

**Test Manual**

Growth Mindset on Leadership



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# **Purpose of this Manual**

This Test Manual frames the process of the developing and maintaining valid and reliable measures of growth mindset that people can use to determine whether they express a growth mindset in the workplace based on their leaders qualities/behaviors. People can also use this measure to determine whether they believe their leader expresses a growth mindset or not based on their qualities/behaviors.

This Test Manual provides information on the following:

* Test preparation and specification: the explanation of the development of the psychological measure and the test specifications.
* Item writing and administration: the development of items to assess the psychological construct.
* Examining subject matter expert (SME) ratings: the process to help refine and edit the scale by using information provided by experts within the related field(s) of the psychological construct.
* Collection of Data: the process on how data was collected by participants.
* Data Cleaning: the process used to clean the data after collection.
* Exploratory factor analysis: the examination of the dimensions of the items in the scale.
* Reliability analysis: the reliability of each dimension of the scale.
* Criterion-related validation: the process of finding criteria to assess the criterion-related validity of the scale.
* Construct validation: the process of finding measures to assess the construct validity of the scale.

# **Test Preparation and Specification**

## **Identifying a Psychological Construct**

For the psychological construct the group decided to measure something that is not currently well measured but captured the groups interests. The group decided on two constructs

* Leadership
* Growth mindset

These two constructs were then combined to see how certain leadership behaviors and/or qualities would impact team member behaviors. We wanted to see whether individuals would express a growth mindset based on the qualities of the leader, and whether that individual believed the leader expressed a growth mindset as well.

## **Test Domain**

Someone who has a growth mindset is someone who believes their intelligence and abilities can be improved through dedication and hard work. This could be accomplished by making an effort, taking risks and challenges, embracing their mistakes, developing their skills and knowledge, and accepting feedback.

Someone who has a fixed mindset or doesn’t express a growth mindset, is someone who believes their intelligence and abilities cannot be improved. They believe that you are born or given so much intelligence that cannot be changed over time.

### *Context of the test*

This concept can apply to all people because when in the workplace individuals and groups have leaders or managers that can impact their actions and the way they behave. The psychological construct or trait was measured relative to a specific context, growth mindset. For example, a growth mindset is typically used in college to help identify whether students believed they could improve their intelligence and succeed. However, we wanted to see people’s opinions on how the leader’s leadership style influenced their mindset.

### *How the construct is to be measured*

In designing the scale, we created leader vignettes that portrayed what we believed to be a “good” leader where they expressed a more qualities of what we believed to be a growth mindset. Then we created another vignette that we believed to be a “bad” leader or one where they expressed more qualities of a fixed mindset, Appendix A. Therefore, the vignettes contained qualities/behaviors that leaders could possess and would appeal to individuals. This way individuals could potentially try and connect the vignette to a real-life scenario of a leader they could have had once.

Therefore, the difference between our construct and related constructs, is that we are looking at whether an individual expresses a growth mindset based on their leader’s, or in this case the leader vignettes, qualities/behaviors. Whereas other constructs look at leadership qualities and whether someone expresses a growth mindset, based on their personal qualities/behaviors.

### *Dimensionality of the Construct and Item format*

The questions for the vignettes are not very broad, as the questions are specific towards growth mindset characteristics. There’s a total of 14 questions per vignette, where seven of those questions are geared towards the individual and how the leader’s qualities/behaviors would impact them. Whereas, the other seven questions were similar to the individual questions, just geared towards their thoughts on the leader. The second vignette had the same 14 questions that were in the first vignette. All questions in the questionnaire were close-ended questions, using a six-point Likert scale from one (strongly disagree) to six (strongly agree), to respond to each item in the questionnaire.

# **Item Writing and Administration**

## **Item Writing and Test Development**

To help in the creation of items, we wanted to keep them simple and use small words so anyone taking the test could understand what we were asking. We started off by looking up the different types of characteristics leaders can express, as well as what characteristics express a growth mindset. By doing this we were able to create vignettes and items where participants could respond based on how they would react today, compared to how they would react in the future.

To ensure the quality of our items, we went back through the definition we had created for a growth mindset and our items that we created. While working on the item creation we also decided to reverse code roughly half of the questions, that way our respondents were not just answering one extreme end or neutral questions throughout the questionnaire. Therefore, by reverse coding some of the items it also decreases the amount of response bias by participants.

In the creation of our items, we used the rational test development method to ensure internal consistency of the test. The items in our questionnaire were closely related to the definition of the construct, growth mindset, that we were measuring. After figuring out which items created were closely related to our construct, we ended up with seven items that were based on the individual’s growth mindset, and another seven based on the leader’s growth mindset. Therefore, the items for the individual measured whether they had a growth mindset based on the impact of the leader’s qualities/behaviors. The leader items measured whether that same individual believed that leader expressed a growth mindset based on their qualities/behaviors discussed in the vignette.

## **SME Ratings**

We did not send out our questionnaire to a group of individuals for a pilot test, however, we did send our 14 items to three different subject matter experts (SMEs). A spreadsheet with the 14 items was then created to be sent out to the SMEs to review our items and see how relevant they believed the items were to the construct, Appendix B.

For the SME response scale, we had them rate an item as 2 for essential, 1 for useful, or 0 as not necessary. We also provided the SMEs with a column to leave their comments for further explanation on why they gave an item the rating they had, Appendix B.

An email, Appendix C, was sent out to three professors at Missouri University of Science and Technology to review and rate our items on the leadership and growth mindset questionnaire. In the email we made sure to clearly present the definition of our construct and provide them the information in the email on how to rate the items in the spreadsheet.

# **Examining SME Ratings**

## **Computing SME Ratings**

We received two out of the three SME ratings. After we received the SME ratings data, we then computed the mean and standard deviation of all the items, shown in Table 1.

### *Table 1: SME Mean Rating*

|  |  |  |
| --- | --- | --- |
| **Question** | **Mean** | **SD** |
| Q1 | 1 | 1.41 |
| Q2 | 2 | 0 |
| Q3 | 1 | 1.41 |
| Q4 | 1.5 | 0.71 |
| Q5 | 1.5 | 0.71 |
| Q6 | 1.5 | 0.71 |
| Q7 | 1 | 1.41 |
| Q8 | 1 | 0 |
| Q9 | 0.5 | 0.71 |
| Q10 | 2 | 0 |
| Q11 | 1 | 1.41 |
| Q12 | 2 | 0 |
| Q13 | 2 | 0 |
| Q14 | 1 | 1.41 |
|  | | |
| **Grand Mean:** | 1.36 |  |

## **Cut Off Score**

From the mean rating scores, we were then able to create a cut off score for the questionnaire. The cut off score we ended up going with was a 0.5 because we only have two out the three SME responses back. From one of the SME responses, their responses were low because they put in the comments how they didn’t understand what we were trying to measure. Therefore, we kept the cut off score low at 0.5 to account for the low ratings received by one of the SMEs. Additionally, if the other SME provided a low rating, then that meant that question was probably not a good question and would be better off being discarded.

## **Discarded Items**

Based on the cut off scores, item 9 appears to be a question that was considered a bad question for both SMEs and should be discarded. Item 7 is an item that could be re-assessed, because the comments for item 7 raised concern for its comprehensiveness and understanding to respondents. Therefore, reviewing that question and deciding on whether rewording the item or discarding the item is better for the questionnaire. SME rating comments are presented in Appendix D. After reviewing items 9 and 7, we decided to discard the SME comments, and keep the items, as we believed the items were necessary for us in determining whether and individual and a leader expressed a growth mindset.

# **Collection of Data**

For the study, we collected our data through an online system, Qualtrics, where responses could be stored instantly. Each member in the team sent the Qualtrics link out to participants through Facebook and/or email. Data was collected between March 25th and April 1st.

# **Cleaning Data**

After April 1st, we had collected data from 103 participants. All identifiable characteristics such as IP Addresses, emails, and any other descriptive characteristics were removed before downloading into R to protect confidentiality of participants. After identifiable characteristics were removed, the data was downloaded into R, and all irrelevant information to running the analyzes were removed such as start date, end date, etc.

During the data cleaning, the responses for vignette 1 and vignette 2 were separated into different data frames, that way, the missing data could be removed based on the vignette. The script to show how the data was cleaned is presented in Appendix E.

# **Exploratory Factor Analysis**

## **Factor Analysis**

Before I could conduct the factor analysis, I had to re-combine the vignettes. This was done by creating another data frame where the responses for vignette 2 were placed under the responses for vignette 1, since the questions were the same for each vignette. To accomplish this, the labeling of the items of vignette 2 needed to be renamed so that they matched the labeling of the items in vignette 1. Once the items were named the same, they could then be put into a data frame as one set of questions for both vignettes. The script for how this was accomplished is shown in the beginning of Appendix F.

Once the new data frame was created, the data frame then had to be converted from a factor to numeric in order to us to run an exploratory factor analysis. Once this step was accomplished an exploratory factor analysis was conducted on the Leader /Growth Mindset Questionnaire, Appendix F. First the parallel analysis was conducted to see how many factors would best fit the measure, outputting Figure 1 below.

### *Figure 1: Parallel Analysis*



Based on the parallel analysis, the three-factor model is shown to be the best model. Therefore, a three-factor model analysis was conducted, but based on the factors that output from the three-factor model we didn’t think the factors created made sense together, so we then ran a two-factor model. After the two model-factor was conducted, we went back and review the items for the factors and agreed that that the two-factor model made more sense than the three-factor model. We with the two-factor model because the item loading for the factor made more sense than it did for the three-factor model, and the three-factor model left out item 4 or Vignette 1.1.4, which was not included in the three-factor mode, but the group agreed was an important. The two-factor model is shown in Figure 2 below

### *Figure 2: Two-Factor Model*



## **Interpretations**

From the two-factor model, Factor 1 (MR1) can be interpreted as Leader Influence, because the items Vignette 1.2.4, Vignette 1.2.5, Vignette 1.2.6 as asking about how strongly an individual believes the leader is willing to take risks and help develop the team’s skills and knowledge. The other three items, Vignette 1.1.3, Vignette 1.1.4, and Vignette 1.1.7 are then talking about the individual’s effort, whether they would try to learn from their mistakes, and provide feedback or suggestions for problem solving.

Factor 2 (MR2), can be interpreted as more Personal Influence, because the first four items, Vignette 1.1.1, Vignette 1.1.2, Vignette 1.1.5, and Vignette 1.1.6 are related to the individual and asking them how much they would be willing to take risks and improve their own skills and knowledge. The other three items, Vignette 1.2.1, Vignette 1.2.2, and Vignette 1.2.7 are talking about the leader’s effort, willingness to help, and listen to others.

## **Threshold**

The team then wanted to see which items loaded onto the factors, and which items failed to load onto the factors and could potentially be deleted, based on the two-factor analysis Figure 2. There was a loading range of .30. From this, it is then shown that all the items loaded onto the factor. However, since items Vignette 1.1.1 and Vignette 1.2.7 are both right at the loading range of .30, therefore, after reviewing those two items, the team concluded that items Vignette 1.1.1 and Vignette 1.2.7 could be deleted.

# **Reliability Analysis**

## **Computing Alpha**

After the factor analysis was completed, a reliability analysis was computed to test the reliability of each factor, Appendix G. The obtained alpha scores were compared to the alpha estimated if each item were deleted. If the removal of an item increased the alpha, then it would be appropriate to remove the item. However, if the removal of an item did not increase the alpha or was not a significant increase to the alpha, then it appropriate to retain the item.

The results for the reliability analysis as shown in the tables below. In Table 2 below, the raw alphas for each factor (Factor 1 and Factor 2 from the factor analysis ran previously) are presented.

### *Table 2: Raw alpha scores for Factor 1 and Factor 2*

|  |  |
| --- | --- |
| Raw Alpha for Factor 1 | 0.82 |
| Raw Alpha for Factor 2 | 0.85 |

For Factor 1 Table 3 shows the reliability (alpha) if an item is dropped. For example, in Table 3, if the second item in the table (Vignette 1.1.4 or item 4 from the questionnaire) was dropped or discarded from the factor, the reliability of the factor would raise to a 0.84. However, if the first item in the table (Vignette 1.1.3 or item 3 in from the questionnaire), it would lower the reliability of Factor 1, dropping the alpha to a 0.81. Lastly, Table 4 represents the item statistics for each item in first factor, such as the number of people who answered that question (N), mean, and standard deviation for each item in Factor 1.

### *Table 3: Reliability if an item is dropped for Factor 1*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **Raw\_alpha** | **Std.alpha** | **G6(smc)** | **Average\_r** | **S/N** | **Alpha se** | **Var.r** | **Med.r** |
| Vignette 1.1.3 | 0.81 | 0.80 | 0.82 | 0.45 | 4.0 | 0.024 | 0.52 | 0.40 |
| Vignette 1.1.4 | 0.84 | 0.83 | 0.84 | 0.50 | 4.9 | 0.020 | 0.035 | 0.42 |
| Vignette 1.1.7 | 0.77 | 0.76 | 0.79 | 0.39 | 3.2 | 0.029 | 0.041 | 0.37 |
| Vignette 1.2.4 | 0.81 | 0.81 | 0.82 | 0.45 | 4.2 | 0.024 | 0.044 | 0.41 |
| Vignette 1.2.5 | 0.73 | 0.73 | 0.70 | 0.35 | 2.6 | 0.034 | 0.018 | 0.36 |
| Vignette 1.2.6 | 0.74 | 0.74 | 0.73 | 0.36 | 2.8 | 0.032 | 0.024 | 0.36 |

### *Table 4: Item Statistics for Factor 1*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **N** | **Raw.r** | **Std.r** | **r.cor** | **r.drop** | **mean** | **sd** |
| Vignette 1.1.3 | 151 | 0.64 | 0.65 | 0.52 | 0.48 | 2.1 | 1.3 |
| Vignette 1.1.4 | 150 | 0.52 | 0.53 | 0.36 | 0.33 | 3.3 | 1.3 |
| Vignette 1.1.7 | 151 | 0.78 | 0.77 | 0.71 | 0.65 | 2.9 | 1.5 |
| Vignette 1.2.4 | 151 | 0.62 | 0.63 | 0.51 | 0.46 | 3.0 | 1.2 |
| Vignette 1.2.5 | 152 | 0.89 | 0.88 | 0.93 | 0.81 | 2.9 | 1.4 |
| Vignette 1.2.6 | 150 | 0.85 | 0.84 | 0.88 | 0.76 | 3.0 | 1.4 |

For Factor 2 Table 5 shows the reliability (alpha) if an item is dropped. For example, in Table 5, if the first item in the table (Vignette 1.1.1 or item 1 from the questionnaire) was dropped or discarded from Factor 2, the reliability of the factor would raise to a 0.88. Lastly, Table 6 represents the item statistics for each item in first factor, such as the number of people who answered that question (N), mean, and standard deviation for each item in Factor 2.

### *Table 5: Reliability if an item is dropped for Factor 2*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **Raw\_alpha** | **Std.alpha** | **G6(smc)** | **Average\_r** | **S/N** | **Alpha se** | **Var.r** | **Med.r** |
| Vignette 1.1.1 | 0.88 | 0.87 | 0.89 | 0.49 | 6.6 | 0.014 | 0.064 | 0.42 |
| Vignette 1.1.2 | 0.85 | 0.84 | 0.88 | 0.43 | 5.2 | 0.018 | 0.089 | 0.24 |
| Vignette 1.1.5 | 0.80 | 0.79 | 0.82 | 0.35 | 3.8 | 0.023 | 0.064 | 0.24 |
| Vignette 1.1.6 | 0.80 | 0.79 | 0.82 | 0.35 | 3.8 | 0.023 | 0.065 | 0.24 |
| Vignette 1.2.1 | 0.80 | 0.80 | 0.83 | 0.36 | 3.9 | 0.023 | 0.065 | 0.24 |
| Vignette 1.2.2 | 0.82 | 0.81 | 0.85 | 0.38 | 4.3 | 0.021 | 0.083 | 0.24 |
| Vignette 1.2.3 | 0.80 | 0.79 | 0.82 | 0.35 | 3.7 | 0.024 | 0.064 | 0.23 |
| Vignette 1.2.7 | 0.87 | 0.86 | 0.89 | 0.47 | 6.3 | 0.015 | 0.073 | 0.42 |

### *Table 6: Item statistics for Factor 2*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **N** | **Raw.r** | **Std.r** | **r.cor** | **r.drop** | **mean** | **sd** |
| Vignette 1.1.1 | 152 | 0.35 | 0.35 | 0.19 | 0.18 | 3.0 | 1.4 |
| Vignette 1.1.2 | 150 | 0.54 | 0.57 | 0.45 | 0.43 | 3.8 | 1.1 |
| Vignette 1.1.5 | 150 | 0.86 | 0.86 | 0.88 | 0.80 | 3.3 | 1.4 |
| Vignette 1.1.6 | 151 | 0.87 | 0.86 | 0.88 | 0.81 | 3.3 | 1.4 |
| Vignette 1.2.1 | 152 | 0.86 | 0.84 | 0.85 | 0.78 | 3.0 | 1.6 |
| Vignette 1.2.2 | 152 | 0.76 | 0.76 | 0.72 | 0.67 | 3.6 | 1.3 |
| Vignette 1.2.3 | 151 | 0.89 | 0.87 | 0.90 | 0.83 | 3.0 | 1.4 |
| Vignette 1.2.7 | 151 | 0.37 | 0.39 | 0.25 | 0.22 | 3.3 | 1.2 |

## **Dropped Items**

After the reliability analysis were completed, we had to decide which items to drop from each factor. By dropping items from the factors, we wanted to know if it would increase the alpha substantially. Looking at which items could be dropped could also help determine what made that item different from the others such as it was worded in a confusing way or maybe participants didn’t understand the question.

### *Dropped items for Factor 1*

Based on Table 2 above for Factor 1, dropping item Vignette 1.1.4 would be beneficial to raising the alpha or reliability score. However, after reviewing the item, this was a question the group found important to determining whether an individual would express a growth mindset or not based on the leader’s qualities/behaviors. It’s expected that participants got confused with wording of the question and re-writing the item or re-wording the item could have improved responses to this item. After removing Vignette 1.1.4 from Factor 1 though, the new raw alpha score was a 0.84. Besides item Vignette 1.1.4, we decided to keep all other items in Factor 1.

### *Dropped items for Factor 2*

For Factor 2, based on Table 5 above, dropping items Vignette 1.1.1 and Vignette 1.2.7 would greatly improve the reliability or alpha for Factor 2. First, we reviewed item Vignette 1.1.1 (item 1) to decide whether the question was necessary or important for determining a growth mindset. After consideration, it was decided that the question could have been confusing to participants and that it probably wasn’t a very good question. Therefore, item Vignette 1.1.1 was removed, and the reliability analysis was computed again, resulting in a new raw alpha score of 0.88. Next, we reviewed item Vignette 1.2.7 (item 14) to determine whether that question was necessary or important in determining a growth mindset as well. Again, we decided the question was probably confusing to participants and weren’t sure how to respond to the question, and it would be better to discard the item. Therefore, item Vignette 1.2.7 was removed, the reliability analysis was computed again, resulting in another new raw alpha for Factor 2 being 0.91.

### *Overall alpha for the measure*

Lastly, a reliability analysis was run on all the times overall, before dropping any of the factors to see how all the items correlated with another. When the reliability analysis was computed, an overall alpha for the measure was a 0.87. In Table 7, the reliability if an item is dropped is show. For example, if item Vignette 1.1.1 were to be dropped from the measure, the alpha would increase to a 0.89. Then, Table 8 represents the item statistics for each item in first factor, such as the number of people who answered that question (N), mean, and standard deviation for each item in Factor 2.

### *Table 7: Reliability if an item is dropped for the overall measure*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **Raw\_alpha** | **Std.alpha** | **G6(smc)** | **Average\_r** | **S/N** | **Alpha se** | **Var.r** | **Med.r** |
| Vignette 1.1.1 | 0.89 | 0.88 | 0.92 | 0.36 | 7.4 | 0.013 | 0.052 | 0.33 |
| Vignette 1.1.2 | 0.87 | 0.86 | 0.91 | 0.32 | 6.2 | 0.014 | 0.066 | 0.29 |
| Vignette 1.1.3- | 0.87 | 0.86 | 0.90 | 0.32 | 6.2 | 0.014 | 0.064 | 0.27 |
| Vignette 1.1.4- | 0.88 | 0.87 | 0.92 | 0.34 | 6.8 | 0.013 | 0.062 | 0.33 |
| Vignette 1.1.5 | 0.85 | 0.84 | 0.89 | 0.30 | 5.4 | 0.016 | 0.056 | 0.27 |
| Vignette 1.1.6 | 0.85 | 0.84 | 0.89 | 0.30 | 5.4 | 0.016 | 0.057 | 0.27 |
| Vignette 1.1.7- | 0.86 | 0.85 | 0.90 | 0.31 | 5.9 | 0.015 | 0.061 | 0.28 |
| Vignette 1.2.1 | 0.85 | 0.84 | 0.89 | 0.29 | 5.3 | 0.017 | 0.055 | 0.26 |
| Vignette 1.2.2 | 0.86 | 0.85 | 0.90 | 0.31 | 5.9 | 0.015 | 0.062 | 0.28 |
| Vignette 1.2.3 | 0.85 | 0.84 | 0.89 | 0.29 | 5.3 | 0.017 | 0.054 | 0.26 |
| Vignette 1.2.4- | 0.87 | 0.87 | 0.91 | 0.33 | 6.5 | 0.014 | 0.062 | 0.30 |
| Vignette 1.2.5- | 0.85 | 0.85 | 0.89 | 0.30 | 5.5 | 0.016 | 0.056 | 0.26 |
| Vignette 1.2.6- | 0.86 | 0.85 | 0.89 | 0.30 | 5.6 | 0.016 | 0.057 | 0.26 |
| Vignette 1.2.7 | 0.88 | 0.88 | 0.92 | 0.36 | 7.2 | 0.013 | 0.057 | 0.33 |

### *Table 8: Item statistics for overall measure*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **N** | **Raw.r** | **Std.r** | **r.cor** | **r.drop** | **mean** | **sd** |
| Vignette 1.1.1 | 152 | 0.19 | 0.18 | 0.089 | 0.068 | 3.0 | 1.4 |
| Vignette 1.1.2 | 150 | 0.51 | 0.54 | 0.480 | 0.440 | 3.8 | 1.1 |
| Vignette 1.1.3- | 151 | 0.53 | 0.54 | 0.494 | 0.443 | 3.9 | 1.3 |
| Vignette 1.1.4- | 150 | 0.35 | 0.36 | 0.271 | 0.246 | 2.7 | 1.3 |
| Vignette 1.1.5 | 150 | 0.81 | 0.81 | 0.825 | 0.761 | 3.3 | 1.4 |
| Vignette 1.1.6 | 151 | 0.81 | 0.81 | 0.824 | 0.761 | 3.3 | 1.4 |
| Vignette 1.1.7- | 151 | 0.67 | 0.66 | 0.630 | 0.587 | 3.1 | 1.5 |
| Vignette 1.2.1 | 152 | 0.85 | 0.84 | 0.855 | 0.807 | 3.0 | 1.6 |
| Vignette 1.2.2 | 152 | 0.65 | 0.65 | 0.629 | 0.582 | 3.6 | 1.3 |
| Vignette 1.2.3 | 151 | 0.87 | 0.86 | 0.878 | 0.828 | 3.0 | 1.4 |
| Vignette 1.2.4- | 151 | 0.45 | 0.45 | 0.382 | 0.351 | 3.0 | 1.2 |
| Vignette 1.2.5- | 152 | 0.78 | 0.78 | 0.798 | 0.733 | 3.1 | 1.4 |
| Vignette 1.2.6- | 150 | 0.76 | 0.76 | 0.733 | 0.711 | 3.0 | 1.4 |
| Vignette 1.2.7 | 151 | 0.23 | 0.24 | 0.149 | 0.129 | 3.3 | 1.2 |

Based on Table 7, we thought the removal of items Vignette 1.1.1 and Vignette 1.2.7, should still be removed from the overall measure, as these items don’t appear to good. Therefore, after removing Vignette 1.1.1 and Vignette 1.2.7, and running the reliability analysis again, we got a new raw alpha of 0.90.

# **Criterion-Related Validation**

For this section of the Test Manual, we identified criteria that could be used to assess the criterion-related validity of our developed measure. Estimates of predictive criterion-related validity and concurrent criterion-related validity. However, the use of postdictive criterion-related validity was not used because it did not seem to work for our measure. This is because we wouldn’t have a pre-determined group of individuals in which we have criterion data for already. Therefore, the use of postdictive criterion-related validity does not work for our measure.

## *Predictive criterion-related validity*

Our measure was looking to see whether particular leader qualities/behaviors would predict a growth mindset in their followers/employees or other team members. We also measured whether that individual thought the leader expressed characteristic of a growth mindset as well based on their (the leader themselves) qualities. Therefore, the correlation between the scores for the leader and mindset criterion could provide the estimate of predictive criterion-related validity.

## *Concurrent criterion-related validity*

If the questionnaire were to be administered to teams with distinct leaders, while also collecting personality criterion scores of individuals, could provide an estimate of concurrent criterion-related validity for the Leader/Growth Mindset Questionnaire. Since there would be no delay in time between collection of the questionnaire scores and the personality criterion scores, the validity of the questionnaire can be determined quicker, providing an estimate of concurrent criterion-related validity.

# **Construct Validation**

We wanted to propose appropriate measures that could provide evidence for construct validation of our questionnaire. By identifying other psychological measure, they could provide evidence of the construct validation. Therefore, two constructs were specified, one that was related to our measure, and another that was unrelated to our measure. Explanations as to why we recommended those measures has been provided in the subsections below, to explain why it would be useful for providing evidence of construct validation.

## *Convergent Validity*

For convergent validity, I’m proposing to use is Carol Dweck’s mindset quiz, as Carol Dweck is known for her research in a growth mindset and what determines someone to express a growth mindset. I chose this quiz, because I believe it should be theoretically related to my measure, as the questions are both directed towards mindset. These questionnaires help in determining whether someone expresses either a growth or fixed mindset. Carol Dweck talks about how a growth mindset is one where individuals believe they further develop their intelligence, traits, and/or skills. This can be done through increasing one’s knowledge or skills, accepting feedback even if it’s negative, willing to take risks and challenge yourself, etc. (Dweck, 2006). She defines a fixed mindset as someone who does not think their intelligence can change, and that we are born with only a certain amount of intelligence.

I expect this measure to be related to my measure considering I got my inspiration for my measure and questions through Carol Dweck and her definition and concept of what it means to have a growth mindset. How I could implement Carol Dweck’s mindset quiz is by administering it to leaders and/or managers in the workplace to see whether they express either a growth or a fixed mindset. Then the same questionnaire could be given to their followers and/or employees to see whether they express a growth mindset and have them respond based on when they are at work. By doing this we could see if leaders who express a growth mindset, whether their followers and/or employees also express a growth mindset and vise versa.

Dweck, C. S. (2006). *Mindset: The new psychology of success*. Retrieved from <https://studentsuccess.unc.edu/files/2015/08/MINDSET-Quiz.pdf>.

## *Discriminant Validity*

The next measure I’m proposing to use is the Leadership Mindset Assessment, which assesses your mindset based on how you are doing in the workplace, and provides answers as to where you are today, where you were a year ago (if you took this assessment a year ago), and where you want to be a year from now (Blane, 2016). I chose this assessment because in my measure, we are also looking at the leader (from the vignettes) and assessing their behaviors and actions. However, Blane defines mindset different than our definition of mindset. We define a growth mindset as someone who believes their intelligence and abilities can be improved through dedication and hard work. This could be accomplished by making an effort, taking risks and challenges, embracing their mistakes, developing their skills and knowledge, and accepting feedback. Blane on the other hand, defines mindset simply as how where someone is today and how well they are doing.

How I could implement this measure, is by administering it to leaders and/or managers in the workplace. Based on the results, I would expect to review results on how well they are performing in their current position, and whether there is room for improvement and how they can improve. However, our measure isn’t looking to see how well the leader is performing in his/her position, but whether they express a growth mindset and how their qualities/behaviors are impacting their followers and/or employees. Therefore, I wouldn’t expect this assessment or measure to be related to our measure of leaders and growth mindset.

Blane, H. (2016, May 28). The leadership mindset assessment. Retrieved from <https://clarisconsulting.net/leadership-mindset-assessment/>.

# **Data Analysis**

The last section of this Test Manual is looking at the relationship between the demographic variables (gender, age, ethnicity, and employment) on the factor scores from the factor analysis that was computed earlier. Therefore, another data frame was created with just the demographic variables. How we stacked the Vignette 1 items on top of the Vignette 2 items, is how we created this new data fame of demographics, where the demographics for Vignette 1 were on top of the demographics for Vignette 2. Then we had to change all the rows with missing data into “NAs”, so we could run our data analysis later, Appendix H.

Next, we had to take the factor scores, and combine them to the demographic data frame, which was done by using the cbind function in R. Once we combined the factor scores to the demographic data frame, we then had to change age from a factor to numeric, and we changed ethnicity to be either “Caucasian” or “Other”, Appendix H, to make the data analysis run more smoothly, and make more sense.

## **Multiple Linear Regression**

### *Factor 1*

A multiple linear regression was computed to compare whether the demographic variables significantly impacted Factor 1, Appendix I. The results showed that for Factor 1 (*M*=0.02, *SD*=0.96), none of the variables significantly impacted Factor 1: gender (*M*=3.50, *SD*=0.53), age (*M*=34.89, *SD*=14.59), ethnicity (*M*=1.45, *SD*=.50), and employment (*M*=4.56, *SD*=0.55). This indicates that gender, age, ethnicity, and employment (e.g., full time employee, full time students, part time employee, part time student, unemployed) did not impact the factor scores. The only demographic variable that was close to significantly impacting Factor 1, was ethnicity. Therefore, an independent sample t-test comparing ethnicity to Factor 1 was conducted to see whether ethnicity impacted Factor 1. The results showed that ethnicity (*M*=1.45, *SD*=.50) did not significantly impact Factor 1 (*M*=0.02, *SD*=0.96), *t*(1,141)=1.808, p=0.073. This indicates that ethnicity did not impact the Factor 1 scores.

### *Factor 2*

A multiple linear regression was computed to compare whether the demographic variables significantly impacted Factor 2, Appendix I. The results showed that for Factor 2 (*M*=-0.01, *SD*=0.94), none of the variables significantly impacted Factor 2: gender (*M*=3.50, *SD*=0.53), age (*M*=34.89, *SD*=14.59), ethnicity (*M*=1.45, *SD*=.50), and employment (*M*=4.56, *SD*=0.55). This indicates that gender, age, ethnicity, and employment (e.g., full time employee, full time students, part time employee, part time student, unemployed) did not impact the factor scores for Factor 2. None of the variables were close to significantly impacting Factor 2, so no further analysis were computed for comparing demographic variables to Factor 2.

# **Appendix A**

Growth Mindset/Leadership Questionnaire

## Vignette 1

Imagine you are put into a group and it’s clear who is in charge, assigning roles for each individual, and setting goals and deadlines for the group. The group follows strict rules set by the leader and are typically motivated through positive and negative reinforcements. However, when the group comes to an impasse, instead of talking about possible solutions as a group, the top leader makes the decisions and it gets filtered down through the group without their input. While projects are usually completed efficiently due to everyone having specialized predetermined roles, it is difficult for feedback from the lower levels to reach the upper levels. When a process needs to change, the adaptations are slow to be determined and implemented.

Based off the scenario above, please answer the following questions based off how you would react or how this would impact you in the group.

V1.1.1 How strongly do you agree that your main focus would be on your performance and not the process of the group to reach their goal? - disagree (growth), agree (fixed)

V1.1.2. How strongly do you agree that you would be willing to take risks or challenge yourself? - disagree (fixed), agree (growth)

V1.1.3. How strongly do you agree that putting forth a lot of effort is useless? - disagree (growth), agree (fixed)

V1.1.4. How strongly do you agree that you would try to avoid making mistakes compared to embracing them? - disagree (growth), agree (fixed)

V1.1.5. How strongly do you agree that your skills would be further developed in this group? - disagree (fixed), agree (growth)

V1.1.6. How strongly do you agree that your knowledge would further develop in this group? - disagree (fixed), agree (growth)

V1.1.7. How strongly do you agree that the environment created, would discourage you from providing feedback/suggestions for problem-solving? – disagree (growth), agree (fixed)

Based off the scenario above, please answer the following questions based off how you perceive this leader in your group.

V1.2.1. How strongly do you agree that this leader is open to feedback from you and others in the group? – disagree (fixed), agree (growth)

V1.2.2. How strongly do you agree that this leader will put a lot of effort into the team’s project? – disagree (fixed), agree (growth)

V1.2.3. How strongly do you agree that this leader is helping develop the team? – disagree (fixed), agree (growth)

V1.2.4. How strongly do you agree that this leader would not be willing to take risks? – disagree (growth), agree (fixed)

V1.2.5. How strongly do you agree this leader is not interested in developing the team’s skills? – disagree (growth), agree (fixed)

V1.2.6. How strongly do you agree this leader is not interested in developing the team’s knowledge? – disagree (growth), agree (fixed)

V1.2.7. How strongly do you agree that this leader puts the process of the group to reach their goal as more important over their performance? – disagree (fixed), agree (growth)

## Vignette 2

Imagine you are put into a group where the leader supports and encourages others’ ideas and creative solutions, but the leader gets the final say in the decision-making process. The leader adapts accordingly to their team members, and the team feels comfortable within their environment. The leader is typically known to be fair and honest, and the group typically expresses high productivity, but when put under time pressure, there is likely to be a lack in communication between the leader and the group. Therefore, the leader may cause confusion in team members when they assess the situation wrong or have to implement new long-term strategies quickly.

Based off the scenario above, please answer the following questions based off how you would react or how this would impact you in the group.

V2.1.1 How strongly do you agree that your main focus would be on your performance and not the process of the group to reach their goal? - disagree (growth), agree (fixed)

V2.1.2. How strongly do you agree that you would be willing to take risks or challenge yourself? - disagree (fixed), agree (growth)

V2.1.3. How strongly do you agree that putting forth a lot of effort is useless? - disagree (growth), agree (fixed)

V2.1.4. How strongly do you agree that you would try to avoid making mistakes compared to embracing them? - disagree (growth), agree (fixed)

V2.1.5. How strongly do you agree that your skills would be further developed in this group? - disagree (fixed), agree (growth)

V2.1.6. How strongly do you agree that your knowledge would further develop in this group? - disagree (fixed), agree (growth)

V2.1.7. How strongly do you agree that the environment created, would discourage you from providing feedback/suggestions for problem-solving? – disagree (growth), agree (fixed)

Based off the scenario above, please answer the following questions based off how you perceive this leader in your group.

V2.2.1. How strongly do you agree that this leader is open to feedback from you and others in the group? – disagree (fixed), agree (growth)

V2.2.2. How strongly do you agree that this leader will put a lot of effort into the team’s project? – disagree (fixed), agree (growth)

V2.2.3. How strongly do you agree that this leader is helping develop the team? – disagree (fixed), agree (growth)

V2.2.4. How strongly do you agree that this leader would not be willing to take risks? – disagree (growth), agree (fixed)

V2.2.5. How strongly do you agree this leader is not interested in developing the team’s skills? – disagree (growth), agree (fixed)

V2.2.6. How strongly do you agree this leader is not interested in developing the team’s knowledge? – disagree (growth), agree (fixed)

V2.2.7. How strongly do you agree that this leader puts the process of the group to reach their goal as more important over their performance? – disagree (fixed), agree (growth)

# **Appendix B**

Subject Matter Expert (SME) Rating Sheet

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Questions:** |  | **Fixed vs Growth** | **Rating:** | **Comments:** |
|  | **Vignette 1** |  |  |  |
| **Based off yourself, how strongly do you agree that:** |  |  |  |
| Q1 | your main focus would be on your performance and not the process of the group to reach their goal? | Disagree (growth) vs Agree (fixed) |  |  |
| Q2 | you would be willing to take risks or challenge yourself? | Disagree (fixed) vs Agree (growth) |  |  |
| Q3 | putting forth a lot of effort is useless? | Disagree (growth) vs Agree (fixed) |  |  |
| Q4 | you would try to avoid making mistakes compared to embrace them? | Disagree (growth) vs Agree (fixed) |  |  |
| Q5 | your skills would be further developed in this group? | Disagree (fixed) vs Agree (growth) |  |  |
| Q6 | you agree that your knowledge would further develop in this group? | Disagree (fixed) vs Agree (growth) |  |  |
| Q7 | the environment created, would discourage you from providing feedback/suggestions for problem-solving? | Disagree (growth) vs Agree (fixed) |  |  |
|  | | | | |
|  | **Based off the leader, how strongly do you agree that:** |  |  |  |
| Q8 | this leader is open to feedback from you and others in the group? | Disagree (fixed) vs Agree (growth) |  |  |
| Q9 | this leader will put a lot of effort into the team's project? | Disagree (fixed) vs Agree (growth) |  |  |
| Q10 | this leader is helping develop the team? | Disagree (fixed) vs Agree (growth) |  |  |
| Q11 | this leader would not be willing to take risks? | Disagree (growth) vs Agree (fixed) |  |  |
| Q12 | this leader is not interested in developing the team's skills? | Disagree (growth) vs Agree (fixed) |  |  |
| Q13 | this leader is not interested in developing the team's knowledge? | Disagree (growth) vs Agree (fixed) |  |  |
| Q14 | this leader puts the process of the group to reach their goal as more important over their performance? | Disagree (fixed) vs Agree (growth) |  |  |
|  | | | | |
|  | **Demographics:** |  |  |  |
| Gender |  |  |  |
| Age |  |  |  |
| Ethnicity |  |  |  |
| Education Level |  |  |  |
|  |  |  |  |
| **Additional Comments:** |  |  |  |
|  |  |  |  |

# **Appendix C**

Subject Matter Expert (SME) Email

Dear \_\_\_\_\_\_\_\_,

My name is Morgan Anderson, and a group of classmates and I are trying to measure whether or not different leadership style behaviors or qualities impact other team or group member behaviors and the way team members think in terms of a more growth or fixed mindset. Therefore, we used two leadership style behaviors/quality vignettes that were opposite from another, so we could see if one style of behaviors or qualities impact team members more along a growth mindset, and the other impacts team members along a more fixed mindset. Along with how team members are impacted by the leader’s behavior or qualities, we are also curious as to how team members perceive that particular leader in general. Therefore, based off how team members perceive that leader does that leader appear to encourage a growth or fixed mindset to their team members. The questions for each vignette are the same for how the leader’s behaviors/qualities would impact that individual, and how that individual perceives the leader, so you only have to go through the first set of questions (total of 14 questions) set up for the first vignette. I would greatly appreciate it if you wouldn't mind being a subject matter expert for my team and I, if you would be willing. Below we have provided the link to the survey, and while you do not have to actually respond to the questions, we would greatly appreciate it if you would evaluate the questions and their appropriateness to the topic we are trying to measure. Therefore, I have also provided a spreadsheet where you can provide your ratings and feedback of each question. There is a column for each question which is indicated in the spreadsheet, then there’s a rating column where you can rate whether the item is essential (rate as a 2), useful (rate as a 1), or not necessary (rate as a 0), and there’s a comments column next to each question where you can provide feedback on each question. When you have gone through all the questions, rated them and provided feedback, please email the spreadsheet to [mam2z@mst.edu](mailto:mam2z@mst.edu). If you have any questions or have any difficulty seeing the survey, please email me at [mam2z@mst.edu](mailto:mam2z@mst.edu). Thank you again for taking the time to review our survey and provide feedback, your responses are greatly appreciated.

Thank You,

Morgan Anderson

# **Appendix D**

Subject Matter Expert (SME) Ratings and Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Questions:** |  | **SME 1 Ratings:** | **SME 1 Comments:** | **SME 2 Ratings:** | **SME 2 Comments:** |
|  | **Vignette 1** |  |  |  |  |
|  | **Based off yourself, how strongly do you agree that:** |  | Growth mindset is similar to goal orientation. Some research (including my own) has found that goal orientation tends to generalize pretty well across situations. It is more of an individual difference. There may be some situational impacts across totally different contexts (e.g. playing videogames verus the workplace or academic verus sports) In general, workplace goal orientation shouldn't vary *much* due to the work context or the behaviors of the leader if it is a stable individual difference that is. Some of the items below seem to indicate variance due to being a part of the group, while others seem to indicate stable traits. This is part of why you need a clearer definition of your construct. |  |  |
| Q1 | your main focus would be on your performance and not the process of the group to reach their goal? | 0 | In this group or in general? | 2 |  |
| Q2 | you would be willing to take risks or challenge yourself? | 2 | bad item. Taking risks and challenging myself could be two different things. Either could be growth oriented. | 2 |  |
| Q3 | putting forth a lot of effort is useless? | 0 | Is this due to the group? | 2 |  |
| Q4 | you would try to avoid making mistakes compared to embrace them? | 1 | Why "compared to embrace them"? I always try to avoid making mistakes. I learn from them when I do though. Isn't that growth orientation? reword this item. | 2 |  |
| Q5 | your skills would be further developed in this group? | 1 | What is my role in the group? | 2 |  |
| Q6 | you agree that your knowledge would further develop in this group? | 1 | What is my role in the group? | 2 |  |
| Q7 | the environment created, would discourage you from providing feedback/suggestions for problem-solving? | 0 | Ok... but is this measuring my growth mindset or that of the environment? | 2 |  |
|  |  |  |  |  |  |
|  | **Based off the leader, how strongly do you agree that:** |  | All of these items begin with "This leader" That could be made part of the stem and removed from each item, so "How strongly do you agree that **this leader**" Then have each statement. |  |  |
| Q8 | this leader is open to feedback from you and others in the group? | 1 | Is their being open to feedback part of encouraging a growth mindset in their followers or is it more an aspect of them having a growth mindset themselves? | 1 | doesn't seem especially mindset-y |
| Q9 | this leader will put a lot of effort into the team's project? | 0 | Doesn't appear related to follower growth. | 1 | This seems like it could still be true for fixed |
| Q10 | this leader is helping develop the team? | 2 |  | 2 |  |
| Q11 | this leader would not be willing to take risks? | 0 | Doesn't appear related to follower growth. | 2 |  |
| Q12 | this leader is not interested in developing the team's skills? | 2 |  | 2 |  |
| Q13 | this leader is not interested in developing the team's knowledge? | 2 |  | 2 |  |
| Q14 | this leader puts the process of the group to reach their goal as more important over their performance? | 0 | Are you equating "the process" with growth? How so? | 2 |  |
| Additional Comments: |  |  | Overall, I want a clearer definition of "growth mindset" If the question here is whether or not this paper leader (the vignette) is seen as promoting employee growth, then ask directly about that... This leader would seek to develop my skills. This leader would encourage me to take risks or try new things... This leader cares about my development as an employee.... and so on. |  |  |

# **Appendix E**

Data Cleaning Code

LM=read.csv("Leadership & Mindset.csv")

View(LM)

#First I want to remove the first 11 columns

LM=LM[,-(1:11)]

LM=LM[,-30]

LM=LM[,-32]

LM=LM[,-(33:34)]

#Next I want to remove the first 2 rows

LM=LM[-(1:2),]

#To separate Vignette 1 questions into their own data frame

LMV1.1=data.frame(LM[,c(1:14,29:32)])

View(LMV1.1)

#To separate Vignette 2 questions into their own data frame

LMV2.1=data.frame(LM[,(15:32)])

View(LMV2.1)

#Remove rows 46,49:50,53:55,60:61,67,73,75:76,78,99:102,104:105 in LMV1.1 - need to subtract 2 from each row number because rows 1 and 2 were removed in the beginning

LMV1.1=LMV1.1[-c(44,47:48,51:53,58:59,65,71,73:74,76,97:100,102:103),]

View(LMV1.1)

#Remove rows 20,42,45:46,49:55,57:62,64:67,72:78,99:105 – again need to subtract 2 since rows 1 and 2 were removed in the beginning

LMV2.1=LMV2.1[-c(18,40,43:44,47:53,55:60,62:65,70:76,97:103),]

View(LMV2.1)

# **Appendix F**

Factor Analysis Code

#I want to combine the vignettes together by placing the vignette 2 questions under vignette 1 questions since they are the same, this will make running the factor analysis easier

#putting LMV2.1 under LMV1.1

LmVdata=data.frame(LMV1.1[,1:14])

#rename LMV2

names(LMV2.1)=names(LMV1.1)

#bind LMV2 to LMV1

LmVdata=rbind(LmVdata,LMV2.1[,1:14])

View(LmVdata)

#change LmVdata to numeric

LmVdata=lapply(lapply(LmVdata,as.character),as.numeric)

LmVdata=as.data.frame(LmVdata)

#run Factor Analysis

fa.parallel(LmVdata[,c(1:14)])

fa3=fa(LmVdata[,c(1:14)],nfactors=3,rotate="promax")

print.psych(fa3,sort=TRUE)

fa.diagram(fa3)

fa2=fa(LmVdata[c(1:14)],nfactors=2,rotate="promax") #go with this factor analysis because the factors make more sense using the 2 factor model compared to the three factor model

print.psych(fa2,sort=TRUE)

fa.diagram(fa2)

#the parallel said to use the three factor model, but I tried the 2 factor model and I liked it better - explain why you went with the 2 factor model

# **Appendix G**

Reliability Analysis Code

#Reliability for factor 1

alpha(LmVdata[,c(3,4,7,11,12,13)],check.keys = T)

#raw alpha of 0.82

#could drop question 4 and then explain the purpose of dropping it (increase reliability)

#look at Q4 and see if we like that question is necessary or important

alpha(LmVdata[,c(3,7,11,12,13)],check.keys = T)

#new raw alpha of 0.84

#Reliability for factor 2

alpha(LmVdata[,c(1,2,5,6,8,9,10,14)],check.keys = T)

#raw alpha of 0.85

#could drop question 1 and 14

#review items 1 and 14 to see if they are necessary or important

#re-run reliability analysis after removing items 1 and 14

alpha(LmVdata[,c(2,5,6,8,9,10)],check.keys = T)

#new raw alpha of 0.91

#Relability across all factors

alpha(LmVdata,check.keys = TRUE)

#raw alpha of 0.87

#remove items 1 and 14

#re-run reliability analysis after removing items 1 and 14

alpha(LmVdata[,2:13])

#new raw alpha 0.90

# **Appendix H**

Demographic Data Frame Code

#create demographic data frame

Demographics=data.frame(LMV1.1[,15:18])

#bind LMV2 demographics to LMV1 demographics

Demographics=rbind(Demographics,LMV2.1[,15:18])

View(Demographics)

#change blanks to NAs

Demographics[Demographics==""]=NA

#Combine factors to Demographics

Demographics=cbind(Demographics,fa2$scores)

View(Demographics)

#change age from factor to numeric

Demographics$Age=as.numeric(as.character(Demographics$Age))

#change ethnicity to be Caucasian against all other ethnicities - Ethnicity2

Demographics$Ethnicity2="Other"

Demographics[!is.na(Demographics$Ethnicity) & Demographics$Ethnicity==3,"Ethnicity2"] = "Caucasian"

#change ethnicity2 to a factor

Demographics$Ethnicity2=as.factor(Demographics$Ethnicity2)

# **Appendix I**

Data Analysis Code

#Data anlaysis - running a multiple linear regression on demographics and the factors

summary(lm(Demographics$MR1~Demographics$Gender+Demographics$Age+Demographics$Ethnicity2+Demographics$Employment,Demographics))

#Ethnicity2 was close to being significant so an independent sample t-test was computed to view it more independently from the rest of the variables

summary(lm(Demographics$MR1~Demographics$Ethnicity2,Demographics))

summary(lm(Demographics$MR2~Demographics$Gender+Demographics$Age+Demographics$Ethnicity2+Demographics$Employment,Demographics))

#nothing was significant or close to significant for this factor and demographics

#independent sample t-test

t.test(MR1~Ethnicity2,data=Demographics)

independentSamplesTTest(MR1~Ethnicity2,data=Demographics)