Identifying an Empirical Research Article

Veronica Bielat, Information Services Librarian, Wayne State University Library System
Navaz Bhavnagri, PhD, Associate Professor, Wayne State University College of Education, Teacher Education Division
September 2008
What is Empirical Research?

- Empirical means *experience* or *data driven*. For example: This data could be from observation or experiment.
- Empirical research *articles* are published in *scholarly, peer-reviewed (or refereed) journals*.
- Most empirical research articles include the following *five components*:
  1. Introduction and Literature Review
  2. Method
  3. Results
  4. Discussion or Conclusion
  5. References
Most scholarly (peer-reviewed, refereed) journal articles are preceded by an ABSTRACT, which gives you a short synopsis of the article’s content.
Look for 5 Components

1. Introduction and Literature Review
2. Method
3. Results
4. Conclusion
5. References
Introduction and Literature Review

This section will provide the **need or rationale** of the particular research project, state their **research question**, **research statement** and/or **hypothesis**, and will **review the literature** that supports (or contradicts) their research question, research statement and/or hypothesis.

---

**Reasons for undertaking research**

---

**Early Formal Science and Technology Education: A Disturbing Picture**

Despite such assessments of their cultural and personal value, science and technology education continues to be accorded low status in elementary schools. This low status is evident in the small proportion of classroom time devoted to these subjects, and the lack of confidence teachers display with regard to the disciplines themselves, as well as how to teach them (Harlen, 1997; Lambert, 1996; Lokan, Ford, & Greenwood, 1996; Newton, 1992). Also, the supply, storage, and maintenance of resources appear to pose a major difficulty for teachers (Lambert, 1996). The urgency of ameliorating this situation through early and successful science and technology education is now clear. Recent science education research (see Osborne & Freyberg, 1985) reveals that ideas formed early in life are highly resistant to change, given their primacy and their frequency of use (Ames, 1968). Furthermore, failure to provide a rich, broad, early experience of seminal ideas of the culture risks gaps which may well impede the later development of ideas (Minsky, 1985).

**Supporting ideas with other scholarly research**
Method

This section describes the methodology or research design used to gather the data for the study.

Typically a methodology includes:

- A description of the participants or subjects.
- A description of the research method, measure, overall research design and/or an approach to data analysis.

The beginning paragraph in the description of the methodology

THE INVESTIGATION: RESEARCH DESIGN, METHODOLOGY, AND REPORTING

A research design and methodology was required that would allow us sustained access to children’s scientific and technological inquiries with their families at home. Fortunately, an appropriate context arose that offered us the opportunity to conduct such an investigation with kindergarten and year-one children at school. It also provoked, legitimated, and gave us access to continuing scientific and technological investigations in families at home.
Results

This section describes (through narrative and charts, graphs, tables or other graphical elements) the final findings reached through analysis of the data. This is sometimes called Results or Findings. The results can be qualitative or quantitative.

Examples of Results

Deane's Family's Participation. In our conversation prior to the classroom sessions, Diane enthusiastically talked about her husband (Robert) and her two sons tending together under the hood of the car. Just as Diane's mother, a geotechnical engineer, to explore rock platforms. Also, during Dean's brother had done similar sessions on the topic of electricity. As Diane and Robin talked together, Diane confessed that Robert knew more about the

Table 2

\[ t\text{-Test Values for Comparisons on Achievement Means Between Students Successfully Completing 0 to 1 Tasks and Students Completing 3 to 4 Tasks} \]

<table>
<thead>
<tr>
<th>Group</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>L - M</td>
<td>3.1</td>
</tr>
<tr>
<td>2L - 2M</td>
<td>3.8*</td>
</tr>
<tr>
<td>3L - 3M</td>
<td>6.7*</td>
</tr>
<tr>
<td>EL - EM</td>
<td>1.4</td>
</tr>
<tr>
<td>G - E, M</td>
<td>2.2</td>
</tr>
<tr>
<td>R, L - E, M</td>
<td>1.2</td>
</tr>
<tr>
<td>G, L - G, M</td>
<td>1.3</td>
</tr>
</tbody>
</table>

*Significant at the 0.001 level
1 = Purity verbal form of instruction
2 = Instruction using activities plus manipulatives along with some verbal instruction

Figure 2

The Accuracy in Long Temporal Judgment Order Task for Each ISI (Interstimulus Interval) Condition. Error Bars Represent SEM

In a narrative

In a table

In a graph
Discussion or Conclusion

This section provides a discussion, summary, or conclusion, bringing together the research question, research statement and/or hypothesis and the findings. It is sometimes called Implications.

SUMMARY AND IMPLICATIONS

We began this article with the continuing concern about the effectiveness of early science and technology education in formal classrooms. Accumulating evidence of families’ participation in learning, often in informal settings, appeared to us to offer a fruitful way forward for early science and technology education. However, we noted that previous research stopped short of distilling the educational significance of what families do. This article provides empirical evidence, not only of the nature of the families’ engagement
References

This section provides a list of cited references. This list references all of the articles cited within the article. Most of these articles would have been referred to (cited) in the Literature Review and Results sections.