACORN* model and Gregorc Style Delineators were utilized while collecting and analyzing data.

**Action:**
It is possible to effectively change things *only* when a teaching professor actually tries out a new idea. In other words, Creativity is important in the 21st Century. We are teaching Technology – Savvy Students. Action needs to be taken to make sure there is constant update always. Instructors should focus on *Continuous Quality Improvement.* This should be based on looking at chosen *Bench-Mark Institutions* and try to follow what they have successfully accomplished.

**Communication:**
Changes are successful *only* when the new ideas are effectively communicated and implemented. This is facilitated by modern technology whether it be e-mail or world-wide-web or internet or You-tube. In the 21st century the student body is more demanding. In other words, appropriate computer software must be intelligently incorporated into the course curriculum content.

**Ownership:**
Support for change is extremely important and is critical. *Only* strong commitment for accepting changes demonstrates genuine leadership. Both the instructor and the student should participate effectively to promote change. Instructors always ask the students to take *Ownership of Learning.* The key is to make sure this really happens. This is accomplished by creating interesting research assignments that are short, yet appropriate to the topic under discussion.

**Reflection:**
Feedback helps towards thoughtful evaluation of the changes implemented. *Only* reflection can provide a tool for continuous improvement. Feedback must be scrutinized and summarized and used as part of continuous quality improvement. Most instructors do conduct an evaluation of the course at the end of the semester. Additional questions should be included to find out how the students react and reflect to the course delivery methodology.

**Nurture:**
Implemented changes deliver results *only* when nurtured and promoted with necessary support systems, documentation and infrastructures. This is where the institution can play a major role and provide much needed leadership. The department chair, the dean of the school and the executive vice president or the provost should support and promote new innovative teaching ideas that promote active student learning.
Implementation

The author is of the opinion that one should utilize a variety of instructional tools to communicate with students who may prefer to have different learning styles (Kolb, 1985). Furthermore, the author also has tried to implement innovative ideas promoted by a variety of researchers and scholars into practice (Narayanan, 2007 & 2019). Implementation procedure has been fairly ‘standardized’ by the author at Miami University. He has been using this procedure throughout his research activity at Miami University. In addition to routinely used methodologies like traditional lectures and laboratory exercises, the author heavily promotes the implementation of 21st century modern technology. This includes, but not limited to: World Wide Web, WebEx, You Tube, I.V.D.L. (Interactive Video Distance Learning) etc. Traditional Audio-visual techniques such as power point presentations, tutorials, problem-solving sessions, reflective research reports, peer group discussions, etc. also supplement student learning. The author would like to state that Washington State University’s Critical Thinking Rubric has proved to be an extremely valuable tool in documenting the effectiveness of systematic use of assessment methods for this research activity. The author would also like to state that he has previously used Washington State University’s Critical Thinking Rubric in several of his ASEE and ASME publications (Narayanan, 2007 & 2019).

Procedure

At Miami University, the author did not provide the students with a questionnaire to fill out. The rationale being that ‘students are exhausted in filling out forms.’ Some researchers are of the opinion: ‘questionnaire-fatigue’ will result in skewed data that may lead to faulty conclusions. Therefore the assessment data was collected in an indirect manner (Narayanan, 2019). The rationale being that author has been fairly successful with this methodology in his previous research activities. The author examined the students’ capabilities using ten writing assignments spread over a fifteen weeks’ semester. Details about data collection methodology is described below. While grading these assignments, the author classified and separated the 38 students in to four groups according to the specifications identified by the Gregorc Style Delineator model. Grading was holistic and utilized the five point Likert Scale which is shown in Appendix B. The data collected have been tabulated, graphed and analyzed. Conclusions were drawn based on the data collected, to provide guidelines that can improve student learning. A sample is shown in Appendix C.
Data Collection

- **Landscape:** Data was collected from 38 students, over a period of two semesters.
- **Engineering Course Curriculum:** Dynamics. A Junior Level Course.
- **Student Generated Documents:** Ten Writing Assignments. Each, 500 Words, Minimum.
- **Volume:** Total of 380 student generated documents. This was collected over two semesters.
- **Topics Discussed:** Ten different topics in the general area of Dynamics such as momentum, linear motion, angular acceleration, etc.

Data Classification

- **Documentation:** Classify the “Characteristics” according to Gregorc Style Delineator model and document by tabulating them using an EXCEL spreadsheet.
- **Grading:** Holistic Grading. Utilize a Five Point Likert Scale.
- **Complete Details:** Appendix D shows a sample for one student.

Data Dissemination

- Data collected was initially presented in an EXCEL format, one table per student, for all the ten writing assignments. A sample is shown in Appendix D.
- The author adopted a holistic and qualitative grading methodology. No quantitative grade points or percentages were recorded.
- Instead, the author assigned Likert Scale Numbers for each assignment according to the guidelines suggested in the Gregorc Style Delineator model.
- Thus, a total of thirty-eight tables were generated for the entire landscape of students studied.
Data Presentation

- The author had a set of thirty-eight tables and determined a sort of *Weighted Average* to present in a suitable single EXCEL spreadsheet. This is shown in Appendix E.

- The author adopted a holistic and qualitative grading methodology. No quantitative grade points or percentages were recorded.

- Instead, the author assigned checkmarks according to the guidelines suggested in the *Gregorc Style Delineator model*.

- Thus, a total of thirty-eight tables were generated for the entire landscape of students studied.

- Next the weighted average was determined and tabulated for each of the characteristics identified by the *Gregorc Style Delineator model*.

- Thus, a final EXCEL table was created based on the weighted average mentioned above. This is shown in Appendix F.

Data Display

- The procedure followed by the author is shown in Appendix A.

- As mentioned earlier, grading was administered using *Washington State University’s Rubric*. This is shown Appendix B.

- The grading data obtained was tabulated using a Five Point Likert Scale.

- Likert Scale is shown in Appendix C.

- EXCEL Spreadsheet data summary and a sample of grading scheme for one student is shown in Appendix D.

- Finalized EXCEL table for all the 38 students, using weighted average calculations is shown in Appendix E.

- A Bar chart was generated based on EXCEL Spreadsheet data summary and this is shown in Appendix F.

- Comparing Gregorc Style with 4MAT Proposal is shown in Appendix G.
Data Analysis

Looking at the bar chart displayed in Appendix F one can easily see that none of the four characteristics assessed recorded a Likert Scale mode value of 5.

The author was trying to assess the impact of Engineering Education utilizing a set of writing assignments in the area of Engineering Mechanics, with specific reference to the subject matter of Dynamics.

Therefore, it is probably an unrealistic aspiration to achieve a mode value of 5 at this very first attempt of research activity.

The author also recognizes that this is only an undergraduate environment. Based on the bar chart generated one can see that the three “traits”

Characteristic # 1 (Concrete Sequential)
Characteristic # 3 (Abstract Sequential)
Characteristic # 4 (Concrete Random)

all show respectable mode values of 3.

• While these are acceptable, they are not adequate.

• It indicates that majority of students in this group belong to the Abstract Random Category.

• The author is attempting to understand the reason and rationale behind this result.

• How was this arrived at and how this can be changed to improve student learning.

• The author needs to work in these areas to provide more input to students.

• He is trying to accomplish a mode value of 4 initially, at least in one or two characteristics.

• Ultimate goal is to attain a mode value of 5 in all the three.
Again, referring to the bar chart, we can see that only one of the “traits”

**Characteristic # 2 (Abstract Random)**

Shows a good mode value of 4.

Based on the data collected the author concludes that:

- This indicates that in this group, most of the students fall under the *Gregorc Style Delineator* category of *Abstract Random*.
- Based on the above data collected the author concludes for this student group that they prefer to learn in an unstructured environment.
- This student group likes to learn using group discussions and laboratory or tutorial activities.
- This group of students prefer not to be restricted by unnecessary rules and guidelines.

**Conclusions**

Based on the “Data Analysis” mentioned above, the author concludes that we should focus more on creating a dynamic classroom for the 21st Century. The author is interested in promoting “Learner-Centered Education.” The great success of Barr and Tagg’s article on the “learning paradigm” indicates widespread agreement about the kind of change needed in post-secondary education (Barr & Tagg, 2012). The author would like to concentrate on the ideas promoted by leading researchers like Barr and Tagg. However, it does not mean that instructors are avoiding fundamental questions about classroom activities or the ultimate goals of learning. The author would like to emphasize that educational accomplishments of students should be assessed using established techniques and formats. This is what the author has attempted to carry out in this research activity. This assessment exercise has provided the author with multiple ideas as to focus on how to achieve more efficient student learning. The author plans to work on improving his classroom assignments to address the issues generated in this research activity. The above set of conclusions are almost identical to the ones the author has arrived at, in his previous research publications (Narayanan, 2019).
APPENDIX  A: Procedure Followed by the Author

- The data collected are **ordinal**. They have an inherent order or sequence, but one cannot assume that the respondent means that the difference between agreeing and strongly agreeing is the same between agreeing and being undecided.

**Descriptive Techniques**
- Summarize using a median or a mode (not a mean). The mode is probably the most suitable for easy interpretation.
- Express variability in terms of the range or inter quartile range. Standard Deviation can’t be used.
- Display the distribution of observations in a dot plot or a bar chart. It can’t be a histogram, because the data is not continuous.
# APPENDIX B: Five-Point Likert Scale

Rubrics courtesy of W. S. U., Pullman, WA.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Has demonstrated excellence. Has provided documentation. Evidence of critical thinking ability. Very good performance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Has analyzed important data precisely. Has answered key questions correctly. Has addressed problems effectively.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Has evaluated material with proper insight. Has used deductive reasoning skills. Has used inductive reasoning skills.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Has employed problem solving skills. Has discussed consequences of decisions. Has been consistent with inference.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data analysis can be improved. More effort to address key questions. Need to address problems effectively.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Expand on evaluating material. Improve deductive reasoning skills. Improve inductive reasoning skills.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem solving skills need honing. Must discuss consequences of decisions. Has been vague with inference.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Poor, unacceptable performance. Lacks critical thinking ability.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Absence of analytical skills. Answers questions incorrectly. Addresses problems superficially.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lacks documentation. Inability to evaluate material. Shows no deductive reasoning power.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inductive reasoning power nonexistent. Poor problem solving skills Unaware of consequences of decisions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unable to draw conclusions.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C: Likert Scale  

Source: [http://templatedb.me/pick/](http://templatedb.me/pick/)

It should be observed that the data collected are ordinal. This indicates that they have an inherent order or sequence. It must be interpreted carefully. The data is not continuous. Therefore it is not appropriate to create a histogram. Mean values do not have any meaning for interpretation.

Furthermore, *Standard Deviation* does not convey anything. The data are normally summarized using a median or a mode. The author prefers *mode* because it is considered to be the most appropriate for this type of data analysis. The data collected are normally displayed in a bar chart.

Reference: [http://www.icbl.hw.ac.uk/ltdi/cookbook/info_likert_scale/](http://www.icbl.hw.ac.uk/ltdi/cookbook/info_likert_scale/)

Source: Descriptive Techniques: Likert Evaluation Cookbook 2004

*Four, Five and Six Point Semantic Differential Likert Scale is shown below.*

```
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Dissatisfied</td>
<td>Dissatisfied</td>
<td>Satisfied</td>
<td>Very Satisfied</td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Dissatisfied</td>
<td>Dissatisfied</td>
<td>Neutral</td>
<td>Satisfied</td>
<td>Very Satisfied</td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Dissatisfied</td>
<td>Very Dissatisfied</td>
<td>Somewhat Dissatisfied</td>
<td>Somewhat Satisfied</td>
<td>Very Satisfied</td>
<td>Extremely Satisfied</td>
</tr>
</tbody>
</table>
```
APPENDIX  D:  Data Collected for  One  Student.  Ten Writing Assignments.

Gregorc Style Delineator

Student # A : Assignment Numbers:  1  2  3  4  5  6  7  8  9  10

Assessment Data Collected by
Mysore Narayanan.  Rubric Courtesy of:
Washington State University, Pullman, WA.
Likert Scale Weight Distribution
1 : Strongly Disagree;  5 : Strongly Agree

<table>
<thead>
<tr>
<th>Mode</th>
<th>Concrete Sequential</th>
<th>Abstract Random</th>
<th>Abstract Sequential</th>
<th>Concrete Random</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likert Scale</td>
<td>3 4 4 4 4 4 3 4 4 4</td>
<td>5 3 4 4 4 4 5 5 4 4</td>
<td>5 3 3 3 4 4 3 4 3 3</td>
<td>5 3 4 4 3 4 3 4 4</td>
</tr>
</tbody>
</table>

Source:  Image Obtained from  Gregorc Style Delineator  Website.

APPENDIX E: Consolidated Data for 38 Students. All Ten Writing Assignments.

Gregorc Style Delineator

Assessment Data Collected by Mysore Narayanan.
Rubric Courtesy of: Washington State University, Pullman, WA.
Likert Scale Weight Distribution
1: Strongly Disagree;
5: Strongly Agree

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Sequential</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Abstract Random</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Abstract Sequential</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Concrete Random</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>
APPENDIX F: Bar Chart based on EXCEL spreadsheet shown in Appendix E.
APPENDIX G: Comparing Gregorc Style with 4MAT Proposal.

Have you ever wondered how the mind works?

Anthony F. Gregorc, Ph. D., founded a theory to explain the ways a human brain processes information.

The Gregorc Style Delineator is a self-scoring written instrument that elicits responses.

Retrieved from: Four Learning Style Types Based on Anthony Gregorc’s Model

<table>
<thead>
<tr>
<th>Gregorc</th>
<th>4MAT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concrete Random</strong></td>
<td><strong>Type 4 Dynamic</strong></td>
</tr>
<tr>
<td>• divergent</td>
<td>• creating and acting</td>
</tr>
<tr>
<td>• experiential</td>
<td>• usefulness and application of learning</td>
</tr>
<tr>
<td>• inventive</td>
<td></td>
</tr>
<tr>
<td><strong>Concrete Sequential</strong></td>
<td><strong>Type 3 Common Sense</strong></td>
</tr>
<tr>
<td>• task oriented</td>
<td>• think and do</td>
</tr>
<tr>
<td>• efficient</td>
<td>• active, practical</td>
</tr>
<tr>
<td>• detailed</td>
<td>• making things work</td>
</tr>
<tr>
<td><strong>Abstract Sequential</strong></td>
<td><strong>Type 2 Analytical</strong></td>
</tr>
<tr>
<td>• intellectual</td>
<td>• reflect and think</td>
</tr>
<tr>
<td>• analytical</td>
<td>• observers who appreciate lecture methods</td>
</tr>
<tr>
<td>• theoretical</td>
<td></td>
</tr>
<tr>
<td><strong>Abstract Random</strong></td>
<td><strong>Type 1 Imaginative</strong></td>
</tr>
<tr>
<td>• imaginative</td>
<td>• feel and reflect</td>
</tr>
<tr>
<td>• emotional</td>
<td>• create and reflect on an experience</td>
</tr>
<tr>
<td>• holistic</td>
<td></td>
</tr>
</tbody>
</table>

References:


Additional Resources


12. [http://telr.osu.edu](http://telr.osu.edu)

13. [http://wsuctproject.wsu.edu/ctr.htm](http://wsuctproject.wsu.edu/ctr.htm)

14. [http://www.pz.harvard.edu/PIs/HG.htm](http://www.pz.harvard.edu/PIs/HG.htm)

15. [http://www.icbl.hw.ac.uk/ltdi/cookbook/info_likert_scale/](http://www.icbl.hw.ac.uk/ltdi/cookbook/info_likert_scale/)

16. GREGORC ASSOCIATES, INC. BOX 351 COLUMBIA, CT 06237