POLAR–ICE
Interdisciplinary Coordinated Education

Open-Ended Science Investigation Checklist

Testable Question –
- ☐ Question begins with *How, What, When, Who,* or *Which.*
- ☐ Question is measurable or able to be investigated with data.
- ☐ Question includes effects/variables being investigated.
- ☐ Question includes only 1-2 effects/variables are included in question.

Investigation Design –
- ☐ Variables are clearly defined.
- ☐ The number of variables is limited to 1-2 to change and 1-2 to measure the resulting change.
- ☐ If applicable, there are treatment and control groups.
- ☐ Variables that will be held constant or accounted for not being able to hold constant are highlighted.
- ☐ The method for data collection and how measurements will be taken is clearly explained.
- ☐ The frequency of data collection and recording is clearly explained.
- ☐ The data collected will provide an answer to the testable question.
- ☐ The tools, equipment, and methods used to collect the data are clearly explained.
- ☐ The way the data is collected will enable appropriate data interpretation for the testable question to be answered.
- ☐ The investigation will last long enough to collect enough data to answer the testable question.
- ☐ Data table is organized to encourage inspection of the raw data for patterns and trends while it is being collected.

Data Representation & Interpretation –
- ☐ Raw and averaged data are included in the figure.
- ☐ If applicable, outliers are identified and discussed.
- ☐ Figures/tables have detailed captions explaining what the figure/table is illustrating.
- ☐ Written interpretation of the data from the figures/tables is included.
- ☐ "Significantly different" is only used to describe a relationship if statistics are included to support the statement.
- ☐ Nominal data (two unrelated independent variables):
  - o Data is represented in a bar graph.
  - o Data is interpreted only to show the difference among the categories.
  - o Data is not interpreted to make predictions about what would happen to a third category.
- ☐ Ordinal data (independent variables that are related but not in the way that was measured):

- o Data is represented in a line graph.
- o Data is interpreted based on the relative ordered relationship among the categories.
- o Data is interpreted to make simple predictions.
- ☐ Interval-ratio data (independent variables that are related in the way that is measured and the measurements are proportional against a consistent scale):
  - o Data is represented in a scatterplot.
  - o The scatterplot has a line or range of best fit through the data points.
  - o Data is interpreted based on the measured relationship among the variables.
  - o Data is interpreted to discuss the relative strength of the relationship among the variables.
  - o Data is interpreted to predict one variable's outcome based on a known quantity of the other variable (within the data range or projected outside of the data range).

Conclusions –

- ☐ Conclusion statements indicate the degree of certainty about the results (e.g., how "sure" about the results).
- ☐ Conclusion statements highlight the overall pattern in the results.
- ☐ Conclusion statements refer to the descriptive statistics as well as outliers, if applicable, and the variation in the raw data.
- ☐ Conclusion statements discuss the potential impact of investigation design or other variables on the results.
- ☐ If applicable, conclusion statements indicate the relative strength of the observed relationship or pattern.
- ☐ Conclusion statements connect the results to the bigger picture without making inference leaps.