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SPECIAL SECTION ON QUANTITATIVE PROGRAM EVALUATION

A Revised Logic Model for Educational Program Evaluation

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The logic model is an evaluation tool popularly used for obtaining grant funding. Its limitations make it unlike other theory driven evaluation methods. A critical examination of the logic model leads to the construction of an enriched revised logic model.

Keywords: evaluation, logic model, program evaluation

Introduction

As evidence of the changing grant requirements in the U. S. Department of Education and various other funding and accreditation entities, program evaluation has grown in popularity over the years. This evidence of growth is seen from foundations such as of America, W.K. Kellogg Foundation, and the Annie E. Casey Foundation, where the use of a logic model is required to compete for grants each year (Fitzpatrick, Sanders, & Worthen, 2012; Stufflebeam, 2001). The logic model is based on a diagram demonstrating how a program will function based on different environmental conditions. The elements of a logic model are inputs, activities, outputs, and outcomes (Wholey, Hatry, & Newcomer, 2010). It is considered an easy model to understand based on its design with built-in diagrams that display information about a program (W. K. Kellogg Foundation, 2004). The use of logic models has steadily increased over the years, and programs and organizations are being challenged more by all levels of federal government to describe their program's story in a way that effectively presents the program's outcome goals and the achievement of these goals (Wholey et al., 2010).

The W. K. Kellogg Foundation (2004) noted the logic model is a depiction of how an organization does its work, which consists of the theory and assumptions underlying the program. It links outcome with program activities or processes or both with the theoretical assumptions and or principles of the program. Frechtling (2007) provided a different definition: “The logic model is a tool that describes the theory of change underlying an intervention, product, or policy. It characterizes a project through a system of elements that include components and connections, with context being an important qualification” (Frechtling, 2007, p. 1).

The logic model is sometimes compared to the hypothesis in a research study. Programs are regarded as a hypothesis, and when a program is implemented, the expected results follow. Logic models are tools used to unpack the hypothesis (Wholey et al., 2010). Logic models are diagrams that display components of a program and its theory, and they can be helpful for program planning, evaluation, and research (OAERS, n.d.). By definition, a logic model is a graphical representation of a program and is referred to as an evaluability assessment or a feasibility analysis. Relationships are described between objectives, activities, indicators, and resources of a program (Dwyer & Makin, 1997). Renger and Titcomb (2002) noted a logic model is an essential first step in program evaluation, a visual representation of a plausible and sensible method of how a program will work under certain conditions to solve identified problems, and it is fundamental to program evaluation.

The U. S. federal government awards nearly \$400 billion annually in grants for most of the nation’s educational, health, social welfare, housing, environmental, criminal justice, and transportation programs. However, this money is not enough to address the complexity of the growing national priorities due to the constant decrease in funding allocations (Polush, 2007). Historically, accountability due to limited funding was obtained via program evaluation (Stake, 1976). This helps granting agencies with the task of making difficult decisions regarding funding for the nation’s social services and other programs. Funding has to be divided among competing needs, and it is vital that evaluation studies are present in order to identify costs and benefits of those programs (Stake, 1976). The fight for government funding is very competitive which makes logic model research even more relevant and vital because many government funded grants require logic modeling in order to qualify for funding initially or to qualify for funding renewal (Chen, 2015).

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Weaknesses of the Logic Model

Stufflebeam (2001) critiqued the logic model's weaknesses and limitations as the following:

1. May undesirably narrow the range of the program services.
2. Evaluators might take over the program staff's responsibility for program design.
3. May ground an evaluation in a hastily developed, inadequate program theory.
4. May develop conflict of interest to defend the evaluation-generated program theory.
5. Might bog down the evaluation in a seemingly endless process of program theory development.
6. May create a theory early in a program and impede the program from redefinition and refinement.

Many of these limitations pertain to program theory development, and others are more concerned with the identification of services offered and the development of the program design.

Purpose of the study

The logic model is missing key elements that are present in other similar models which could help to make the logic model more comprehensive and effective. In order to address limitations of the logic model, a revised logic model and logic model flow-chart will be designed and serve as a guide to be followed throughout the logic model evaluation process. The W.K. Kellogg Foundation (2004) provided sample checklists and flow charts for logic model development, which will be used to develop the revised logic model and the logic model flow chart.

Similarly, a template for the logic model created by the United Way of America was used as the resource for an enriched logic model. The logic model created by United Way of America is more of a conceptual model which allows for the most adaptation and can be easily transformed to fit a wide array of programs (W.K. Kellogg Foundation, 2004). To help remedy some of the logic model limitations and lack of standards, a revised logic model was created based on the evaluation standards created by the Joint Committee on Standards for Educational Evaluation (1994).

Method

The methodology was divided into three different sections. The first section focused on the development of the newly revised logic model. The second section described the procedures for testing both the original and newly revised logic model. Lastly, the third section described the meta-evaluation and analysis of the two logic models after they had been used and applied to the learning community educational program. The purpose of the last phase, which relates to the main research question, is used to help determine which logic model is more effective.

The revisions to the original logic model were based on the Joint Committee on Standards for Educational Evaluation (1994) and Stufflebeam's (2001) research. After the revised logic model was designed, it was used to evaluate a learning community educational program, within a midwestern higher education institution. In order to compare the original logic model to the revised logic model. The purpose of the evaluation of the learning community was to determine the effectiveness of the learning community educational program at a midwestern higher education institution.

Development of the Newly Revised Logic Model

The United Way of America logic model is comprised of four main components: inputs, activities, outputs and outcomes. The revised logic model, like the original model, will also include these components. However, in addition to the characteristics seen in the original logic model, the revised logic model will also include a logic model flow chart, program theory identification/validation check and theory research components prior to its use, the use of Chi-Square test for data analysis, rejection of artificial cut scores, and consideration for contextual influences.

Development Procedures

In order to create the revised logic model, research was conducted to discover some of the most relevant and repeatedly stated limitations offered by evaluation professionals. These limitations were considered along with the logic model limitations offered by Stufflebeam (2001). The limitations of the logic model that are important to this study are unidentified program theory, program services, and program design; the logic model is better practiced as a framework, instead of an evaluation model or method; it can be time consuming and costly to develop a logic model; other theory-based models, similar to the logic model, use statistical

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methods in order to analyze the data used in the evaluation; other theory-based models, similar to the logic model, reject the use of artificial cut scores; other theory-based models, similar to the logic model, consider the use of contextual influences.

Utility standards help to assure that stakeholders find program evaluation processes valuable to their needs (Joint Committee on Standards for Educational Evaluation, 1994). More specifically, this change helped to improve Utility Standard Number 7, timely and appropriate communicating and reporting, which states that evaluations should adapt to the information needs of their audiences (Joint Committee on Standards for Educational Evaluation, 1994). The last step in the newly revised logic model flow chart, meta-evaluation/evaluation review, helped to improve the evaluation accountability standards provided by the Joint Committee on Standards for Educational Evaluation (1994). More specifically, the evaluation review addressed the Accountability Standard Number 2, internal meta-evaluation, which states that evaluators should use the Joint Committee on Standards for Educational Evaluations (1994) and other standards in order to examine the accountability of the evaluation design, procedures, data collection, and outcomes.

The logic model flow chart includes all of the practical steps needed for a program evaluation in addition to procedures that are distinctively related to some of the logic model limitations. The logic model flow chart includes negotiate evaluation terms; identify program design and the problem the program is trying to address; identify program theory; logic model development which include inputs, activities, outputs, and outcomes; data collection; data analyze including the Chi-Square test and other necessary tests as needed; data reporting; provide recommendations, and meta-evaluation.

Procedures: Testing the Original and Newly Revised Logic Models

The original logic model was completed by using the standard logic model procedures developed by United Way of America. This will include the development of the logic model by providing the programs inputs, activities, outputs, and outcomes. The newly revised logic model flow chart was followed step-by-step in the following order: negotiate evaluation terms; identify program design and the problem the program is trying to address; identify program theory; logic model development which include inputs, activities, outputs, and outcomes; data collection; data analysis including the Chi-Square test and other necessary tests as needed; data reporting; provide recommendations, and meta-evaluation.

Data for the learning community evaluation was obtained from the institutional Student Admissions and Records System (STARS) at a major midwestern urban university. It is composed of student demographic and academic information. STARS also includes the learning community cohort database. Students first year GPA on a 4.0 scale, and students' re-enrollment status was obtained through STARS. STARS is a university web-based application used to access university data for advising, retention, curriculum and program tracking (Baier, 2014).

Participants

The participants of interest for this study were first time, first year college students admitted and enrolled in the particular learning community during the following fall cohorts: Fall, 2007 (N = 3096), 2008 (N = 2797), 2009 (N = 2957), and 2010 (N = 2613) semesters at a midwestern higher education institution. The learning community participants were in one of the following fall cohorts: Fall, 2007 (N = 25), 2008 (N = 35), 2009 (N = 30), and 2010 (N = 20).

The learning community educational program used in this study included a total of N=110 subjects. The following demographic information was collected from the subjects: gender, ethnicity, and age. Gender for the entire group of cohorts is 78 (71%) female and 32 (29%) male. Ethnicity for the group is 64% Black, 23% unknown, 8% Hispanic, and 3% White, and 2% Asian. The age for the group includes 71% 18 years old, 12% 19 years old, 9% 20 years old, and 8% 21 years old. Participants represented were all high achieving academics from high school and represented local high schools near the area of the midwestern institution. An IRB was obtained in order to conduct this research because it includes data regarding human subjects.

Research Design

The main objective of this research was to discover which of the two logic model types, the original logic model or the revised logic model, was more effective according to the standards created by the Joint Committee on Standards for Educational Evaluation (1994). The evaluation of the learning community educational program was conducted as a non-experimental retrospective study in order to gauge the how time affects group changes. The design for this study is retrospective descriptive to look backward to locate information on the independent variables that help to explain the current differences on the dependent variables and to describe the characters of the study phenomenon (Johnson, 2001).

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A summative meta-evaluation was conducted in order to determine if there is a statistically significant difference between the original logic model and the revised logic model, and will ultimately help to determine which logic model is more effective based on program evaluation standards and guidelines. A meta-evaluation checklist will help to determine which evaluation standards were met for each of the two logic models.

Data Collection/Analysis

Data needed to perform the evaluation of the learning community was collected using STARS. Data collected from STARS included both learning community student. The Statistical Package for the Social Sciences for Windows (SPSS 23.0) was used. An alpha level of 0.05 was used as the significance level, which was used to determine whether to reject or fail to reject the null hypothesis.

Data was collected from STARS in order to understand student success, student's GPA and graduation status, was analyzed in order to determine the learning community's effectiveness. Chi-Square analysis was used to determine if there are statistically significant differences between learning community students with a 2.5 GPA and higher and a 2.49 GPA and below at the midwestern higher education institution.

Meta-Evaluation: Original and Revised Logic Models

The meta-evaluation was used to determine the effectiveness of both logic models and will allow for a comparison which revealed the most effective model between the two. The meta-evaluations of both the original and newly revised logic models was conducted by using the standards from the Joint Committee on Standards for Education Evaluation (1994). Each evaluation standard was added to a meta-evaluation checklist and both logic models were analyzed in order to determine their effectiveness.

The evaluation standards used in the meta-evaluation from the Joint Committee on Standards for Educational Evaluation (1994) include five categories which are: Utility, Feasibility, Proprietary, Accuracy, and Evaluation Accountability. There is a total of 30 standards represented in these five categories. The 30 standards were compared to each logic model by way of checklist, in order to determine which model is efficient, as noted in Figure 2.

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Meta Evaluation Check-list of the Original and Newly Revised Logic Model			
Evaluation Standard	Original Logic Model	Newly Revised Logic Model	
U1 Evaluator Credibility			Utility Standards (8)
U2 Attention to Stakeholders			
U3 Negotiated Purposes			
U4 Explicit Values			
U5 Relevant Information			
U6 Meaningful Processes and Products			
U7 Timely and Appropriate Communicating and Reporting			
U8 Concern for Consequences			
F1 Project Management			Feasibility Standards (4)
F2 Practical Procedures			
F3 Contextual Validity			
F4 Resource Use			
P1 Responsive and Inclusive Orientation			Proprietary Standards (7)
P2 Formal Agreements			
P3 Human Rights and Respect			
P4 Clarity and Fairness			
P5 Transparency and Disclosure			
P6 Conflicts of Interests			
P7 Fiscal Responsibility			
A1 Justified Conclusions and Decisions			Accuracy Standards (8)
A2 Valid Information			
A3 Reliable Information			
A4 Explicit Program and Context Descriptions			
A5 Information Management			
A6 Sound designs and Analyses			
A7 Explicit Evaluation Reasoning			
A8 Communication and Reporting			Evaluation Accountability Standards (3)
E1 Evaluation Documentation			
E2 Internal Meta-Evaluation			
E3 External Meta-Evaluation			

Figure 2. Meta-Evaluation Checklist of the Original and Newly Revised Logic Models: Based on the Joint Committee on Standards for Educational Evaluation (1994).

Data Analysis

The entries for both the original and revised logic model approach in Figure 2 was compared via a one-tailed Wilcoxon Rank Sum Test with nominal alpha set to 0.05. It is a nonparametric alternative to the t-test, and is most useful when normality is violated. Monte Carlo research has shown it is a much more powerful test (Sawilowsky, 2005).

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Results

The first research questions in this study was, “Are evaluation standard characteristics missing from the original logic model?” The Revised Logic Model was created based on the evaluation standards found within The Program Evaluation Standards from the Joint Committee on Standards for Educational Evaluation (1994) and Stufflebeam’s (2001) Evaluation Models. Both of these resources indicated there were standards missing from the logic model that are seen in other questions and methods approaches.

Both the outcome/value added approach and case study approach included evaluation standard characteristics missing from the Theory-Based Approach, which include logic models. It was found that the following items were missing from the original logic model: Methods (Cross-Break Tables), Consideration for Contextual Influences, and Rejection of Artificial Cut-Scores.

The second research question in this study was, “What program evaluation characteristics, seen in other similar standardized models, help to make them more efficient and capable?” In order to help make the logic model more standardized and comparable to other questions and methods approaches the following characteristics were added: Chi-Square test, rejection of artificial cut-scores, consideration of contextual influences, logic model flow chart, and stakeholder interviews.

It was found that the original logic model needed revisions, having the following limitations and missing evaluation standards. Shown in Table 1 below are the limitations seen in the original logic model, the evaluation standards related to those limitations, and the revised logic model revisions established in order to change the original model and make it more standardized and effective. Note the limitations “No Relevant Information” and “No Accountability” were added to the list after observations of both models and the identification of insufficient evaluation standards.

The main research question was, “Will the logic model become more effective after improving limitations and reevaluating its evaluation standards and guidelines?” The meta-evaluation results from the original and newly revised logic models were used to conduct a d Wilcoxon Rank Sum Test to determine if there were statically significant differences between the meta-evaluation results for the original logic model and the newly revised logic model.

The total mean score for the revised logic model meta-evaluation was .933 while the mean score for the original logic model meta-evaluation was .267. The

Wilcoxon Rank Sum Test was statistically significant ($Z = -2.04$, exact one tailed $p = .031$).

Table 1. Logic Model Limitations, Insufficient Evaluation Standards, and Revisions

Limitations	Evaluation Standards	Revisions
No Methods	Feasibility	Chi-Square Test
No Contextual Influences	Accuracy	Program Theory Research/Validation
No Rejection of Artificial Cut Scores	Accuracy	Reject Artificial Cut Scores
Time Consuming & Costly	Accuracy	Logic Model Flow-Chart
No Relevant Information	Utility	Stakeholder Interview
No Accountability	Evaluation Accountability	Meta-Evaluation

Discussion

Logic models have the potential to contribute greatly to educational programs as well as the field of program evaluation, with the addition of evaluation standards and research from Stufflebeam (2001). In consideration of the research found in Stufflebeam's (2001) *Evaluation Models*, the following additions were made to the revised logic model: Chi-Square test (which provides Cross-Break tables), the rejection of artificial cut scores, and the consideration of contextual influences. Given the program evaluation standards created by the Joint Committee on Standards for Educational Evaluation, the following additions were made: logic model flow chart, program theory identification, meta-evaluation. In this study, the revised logic model was shown to be more promising than the original logic model.

Theory-oriented evaluation models have become more recognized in program evaluations, and the logic model has been used widely because of this (Fitzpatrick et al., 2012). The objectives of this study were to transform the original logic model from being a static framework that is less amenable to change into a more dynamic and hence nimble evaluation model. This study helps to address the research found from Stufflebeam (2001) which indicated that program theory-based approaches, such as the logic model, were one of the worst in the field. Others, such as Suchman (1967), Langford (2010), and Weiss (1998), did not even consider the logic model a model at all, instead labeled it a framework: "The logic model does not dictate any prescribed method or evaluation, nor does it imply any kind of evaluation model" (Bolden, 2007, p. 57). However, Stufflebeam, along with many others, did not discuss how to improve the logic model, and that is what is missing from the

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literature. This study, therefore, was designed to serve as a catalyst to more research on this topic and improvements in the field of program evaluation and research.

The logic model findings from this research will help to promote research and program evaluation dialogue that will ultimately contribute to improving the field of program evaluation. Based on the findings from this study, further research could be done in many areas in order to help promote a more accurate logic model. Further investigation could be made in order to discover how other models could be improved. For example, Stufflebeam mentioned that there were four other approaches that he found needed improvements which included the following: politically controlled, public relations, accountability, and clarification hearings. Further investigation could be conducted in order to test methods that fit with these approaches in order to improve them.

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