

Evaluating The Effectiveness Of A Course-Objective Writing Developmental Teacher Training Program

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ABSTRACT

One of the challenges for educators is composing well-written, specifically stated outcomes of student learning. Developmental teacher training is a program designed to improve the effectiveness of university instructors. The program focuses on improving course methodology by guiding instructors through the development of correctly written and structured course objectives, effective and efficient delivery methodology including implementation of technology as a delivery medium, and proper outcomes evaluation of course effectiveness measured against the course objectives. This paper evaluates the effectiveness of the training. The outline used in the training is included in the appendix.

INTRODUCTION

A major component of the training program is developing instructors' course-objective writing skills. The American Association of Collegiate Schools of Business (AACSB) accredited business schools require course objectives to be written in compliance with Bloom's Taxonomy cognitive domain. Bloom's cognitive domain defines the following six distinct levels of learning (Bloom, 1956):

1. **Knowledge:** The remembering or recalling of appropriate previously learned information.
2. **Comprehension:** Grasping or understanding the meaning of informational materials.
3. **Application:** The use of previously learned information in new and concrete situations to solve problems that have single or best answers.
4. **Analysis:** The breaking down of informational materials into their component parts, examining and trying to understand the organizational structure of the information to develop divergent conclusions by identifying motives or causes, making inferences, and/or finding evidence to support generalizations.
5. **Synthesis:** Creatively or divergently applying prior knowledge and skills to produce a new or original whole.
6. **Evaluation:** Judging the value of material based on personal values/opinions, resulting in an end product, with a given purpose, without real right or wrong answers.

Bloom stipulated that specific verbs are to be used in course objectives to delineate which level of learning the objective addresses. Course objectives must be written to include a statement of the learning objective, a statement of the conditions under which the learning will take place, and a measurement of successful accomplishment. This criterion is more commonly referred to as the behavior-condition-degree, or BCD, criterion (University of Washington). Anyone unfamiliar with Bloom's Taxonomy is referred to *Bloom's Taxonomy of the Cognitive Domain* (1956) or any of the myriad of articles and books published on the subject since the original publication.

To improve the objective-writing skills of university instructors, the Developmental teacher training program provides instruction on the basic concepts of Bloom's Taxonomy and verb utilization in objectives. This is

intended to help instructors focus their course on specific learning objectives. Thus, under the premise that properly written objectives focus course instruction towards accomplishment of the desired learning outcomes, Developmental teacher training should help instructors attain higher levels of learning.

PURPOSE

The purpose of this research is to determine the effectiveness of Developmental Teacher Training. Course objectives taken from course syllabi were evaluated to determine the Bloom's Taxonomy level for each objective.

METHODOLOGY

Participants in a recent program were asked to bring course objectives from one of their courses to the training. At the onset of training, the instructors were asked to evaluate the taxonomy level of their objectives. The instructors were given the above definitions of the taxonomy levels, but no other training or information was provided. Subsequent to instructor self evaluation, Bloom's Taxonomy academic experts established the course objectives' taxonomy levels using the *Comprehensive Bloom's Taxonomy Verb List* (Almerico and Baker, 2005). The instructors' self assessments were compared with the expert assessment to determine the Self-Assessment Accuracy (SAA). The SAA was evaluated at the beginning and at the end of Developmental teacher training in a pretest/posttest repeated measure design.

The SAA is a continuous variable measured from 0 to 1. A perfect Self-Assessment Accuracy is one. SAA is calculated using the following procedure:

1. A point value is assigned to each objective based on the Bloom's Taxonomy learning level it represents. Knowledge=1, Comprehension=2, Application=3, Analysis=4, Synthesis=5, Evaluation=6. Point values are automatically assigned by the B-CAT software. Point values are assigned to instructor self-evaluated objectives based on the learning levels specified by the instructor.
2. The absolute value of the difference between B-CAT evaluation and instructor evaluation is calculated for each objective.
3. The average difference is calculated for all objectives. This is the average instructor error (AIE). The maximum value of average instructor error is five.
4. SAA is calculated by the following formula: $SAA = 1 - AIE/5$. Thus, total error (unlikely) on the part of an instructor would result in a score of zero. Total correctness on the part of the instructor would result in a score of one.
5. Separate SAA values were calculated for before training and after training for each instructor.

Thirty university instructors participated in the program. The instructors were from two midsize, private, southern universities. All of the instructors had less than five years of university-teaching experience and were first-time participants in the program. Ten instructors teach in the college of education, ten instructors teach in the college of business, and ten instructors teach in the college of liberal arts. SAA values before and after training, categorized by college, were calculated using a Microsoft Excel spreadsheet. These values were then read into Minitab for data analysis. Table 1 shows the data as read into Minitab, and Table 2 shows the descriptive statistics of interest.

Table 1: SAA Scores by College

SAA Before	SAA After	Difference	College
0.83	0.95	0.12	Education
0.89	1.00	0.11	Education
0.78	0.96	0.18	Education
0.81	0.90	0.09	Education
0.74	0.87	0.13	Education
0.92	0.94	0.02	Education
0.88	0.92	0.04	Education
0.85	0.88	0.03	Education
0.79	0.91	0.12	Education
0.90	1.00	0.10	Education
0.74	0.90	0.16	Business
0.76	0.93	0.17	Business
0.73	0.88	0.15	Business
0.62	0.90	0.28	Business
0.58	0.92	0.34	Business
0.66	0.80	0.14	Business
0.78	1.00	0.22	Business
0.94	1.00	0.06	Business
0.86	0.90	0.04	Business
0.90	0.92	0.02	Business
0.52	0.88	0.36	Liberal Arts
0.66	0.94	0.28	Liberal Arts
0.62	0.90	0.28	Liberal Arts
0.58	0.88	0.30	Liberal Arts
0.49	0.80	0.31	Liberal Arts
0.88	1.00	0.12	Liberal Arts
0.76	0.93	0.17	Liberal Arts
0.94	1.00	0.06	Liberal Arts
0.92	1.00	0.08	Liberal Arts
0.82	0.84	0.02	Liberal Arts

Table 2: Descriptive Statistics

College	Mean Before	S.D. Before	Mean After	S.D. After	Mean Difference	S.D. Difference
Education	0.839	0.590	0.933	0.014	0.094	0.050
Business	0.757	0.118	0.915	0.018	0.158	0.103
L. Arts	0.719	0.167	0.917	0.022	0.198	0.122
Combined	0.772	0.129	0.922	0.057	0.150	0.103

The data were analyzed using a paired sample t-test to determine if the training received was effective. The null hypothesis is that the training program was not effective, while the alternative hypothesis is that it was effective. The test was conducted at the five percent level of significance. The results of this paired sample t-test are found in Table 3.

Table 3: Results of Paired Sample T-Test

Computed t	df	Critical t	P-value
7.99	29	± 2.045	0.000

Since computed t is greater than critical t, the null hypothesis is rejected. The results from the analysis of the sample data suggest that the training increased the scores beyond that which could be attributed to random or

chance factors. It can be concluded that the Developmental teacher training Program significantly increased SAA scores.

Another question of interest is if there is a difference in the mean change in SAA scores by college. The null hypothesis is that there is no difference in the mean change in SAA scores by college, while the alternative hypothesis is that there is a difference. The data were analyzed using a one-way analysis of variance (ANOVA). This test was also conducted at the five percent level of significance. The results of this one-way ANOVA are found in Table 4.

Table 4: Results of One-Way ANOVA

Computed F	df	Critical F	P-value
2.95	2, 27	3.354	0.069

The computed value of F is not greater than the critical value, so the null hypothesis cannot be rejected. The evidence from the sample suggests that there is no difference in the mean change in SAA scores by college.

CONCLUSIONS

1. Based on the sample and findings discussed herein, it appears that the Developmental teacher training program creates a statistically significant improvement in faculty ability to write course objectives compliant with Bloom's Taxonomy thus supporting the purpose of this research project.
2. Based on before and after values, it appears that there is no statistically significant effect for the college in which the faculty member teaches.
3. It should be noted that this analysis is based on a single session of the Developmental teacher training program containing a limited number of participants (n=30). Additional evaluations for subsequent program sessions are recommended to increase the number of participants and confirm the findings herein.

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APPENDIX

Workshop Handout

This is a workshop designed to help instructors develop better course objectives. The workshop focuses on using Bloom's Taxonomy to develop specific course objectives in the ABCD (audience, behavior, condition, degree) format. Attendees are invited to bring their course objectives and syllabi for review.

Workshop Task:

1. Listed below in Table 1 are Bloom's Taxonomy action verbs used to develop learning objectives and define student assignments. For each of the six taxonomy categories, select five action verbs and record them on the worksheet provided.
2. Table 2 provides a list of possible assignment products from various fields of study. Select an assignment product from Table 2 that corresponds to each of the action verbs you recorded for each of the six Bloom's Taxonomy categories.

Table 1: Assignment Verbs

Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Arrange	Add	Acquire	Advertise	Abstract	Appraise
Cite	Approximate	Adapt	Analyze	Animate	Argue
Define	Articulate	Allocate	Audit	Anticipate	Assess
Delineate	Associate	Alphabetize	Blueprint	Assemble	Attach
Describe	Clarify	Apply	Breadboard	Budget	Compare
Draw	Classify	Ascertain	Break Down	Code	Conclude
Duplicate	Convert	Assign	Categorize	Collect	Core
Enumerate	Detail	Attain	Characterize	Combine	Counsel
Find	Elaborate	Avoid	Confirm	Compile	Criticize
Identify	Estimate	Back Up	Contrast	Compose	Critique
Index	Exemplify	Build	Correlate	Construct	Decide
Indicate	Express	Calculate	Debate	Cope	Defend
Isolate	Extend	Capture	Deduce	Correspond	Dispute
Know	Extrapolate	Change	Detect	Craft	Editorialize
Label	Factor	Choose	Diagnose	Create	Evaluate
List	Give	Chose	Diagram	Cultivate	Grade
Locate	Infer	Complete	Differentiate	Debug	Hire
Match	Interact	Compute	Discover	Depict	Judge
Meet	Interpret	Demonstrate	Discriminate	Design	Justify
Memorize	Observe	Depict	Dissect	Develop	Measure
Met	Paraphrase	Depreciate	Distinguish	Devise	Prescribe
Name	Picture	Derive	Ensure	Dictate	Prioritize
Point to	Predict	Determine	Examine	Discuss	Rank
Quote	Put In Own Words	Diminish	Experiment	Engineer	Rate
Read	Reorder	Dramatize	Explain	Enhance	Recommend
Recall	Rephrase	Employ	Explore	Explain	Release
Recite	Report	Examine	Figure Out	Facilitate	Review
Recognize	Restate	Exercise	File	Forecast	Revise
Record	Retell	Exhibit	Group	Format	Score
Recount	Subtract	Expose	Inquire	Formulate	Support
Relate	Summarize	Factor	Inspect	Generalize	Test
Repeat	Trace	Figure	Interrupt	Generate	Validate
Reproduce	Vary	Graph	Inventory	Handle	Value
Select	Visualize	Handle	Investigate	Hypothesize	Verify
Show		Illustrate	Lay Out	Imagine	Weigh
Study		Interpolate	Maximize	Improve	
Tabulate		Interview	Minimize	Incorporate	
Tell		Made	Optimize	Individualize	
Underline		Make	Order	Initiate	
		Manipulate	Organize	Integrate	
		Modify	Outline	Interface	
		Operate	Point Out	Invent	
		Plot	Query	Lecture	
		Portray	Question	Model	
		Practice	Relate	Modify	
		Price	Separate	Originate	
		Process	Size Up	Overhaul	
		Produce	Solve	Plan	
		Project	Specify	Portray	
		Protect	Subdivide	Pose	
		Provide	Survey	Prescribe	
		Put Into Practice	Test	Program	
		Round Off	Train	Propose	
		Schedule	Transform	Rearrange	

Table 1: Assignment Verbs
continued

Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
		Sequence	Utilize	Reconstruct	
		Show	Transfer	Refer	
		Simulate		Reinforce	
		Sketch		Reorganize	
		Solve		Report	
		Subscribe		Revise	
		Tabulate		Rewrite	
		Teach		Schematize	
		Transcribe		Set Up	
		Translate		Speculate	
		Use		Support	
				Systematize	

Table 2: Assignment products

Advertisement	Illustrations	Poster Board
Analogies	Income statement	Program
Balance sheet	Internal rate of return	Questionnaires
Book reviews	Interviews	Radio shows
Cartoon	Inventions	Recipes
Cash flow statement	Journal	Recommendations
Chart	Laws	Recordings
Circuit	Lessons (student taught)	Report
Collages	Letter	Research
Comic strips	Machines	Resume
Commercials	Map	Return on investment
Confessions	Market analysis	Role playing
Construction	Metaphor	Scrap book
Conclusions	Model	Screen play
Critiques	Movie review	Sculpture
Dances	Murals	Self evaluation
Database	Myths	Short story
Debates	Net present value	Sketches
Design plans	Network	Songs
Diagrams	News article	Spreadsheet
Diaries	Outlines	Speculations
Dictionaries	Painting	Speeches
Dioramas	Panel discussion	Strategic analysis
Displays	Pantomime	Survey
Essays	Petition	Term paper
Forecast	Photograph	Theater performance
Formula	Picture	Time line
Games	Poem	Valuing
Graphs	Portfolio	Worksheet

Taxonomy Level	Action Verbs	Assignment Products
Knowledge		
Comprehension		
Application		
Analysis		
Synthesis		
Evaluation		

3. For each pair of corresponding verbs and products, write a course objective in Bloom’s Taxonomy audience behavioral, condition, degree/criteria (ABCD) format.

Example: Using a battery, wire, switch and bulb, Electrical Circuits 1 students will create an electrical circuit such that the bulb will light when the switch is turned on.

Audience - Electrical Circuits 1 students

Behavior – will create

Condition – using a battery, wire, switch and bulb

Degree/criteria – bulb will light when the switch is turned on

Course objectives by Taxonomy level
Knowledge
Comprehension
Application
Analysis
Synthesis
Evaluation

NOTES