ATE Evaluator Network – Social Network Analysis Results at Baseline

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Background

EvaluATE is the evaluation hub for the National Science Foundation's (NSF) Advanced Technological Education (ATE) program and is located within The Evaluation Center at Western Michigan University (WMU). EvaluATE aims to develop the evaluation capacity of more than 300 ATE projects and centers, which involve more than 400 principal investigators (PIs) and co-PIs; over 200 evaluators; and numerous staff, grant professionals, program officers, and others who develop, administer, assess, and oversee ATE-funded work. EvaluATE received funding from the NSF, which will fund its efforts from January 2019 through December 2024 through. This grant is supporting a major expansion of EvaluATE's work to include four distinct but interrelated streams of activity: research on evaluation, training, facilitation of an ATE evaluation network, and the annual survey of ATE grantees. This project's goals are to:

> 1) Expand the evidence base for effective STEM education evaluation practices.
> 2) Enhance ATE evaluators' evaluation knowledge and skills.
> 3) Enhance the ability of ATE project personnel to use valuation effectively.
> 4) Increase professional exchange among ATE evaluators.
> 5) Produce timely and informative reports about the status and productivity of the ATE program for use by multiple stakeholders and diverse audiences

EvaluATE's efforts to increase the professional exchanges among ATE evaluators (i.e., goal 4) include providing opportunities for ATE evaluators to meet each other through organized events such as the ATE evaluation reception at the annual ATE PI conference and by providing a means for connecting and communicating with other ATE evaluators through the development and promotion of a dedicated Slack channel.

The Rucks Group, the external evaluator for the project, has been working with EvaluATE to develop a strategy for exploring the network of connections among ATE evaluators and assessing changes in the network over time using social network analysis (SNA) methodology. This report provides initial information about the current network in terms of the number of connections among ATE evaluators, how frequently ATE evaluators connected with each other on evaluation-related matters, and what types of interactions they had. This information will serve as a baseline for evaluating potential changes in the network in response to EvaluATE's efforts to increase professional exchanges among ATE evaluators.

Survey and Data Collection for the Social Network Analysis

A set of questions to capture the information needed for the SNA was added to EvaluATE's spring 2019 survey of ATE evaluators. The questions were designed to determine the number of connections among ATE evaluators as well as the characteristics of those connections in terms of interaction frequency and types. Survey respondents were first presented with seven sequential alphabetized lists of 20 to 30 ATE evaluators – for a total of 145 listed ATE evaluators – and asked to select each ATE evaluator with whom they had at least one evaluation-related interaction with in the past 12 months. Examples of evaluation interactions included the following:

- Providing evaluation guidance, resources, or information.
- Receiving evaluation guidance, resources, or information.
- Working together on an evaluation.
- Collaborating on educational or outreach activities (e.g., article, presentation, committee).

Informal types of interactions, such as conversations at conferences, are certainly important for initiating and sustaining connections. But people's attempts to recall connections based solely on a casual conversation or two would be both burdensome and susceptible to recall error. Consequently, respondents were deliberately directed to consider only those connections that included more substantive types of evaluation-related interactions.

After identifying each of their ATE evaluator connections, respondents were then asked to indicate how often they had interacted with that individual on evaluation-related matters (i.e., 1-2 times, 3-10, or more than 10) and then finally asked to select or identify the types of interactions they had. While respondents were provided with the four types of interactions as previously described (e.g., providing evaluation guidance, resources, or information, etc.), they also had the option to select "Other" and to describe the type of interaction. An abbreviated copy of the SNA survey items is provided in Appendix A.

ATE Evaluator Respondents

A total of 61 of the 147 (42%) ATE evaluators responded to the SNA portion of the 2019 ATE evaluator survey. Their demographics are described below.
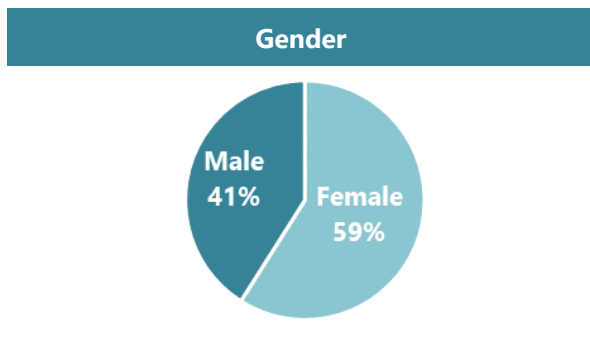

Figure 1. Distribution of ATE evaluator respondents by gender. (n=61)

Ethnicity	
White/Eastern European	83%
Black/African American/African/Caribbean	9%
Asian/East Asian/Indian	6%
Other	2%

Table 1. Distribution of ATE evaluator respondents by ethnicity. (n=59)

Employment	
Independent consulting practice	39%
Consulting, research, or evaluation firm	33%
Higher education	18%
EvaluATE staff	8%
Other	2%

Table 2. Distribution of ATE evaluator respondents by employment. (n=61)

Educational background	
Doctoral degree	55%
Master's degree	38%
Bachelor's degree	5%
Graduate coursework	2%

Table 3. Distribution of ATE evaluator respondents by educational background. (n=60)

Years of evaluation experience	
Median	14 years
Mean	13 years
Standard dev.	9.1 years
Range	1 to 35 years

Table 4. Years of evaluation experience. (n=61)

62% of ATE evaluator respondents are working on 1 or 2 ATE projects.

23% are working on 3 or 4 ATE projects.

15% are working on 5 or more ATE projects.

Number of Individuals and Connections in the Network

A total of **115 evaluators** are represented in the ATE Evaluator Network at baseline. These include the following:

61 ATE evaluators who completed the items on the ATE evaluator survey

35 ATE evaluators who were selected as a connection but did not complete the survey themselves

19 Additional individuals who were not listed as an ATE evaluator.

Among the 61 ATE evaluators who completed the items, there were a total of **422 connections** reported for an **average of 6.9 connections** per evaluator.

Frequency and Types of Evaluation-related Interactions

More than half of the connections among evaluators involved one or two interactions in the past year
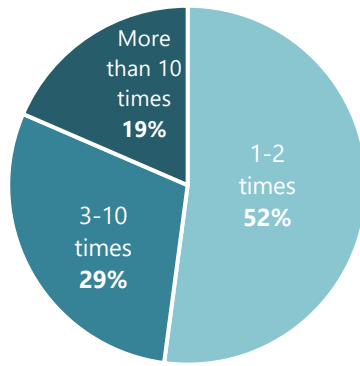

More than 10 times **19%**

1-2 times **52%**

3-10 times **29%**

Figure 2. Distribution of the number of interactions for each connection over the prior year. (n=422)

Types of interactions	
RECEIVED guidance, resources, or information	48%
PROVIDED guidance, resources, or information	36%
Collaborated on an educational or outreach activity	28%
Worked together on an evaluation	29%
Other (e.g., provided a referral, received a referral, worked together on a proposal)	10%

Table 5. Distribution of the types of interactions for each connection over the prior year. (n=422)

The 2019 ATE evaluator survey also included a question to determine if any of the respondents' reported connections had been first made at the reception hosted by EvaluATE at the 2018 ATE PI Conference.

Fourteen new connections were made among the 17 survey respondents who had attended EvaluATE's reception at the 2018 ATE PI conference.

Visual and Quantitative Description of the Network using SNA

A key strength of SNA as a method for evaluating networks is the ability to generate visualizations of those networks that can provide rich and useful information about the network as a whole and the position of individuals within that network.

Visualization of the ATE Evaluator Network at Baseline

Each dot in Figure 3 (below) represents an individual (or "node" in SNA terminology) in the network.

- The larger and darker the dot, the more connections that individual has.

Each line represents a connection (or "edge" in SNA terminology) between two individuals.

- The darker the line, the more interactions reported for that connection over the prior year.

- An arrow indicates that one individual identified the other as a connection. Connections with arrows on each end indicate that each had identified the other as a connection.
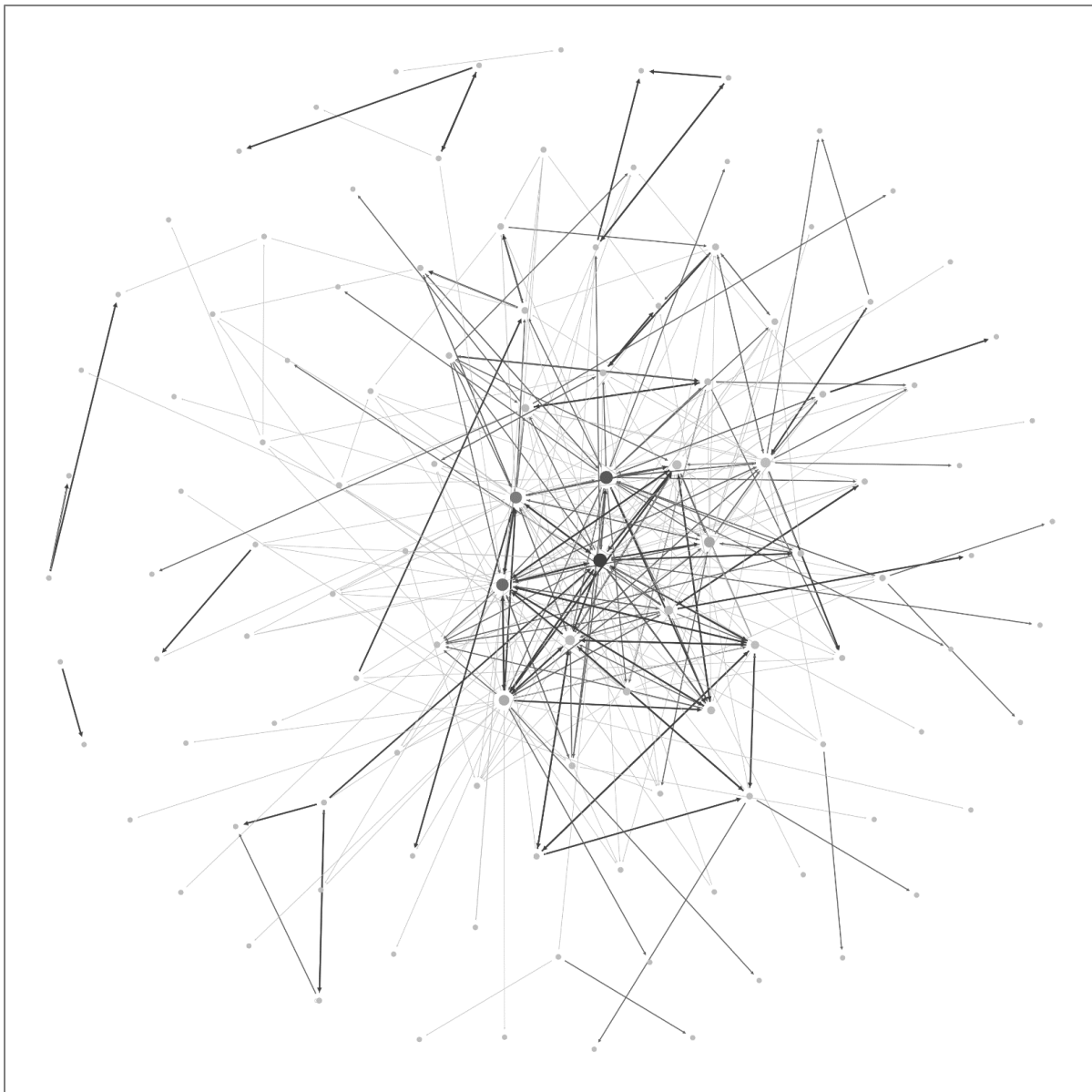

Figure 3. Full ATE Evaluator Network at baseline showing 422 connections among 115 individuals.

Quantitative Descriptive SNA Measures

In addition to generating powerful visual depictions of networks, SNA can also be used to quantitatively describe the networks at a given point and then tracked to monitor changes over time. For example, SNA provides measures for analyzing the extent to which the individuals within a network are interconnected (i.e., density) and also (i.e., centralization). These quantitative measures in relation to the information gathered from ATE evaluators are described below.

<u>Density</u>

The simplest SNA measure to describe the connectedness at the network level is density, which measures the extent to which individuals in a network are interconnected. It is calculated as the total number of paired connections or ties in a network divided by the maximum number of ties possible.

The ATE Evaluator Network had a **density** of **4.9%** at baseline.

It should be noted that this is probably an underestimation of the true interconnectedness among the 115 individuals represented in the network. There are 54 individuals who did not complete the survey but were identified as a connection by one or more people who did. If each of these 54 individuals had provided connection information, the interconnectedness of the network – as measured by density – would most certainly be higher.
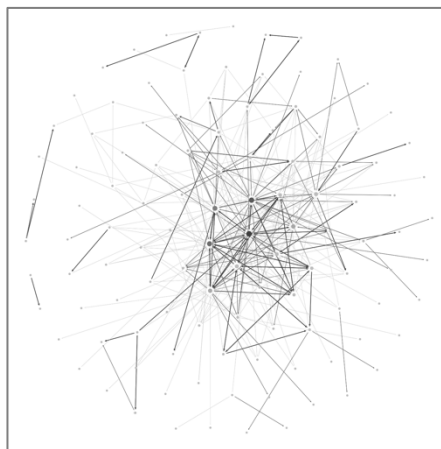

Figure 4. Full ATE Evaluator Network at Baseline.

The low **density** of the ATE Evaluator Network can be clearly seen in this visualization.

Centralization

Degree centrality is a common individual-level measure used in SNA to denote how influential a given individual is within the network and based purely on the number of connections associated with the individual. Centralization, however, is a network-level measure that provides an indication of how centralized a network is. In a highly decentralized network, most individuals within the group have similar numbers of connections while – in a highly centralized network – most connections are held by a small minority of individuals. Centralization ranges from 0 (i.e., all individuals have the same number of ties to others) to 1 (i.e., all ties are held by a single individual in the network).

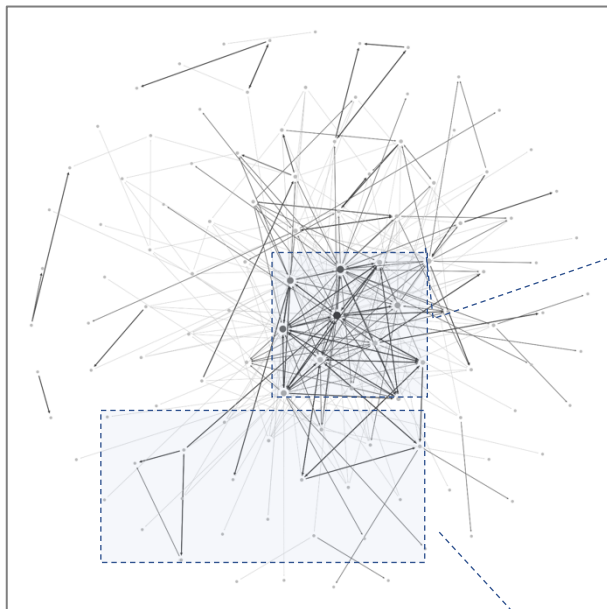## The ATE Evaluator Network had a **centralization** score of **.49** at baseline.

Figure 5. Full ATE Evaluator Network at baseline.
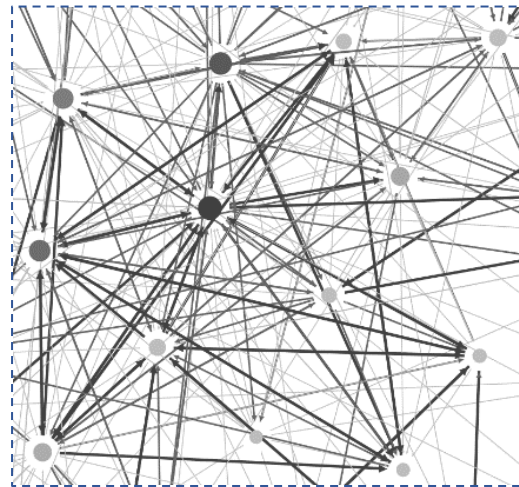

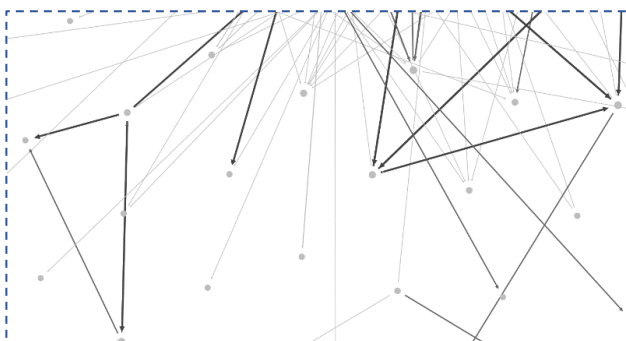**Figure 6.** Magnified portion of the ATE Evaluator Network at baseline.

Figure 7. Magnified portion of the ATE Evaluator Network at baseline.

The magnified portion of the network (Figure 5) shown in Figure 6 (above) provides a clearer picture of the relatively few highly connected or centralized individuals within the ATE Evaluator Network at baseline.

Figure 7 (left) shows the many individuals with relatively fewer connections that is more typical within the ATE Evaluator Network at baseline. However, it should be noted that some of the less connected individuals have developed strong connections with each other.

Final Thoughts

This report provides a description of the ATE Evaluator Network at baseline before the implementation of systematic efforts by EvaluATE to increase professional exchange among ATE evaluators. The baseline data shows that many ATE evaluators connect with each other on evaluation-related matters, but there are certainly opportunities for growth in terms of the number of connections, the frequency of interactions among connected individuals, and in the overall connectedness – or density - of the network. Currently, the ATE Evaluator Network is characterized by a relatively small number of individuals who are highly connected or central within the network. While a decrease in the centrality of these individuals would not necessarily be a positive outcome, it would be good to see the relative centrality of others in the network increase. Ideally, as the network of ATE evaluators becomes more interconnected, there will be less of a reliance on a relatively small group of individuals for evaluation-related guidance, support, and collaboration.

Appendix A – Social Network Analysis Questions from the 2019 ATE Evaluator Survey (abbreviated version)

You will be presented with 7 alphabetized lists of ATE evaluators. Each list will contain 20 to 30 names. This may sound like a lot, but it should take no more than 5 minutes to complete this part of the survey. Please select the name of each evaluator with whom you have had at least one evaluation-related interaction in the past 12 months.

Evaluation-related interactions could include any of the following: Providing or receiving evaluation guidance, resources, or information; Working together on an evaluation; Collaborating on educational or outreach activities (e.g., article, presentation, committee).

Q1. I have had at least one evaluation-related interaction with each of the following individuals in the last 12 months.

☐ Name 1 ☐ Name 2 ☐ Name 3

Q2. Can you think of any other ATE evaluators with whom you have had at least one evaluation-related interaction in the last 12 months?

☐ Yes ☐ No

Display this question if Q2 = Yes

Q3. Please enter the me(s). _____

Q4. What types of evaluation-related interactions have you had with each person in the last 12 months? (Select all that apply)

Carry forward names selected in Q2 and write-ins from Q3

	PROVIDED guidance, resources, or information	RECEIVED guidance, resources, or information	Worked together on an evaluation	Collaborated on an educational or outreach activity	Other
Name 1	☐	☐	☐	☐	☐
Name 2	☐	☐	☐	☐	☐
Name 3	☐	☐	☐	☐	☐
Name (write-in)	☐	☐	☐	☐	☐

Q5. About how often have you had evaluation-related interactions with each person in the last 12 months?

Carry forward names selected in Q2 and write-ins from Q3

	1 – 2 times	3 -10 times	More than 10 times
Name 1	☐	☐	☐
Name 2	☐	☐	☐
Name (write-in)	☐	☐	☐