AC 2011-2762: ASSESSMENT OF SERVICE LEARNING

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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 dozens of papers at various Assessment Institutes. His posters in the areas of 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.

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Assessment of Service Learning

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Abstract

Service-learning has been gaining popularity in engineering disciplines, slowly but steadily. It is quite important that universities have a need to accept and adapt to changes in order to make higher education more effective. Furthermore, it is apparent that students learn best, when they are provided with an opportunity to utilize their knowledge to help a select community. Honnet and Poulsen indicate that service to a community adds value to the learner's educational accomplishments. At Miami University, which is primarily a liberal arts university, the author prefers to place service learning as a mechanism wherein the student learners shall mentor and guide so as to empower others to help themselves. Eyler and Giles are of the opinion that service learning relieves the students of the monotony of routine classroom work and learning disengagement. The author believes that service learning helps to rekindle the social consciousness of the student learner. The author also promotes designing of service-learning programs that can make a significant impact in the area of social activism. Regardless, since the United States thrives on a market-driven economy, service-learning course curriculum content must be designed with due regard to the applicability of such socio economic educational philosophies. In this paper the author attempts to outline his efforts in assessing and promoting service learning at Miami University.

Introduction

The service-learning opportunities at colleges and universities should be aimed at the development of the civic education of student learners however, the service-learning course must nevertheless be focused on career preparation of the college students as well. Furthermore it must be clearly acceptable to the appropriate accreditation agencies. This has been substantiated by Alexander Astin's research for instance (Astin, 1982, 1985 & 1999). Astin has shown that *commitment to service tends to be lowest at institutions that place "resource acquisition" as a top priority.* The Senior Design Project Class, which is a two-semester long course, with a total of four credit hours, can be viewed as a service learning class, depending upon the project chosen by the select student group. It does contain a substantial amount of education about ethics, ergonomics, economics, sociology and liberal education principles, in addition to rigorous engineering subject matter. The student groups are encouraged to appreciate the realities of socio-economic impact of their chosen project. In many cases, the project will have to be addressed with a strong will to succeed and necessarily require coalitions of volunteerism, industry sponsored funding and donated resources.

The author has utilized several of these principles outlined by researchers and scholars while he taught engineering subject matter at Miami University. He has also applied some of these ideas into his classroom activities. As a result of this experiment the author was able to

collect and analyze several sets of data. These results have been previously presented in a poster form at the 114th National Conference of the American Society for Engineering Education in Honolulu, Hawaii (Narayanan, 2007). This paper is a *follow-up* on that research activity. Certain paragraphs and certain appendices have been reproduced here for sake of clarity and completeness.

Assessing Learning in Interactive Courses is quite complex and Clifford O. Young, Sr., and Laura Howell Young of California State University, San Bernardino argue that a new paradigm for assessment, a learning paradigm, must be constructed to measure the success of new kinds of educational practices (Young & Young, 1999). Their research is based on the data collected using two survey instruments, the Instruction Model-Learning Model Questionnaire (IMLMQ) and the Student Evaluation of Teaching Effectiveness (SETE).

Award winning scholar, Anthony Grasha has compared traditional versus naturalistic approaches to the assessment of learning styles and comments about the benefits they offer (Grasha, 1990). Grasha's 1996 book, *Teaching with Style*, offers an innovative and user-friendly guide to enhancing the teaching and learning processes. Furthermore, it provides a unique and comprehensive approach to helping college faculty in all disciplines enhance the quality of their teaching. Internally developed assessment tools can also used in assessing service learning courses (Forrest, 1990).

The importance of Course Portfolio has been stressed by various researchers (Edgerton, Hutchings, & Quinlan, 1991; Forrest, 1990; Cerbin, 1994). Dr. Barbara Cambridge, Associate Dean at the Indiana University Purdue University Indianapolis [I.U.P.U.I.] is currently the Vice President of the American Association for Higher Education (AAHE) and is the Project Director of BEAMS. (Building Engagement and Attainment of Minority Students).

Barbara Cambridge's unique book, *Portfolio Learning* clearly demonstrates the value of generating an organized portfolio. This type of learning is very creative as readers write, revise, assess, and present themselves as thinkers and writers using their portfolio as a vehicle for documentation of their knowledge (Cambridge and Williams, 1998). Constructed around the narrative of one engaging journey to portfolio completion, this book, *Portfolio Learning* presents a variety of writing activities, flexible assignments, and opportunities for the student learner.

Leading scholars in the area of cognitive science and educational psychology are of the opinion that factors such as personal autonomy, self-confidence, ability, study behaviors, social adjustments, diversity and discrimination may also play a vital role in the recorded grades (Astin, 1999, Chickering, 1969 and Sedlacek, 1987). Dr. Hunter R. Boylan, who is the Director of the National Center for Developmental Education at Appalachian State University in Boone, North Carolina, is of the opinion that students fail to do well in college for a variety of reasons. Furthermore, Boylan continues to say that only one of them is lack of academic preparedness (Boylan, 2001).

Implementation and Assessment

For purposes of assessment, the author requires and mandates that the students create a systematically organized student-service-learning course portfolio that clearly documents every activity in its complete detail. Whether it be a group discussion or an e-mail communication or cost estimating spreadsheet, it shall be found the portfolio at an appropriate place. These portfolios are gauged, graded, evaluated and assessed using a variety of rubrics and assessment tools. The author has previously presented some of these results in a poster form at the 114th ASEE Annual Conference in Honolulu, Hawaii. The author has generated and utilized a rubric for purposes of assessment. Furthermore, it should be recognized that each topic or subject matter may be different and the difference may be huge and significant. Each instructor's delivery style is different and one may even arrive at two different sets of data for the same subject and topic when two different instructors are involved (Narayanan, 2007).

In *Review of Educational Research*, published by the National Institute for Science Education of Madison, Wisconsin, Springer, Stamen & Donovan report on a meta-analysis conducted during 1998-1999. In their paper, *Effects of small-group learning on undergraduates in science, mathematics, engineering and technology,* they conclude that small-group learning promotes greater student achievement, increases retention in courses, and promotes favorable attitudes toward the course material. (Springer, Stamen, & Donovan, 1999). Sharan & Sharan also stress the importance of cooperative learning methods incorporated into the traditional classroom and recommends group investigation. (Sharan & Sharan, 1994).

Traditional methods of instruction may not be very resourceful in service learning courses pertaining to engineering disciplines. Student learning styles are completely different and instructors have to accommodate new and different learning strategies. (Schmeck, 1988). The instructor responsible for a service-learning course is charged with the responsibility of creating an active learning environment. The instructor may have to utilize some innovative modern technology to design, develop and present interactive lecture demonstrations. (Cook-off & Thornton, 1997). Herein the instructors should utilize Silverman's guide. He offers several suggestions in his famous book, *Active learning: 101 strategies to teach any subject* (Silverman, 1996). Finally, it is extremely important that the achievement and accomplishments of these student teams need to be assessed and evaluated. Slavin has provided us with some very useful guidelines regarding cooperative learning and achievement. (Slavin, 1994 & 1996).

The principles of *VARK* as outlined by Fleming and Mills could also be used to document assessment activities (Fleming and Mills, 1991). The author has not listed out the complete mechanics of the VARK methodology in this paper. He has presented and published this in another paper (Narayanan, 2009). As mentioned earlier assessment of service learning was carried out using a scheme based on *Washington State University's Critical Thinking Rubric.* The author has carried out important research in the area of educational methodologies and has generated a set of **12** characteristics that would be useful in assessing service learning. The author recognizes that another instructor may choose to select a different set of

characteristics for assessing service learning. Each instructor's style is different and one should respect individuality.

The **12** characteristics chosen by the author are detailed below. These characteristics have been incorporated into an excel spreadsheet for documenting collected data. Over a period of several years, data was collected for **22** students groups. A bar chart was generated based on *Likert Scale.*

1. Expertise and Experience of the Student Group
2. Incorporates the Principles of Total Quality Management
3. Promotes and Integrates Across Disciplines
4. Challenges and Motivates Active Learners
5. Creates a Supportive Educational Environment
6. Uses Modern Techniques and Technology Appropriately
7. Designs Appropriate Assessment Techniques
8. Uses Resources Intelligently and Comprehensively
9. Encourages Group Dynamics and Flexibility
10. Develops Appropriate Service Learning Experiences
11. Supports Diversity and Incorporates Diverse Strategies
12. Focuses on the Importance of Service Learning

The spreadsheet generated is shown in Appendix A.

Appendix B shows the actual bar chart generated using the data collected.

Analysis of bar chart is shown in Appendix C.

Appendix D shows *Washington State University's Critical Thinking Rubric.*

Appendix E shows the procedures followed for assessment of critical thinking.

Appendix F shows the principles of assessment.

Appendix G shows the procedure followed by the author.

Appendix H shows the procedure and principles of *Scientific Method.*

Appendix I shows the principles of *Learning Paradigm.*

Appendix J outlines the ten assessment strategies suggested by research.

Conclusions

Referring to the bar chart shown in Appendix B, one can observe, from the data collected, that students document group dynamics which in indeed very important. They are also very capable of using modern technology for analyzing data collected. They do support diversity and they provide encouragement in creating a supportive educational environment. All the following four characteristics have recorded the maximum possible score of **5** on Likert Scale.

Supports Diversity and Incorporates Diverse Strategies.
Encourages Group Dynamics and Flexibility.
Uses Modern Techniques and Technology Appropriately.
Creates a Supportive Educational Environment.

The student group has fairly good expertise and are fairly experienced. Many students are non-traditional students. Some have worked in the United States Marines and United States Navy and as such they have acquired adequate skill in a wide variety of disciplines.

The category:

Expertise and Experience of the Student Group

Has recorded a very good Likert Scale score of **4.**

This is a very good score, however author is very much surprised to see that this did not record a score of **5.**

Five other characteristics have recorded an adequate score of **3** on Likert Scale, indicating that there is plenty of room for improvement. These characteristics are:

Focuses on the Importance of Service Learning.
Develops Appropriate Service Learning Experiences.
Uses Resources Intelligently and Comprehensively.
Challenges and Motivates Active Learners.
Incorporates the Principles of Total Quality Management.

It is essential that instructor takes a careful look at these traits. The instructor should generate a set of activity that could help the students understand the importance of these five characteristics. Attempt must be made to improve the score, initially to **4** and ultimately to **5.**

Two characteristics have recorded an unacceptable score of **2** on Likert Scale, indicating that there is serious deficiency. These are:

Designs Appropriate Assessment Techniques.
Promotes and Integrates Across Disciplines.

The instructor should devote much more time to stress the importance of assessment and the advantages of integrating interdisciplinary activities.

It is essential that instructor has to improve this score, initially to **3** and ultimately to **4.** Preferably, **5.**

In summary, the author acknowledges that more research is required to examine in detail the benefits of service learning. Lively classroom discussions have shown to allow greater student participation. Although, some scholars say that such a method puts forth a completely different approach to college education compared to a traditional lecture format (Midgley, 2002).

Service learning should lead the path and provide a constructive approach to university learning experience.

Acknowledgements

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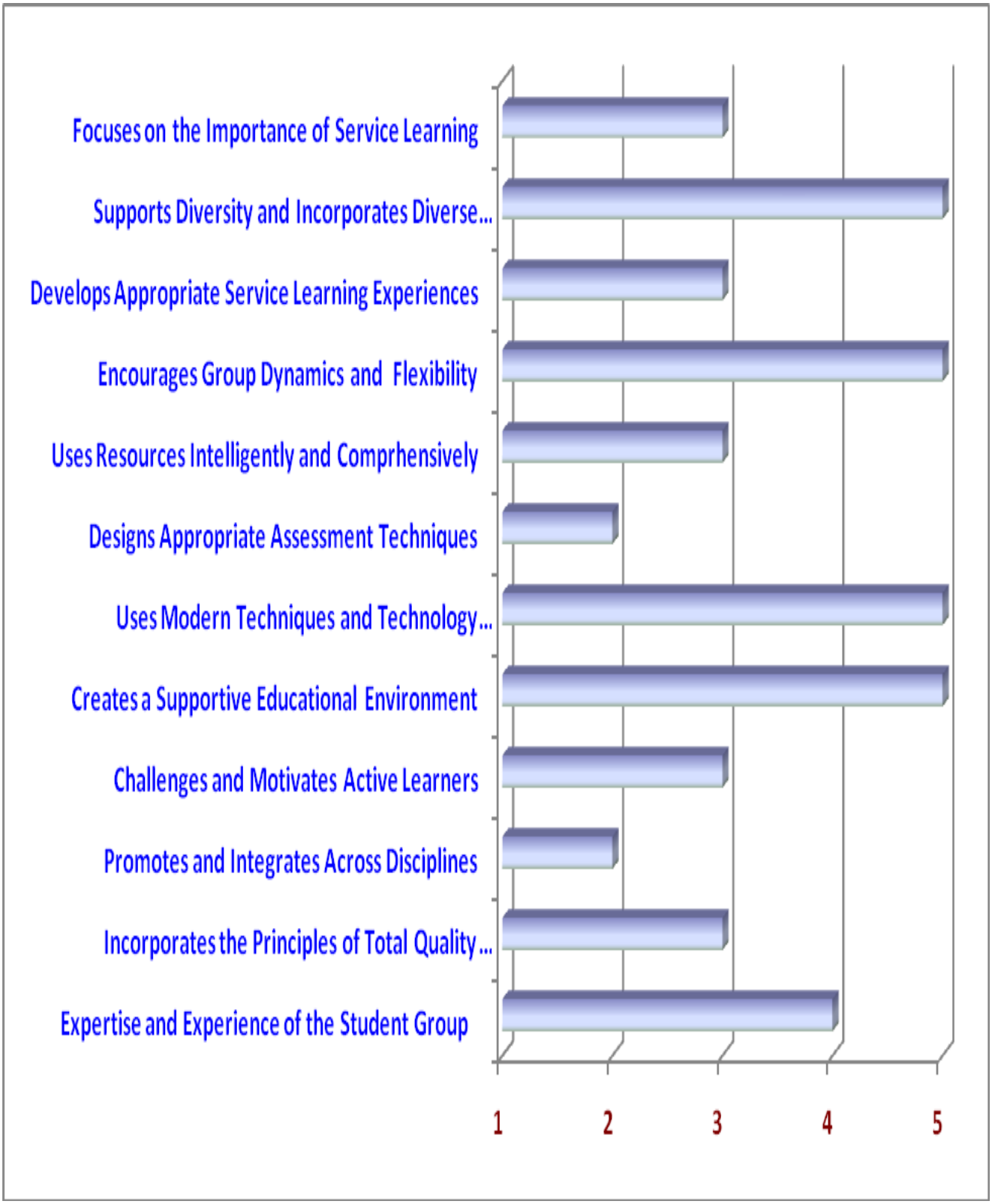
APPENDIX A: Spreadsheet Generated for Assessment

ASSESSMENT OF SERVICE LEARNING													MODE
Expertise and Experience of the Student Group	4	4	5	5	4	.	.	.	.	.	.	.	4
Incorporates the Principles of Total Quality Management	4	4	5	5	3	.	.	.	.	.	.	.	3
Promotes and Integrates Across Disciplines	3	4	5	5	3	.	.	.	.	.	.	.	2
Challenges and Motivates Active Learners	4	3	5	5	4	.	.	.	.	.	.	.	4
Creates a Supportive Educational Environment	4	5	5	5	4	.	.	.	.	.	.	.	5
Uses Modern Techniques and Technology Appropriately	3	4	5	5	4	.	.	.	.	.	.	.	5
Designs Appropriate Assessment Techniques	2	2	5	2	4	.	.	.	.	.	.	.	2
Uses Resources Intelligently and Comprehensively	4	4	5	5	4	.	.	.	.	.	.	.	3
Encourages Group Dynamics and Flexibility	4	4	5	5	4	.	.	.	.	.	.	.	5
Develops Appropriate Service Learning Experiences	4	3	5	3	4	.	.	.	.	.	.	.	3
Supports Diversity and Incorporates Diverse Strategies	4	5	5	5	4	.	.	.	.	.	.	.	5
Focuses on the Importance of Service Learning	4	5	5	5	4	.	.	.	.	.	.	.	3

Likert Scale Analysis.

Likert Scale Score of 5 : Excellent or Strongly Agree.
Likert Scale Score of 4 : Good or Agree.
Likert Scale Score of 3 : Neutral or Undecided.
Likert Scale Score of 2 : Poor or Disagree.
Likert Scale Score of 1 : Unacceptable or Strongly Disagree.

APPENDIX B: Likert Scale Bar Chart Generated for Assessment



APPENDIX C: Analysis of Assessment Bar Chart

Referring to the bar chart shown in Appendix B, one can observe, from the data collected, that students document group dynamics which in indeed very important. They are also very capable of using modern technology for analyzing data collected. They do support diversity and they provide encouragement in creating a supportive educational environment. All the following four characteristics have recorded the maximum possible score of **5** on Likert Scale.

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Incorporates the Principles of Total Quality Management.

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Two characteristics have recorded an unacceptable score of **2** on Likert Scale, indicating that there is serious deficiency. These are:

Designs Appropriate Assessment Techniques.

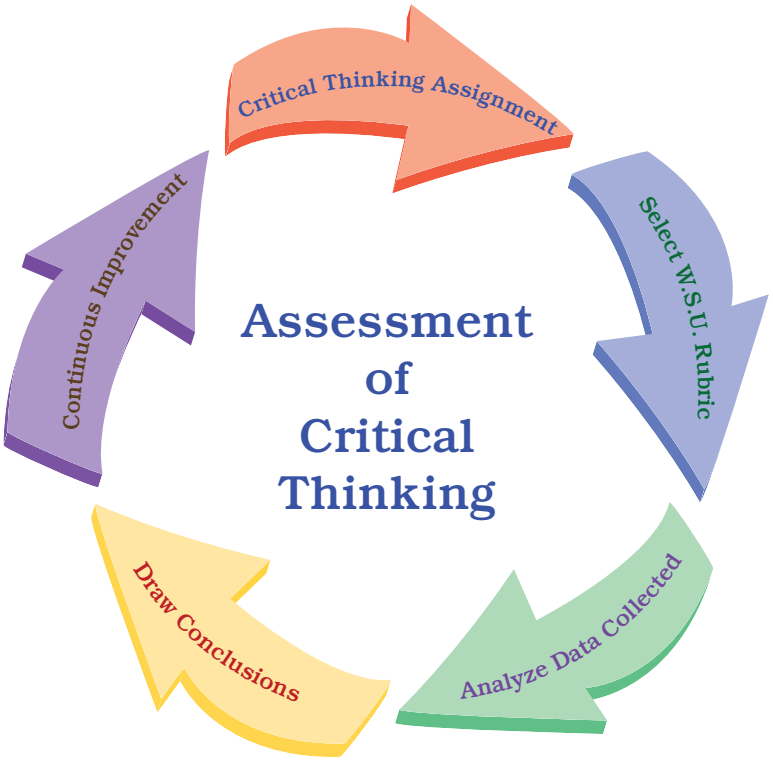
Promotes and Integrates Across Disciplines.

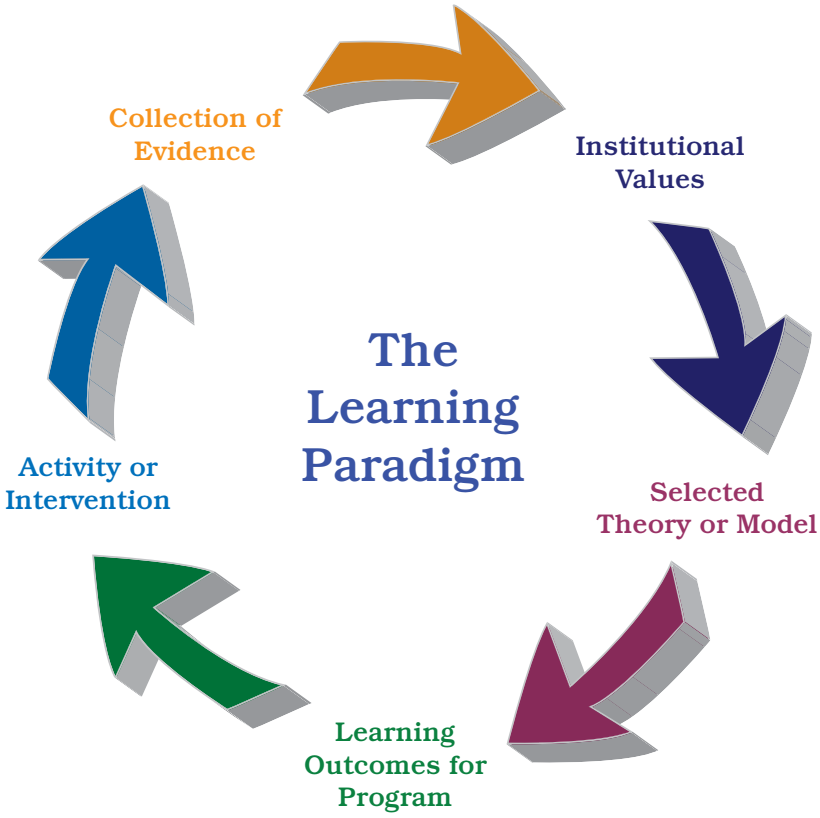
The instructor should devote much more time to stress the importance of assessment and the advantages of integrating interdisciplinary activities.

It is essential that instructor has to improve this score, initially to **3** and ultimately to **4.** Preferably, **5.**

APPENDIX D: Rubrics for conducting assessment

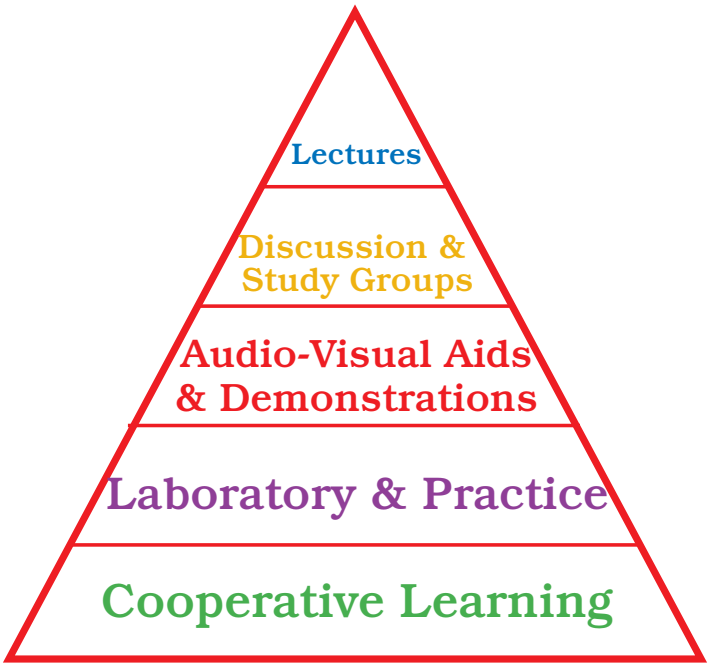
	Rubrics based on Likert Scale	Courtesy of W.S.U., Pullman, WA. 99164
5	Has demonstrated excellence. Has provided documentation. Evidence of Creativity Exists. Very good performance	Has analyzed important data precisely. Has answered key questions correctly. Has addressed problems effectively. Has evaluated with proper insight. Has used deductive reasoning skills. Has used inductive reasoning skills. Has employed problem-solving skills. Discusses consequences of decisions. Has been consistent with inference.
3	Has demonstrated competency. Adequate documentation. Creativity can be improved. Acceptable performance.	Data analysis can be improved. More effort to address key questions. Need to address problems effectively. Expand on evaluating material. Improve deductive reasoning skills. Improve inductive reasoning skills. Problem solving skills need honing. Must discuss consequences of decisions. Has been vague with inference.
1	Poor, unacceptable performance. Lacks Creativity.	Absence of analytical skills. Answers questions incorrectly. Addresses problems superficially. Lacks documentation. Inability to evaluate material. Shows no deductive reasoning power. Inductive reasoning power nonexistent. Poor problem solving skills Unaware of consequences of decisions. Unable to draw conclusions.


Assessment of Critical Thinking
Critical Thinking Assignment
Select W.S.U. Rubric
Analyze Data Collected
Draw Conclusions
Continuous Improvement

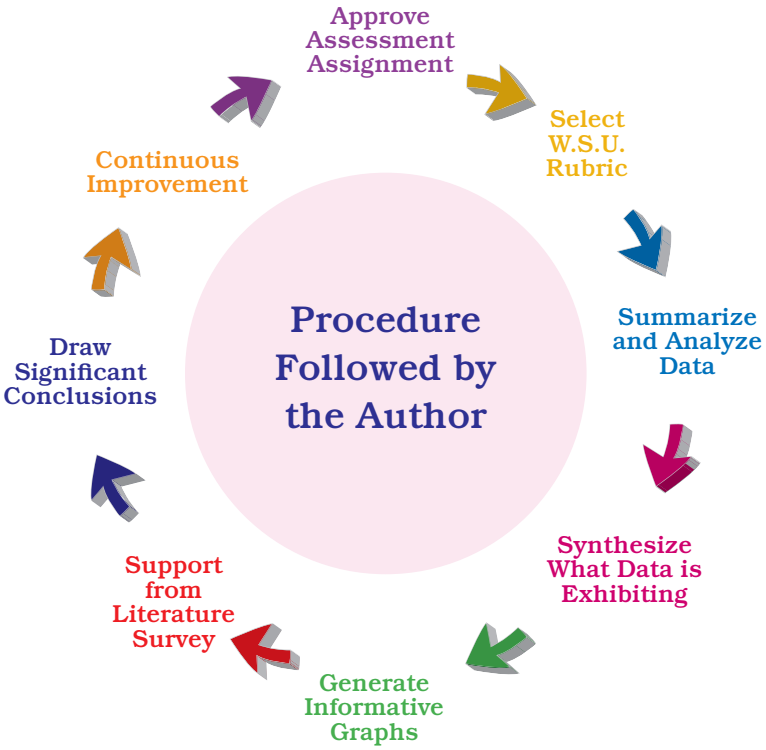

The Learning Paradigm
Collection of Evidence
Institutional Values
Selected Theory or Model
Learning Outcomes for Program
Activity or Intervention

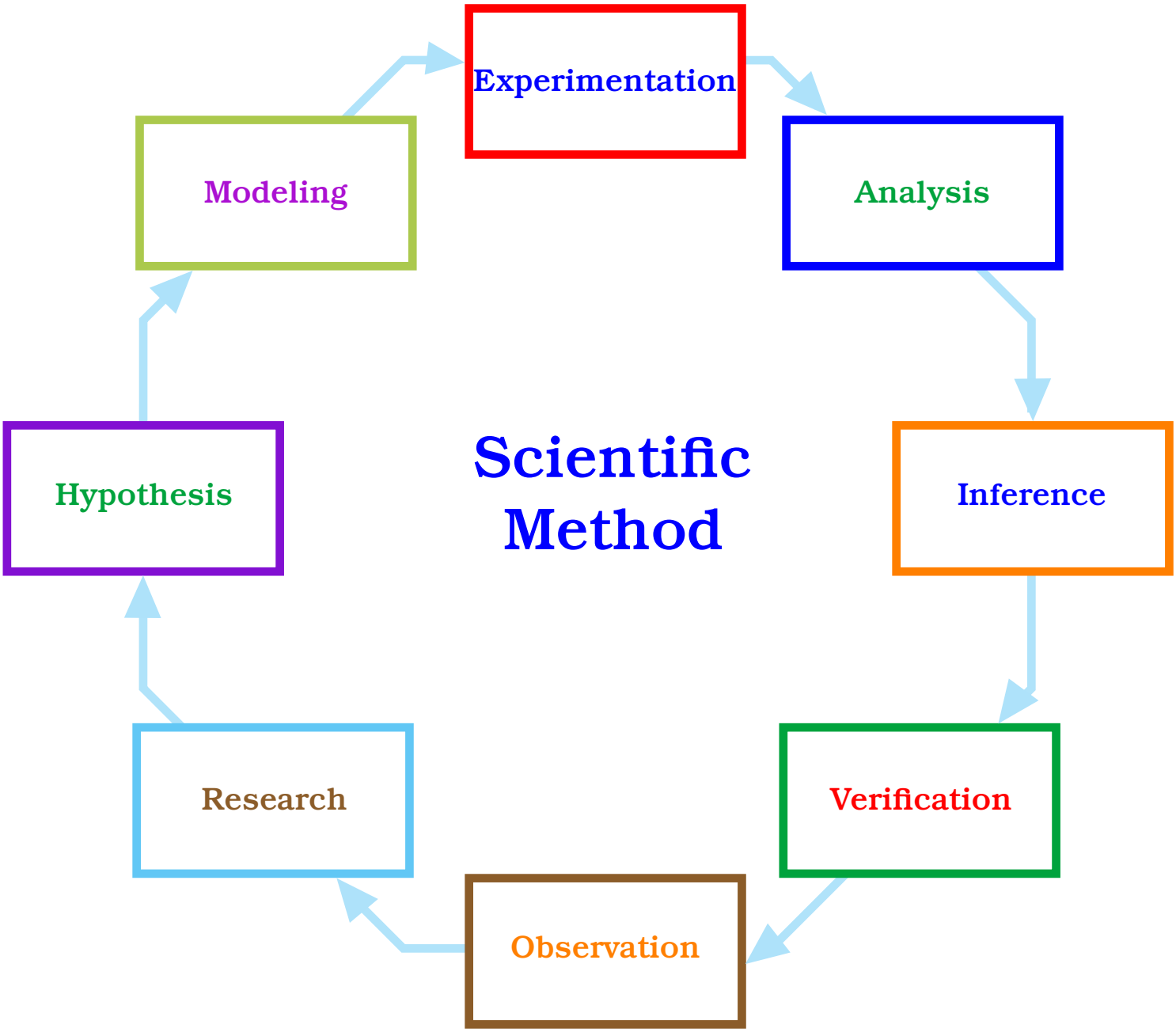
Works Best When it is Ongoing and not Episodic
Illuminates Questions that People Care About
Promotes Dynamic Change and Instills Improvement
Educators Meet Responsibilities to Students
Understanding of Learning is Multidimensional
Student Learning Begins with Educational Values
Provides Needed Attention to Outcomes
Improvement in Clarity and Explicitly stated Objectives
ASSESSMENT

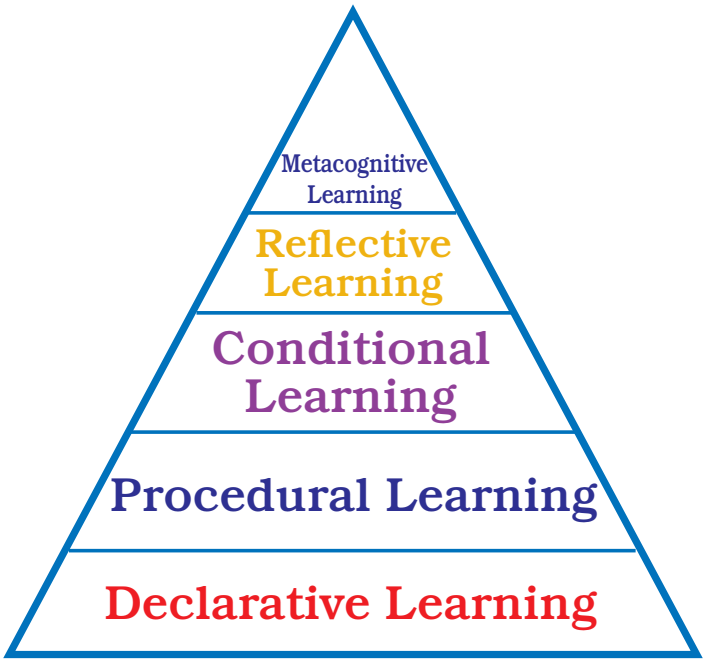
Develop
Improve
Succeed
Communicate
Utilize
Simplify
Support
Involve
Objective
Novice
DISCUSSION



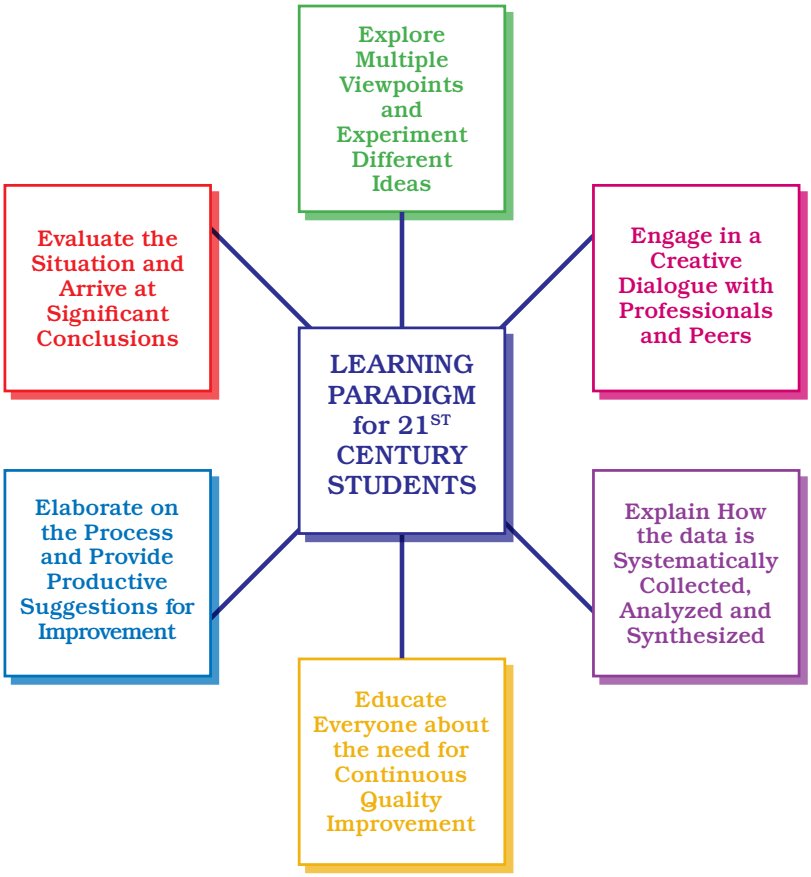
LEARNING PYRAMID




Scientific Method
Experimentation
Analysis
Inference
Verification
Observation
Research
Hypothesis
Modeling



ANGELO'S PYRAMID



Ten Assessment Strategies Suggested by Research

1. Have employees write, discuss, document and communicate their creative ideas.
2. Utilize proven rubrics to make standards and evaluation criteria explicitly clear.
3. Get employees working in groups, on substantive tasks, in and out of corporate environment.
4. Provide prompt and productive feedback frequently to the employees about their progress and accomplishments.
5. Establish and communicate high expectations, both for the supervisors and for the employees.
6. Provide opportunities and help employees to achieve those expectations and criteria.
7. Focus on helping the employees successfully attain their goals and objectives, with enthusiasm.
8. Promote Critical Thinking and support creativity. Respect diversified approaches and admire individual's talents.
9. Appreciate multitude ways of reason, logic and pave a path for problem solving methodologies.
10. Encourage supervisor-employee interaction, in and out of the industrial establishment circles.

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