Understanding the gap between research and practice: Chemistry faculty's awareness and reported implementation of evidence-based instructional practices (EBIPs)

Matthew Moffitt

University of Nebraska-Lincoln

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Abstract for DBER Group Discussion on 2013-03-14

Presenter, Department(s):
Matthew Moffitt
Graduate Student
Department of Chemistry
University of Nebraska-Lincoln

Title:
Understanding the Gap between Research and Practice: Chemistry Faculty’s Awareness, Reported Implementation, and Perceived Difficulties in Implementing Evidence-Based Instructional Practices

Abstract:
After decades of chemical education research and reform efforts to enhance the learning environments provided in gateway chemistry courses, the impact on instructional practices is yet to be determined. Years of research clearly demonstrate that evidence-based instructional practices (EBIPs) – practices grounded in learning theories – promote students’ learning and attitudes toward the field. Therefore, it is critical to characterize the state of instructional practices in these courses to better understand the uptake of EBIPs by chemistry instructors. This study addresses this need by characterizing chemistry faculty’s self-reported awareness and implementation of EBIPs and factors that influence their implementation decisions. Online surveys were collected from assistant professors in various stages of their academic appointment at research-intensive institutions throughout the country (N=86) and assistant/associate professors with specific interest in teaching (N=20). Comparisons between the different types of faculty on their self-reported awareness, implementation of EBIPs and perceived barriers to implementation will be presented.
Understanding the gap between research and practice:

Chemistry faculty's awareness and reported implementation of evidence-based instructional practices (EBIPs)

Matt Moffitt
Department of Chemistry
University of Nebraska Lincoln
Gap Between Research and Practice

- “In education as in other fields, translating research into practice has posed a challenge for decades”

- Evidence-based instructional practices

 Prior studies are based only on self reports

Traditional chemistry lecture

Understanding of evidence-based instructional practices

GAP


- the picture/figure should be a representation of the gap between research and practice; see how Brian Couch used pictures/figures to illustrate his points.

- The citation needs to be APA style or ACS style: pick one and be consistent throughout the talk

- you need to introduce what you mean by evidence-based teaching practices here.

- Why do you have that statement? Should something else be included before to bring more meaning to this statement? Does it make sense to start there? Look at how the dBER report approaches it (in what section of the chapter this statement fall in)

Always think: What is the message I want my listener to leave with?
Marilyne Stains, 3/10/2013
Establishing a Baseline

• “A reliable baseline understanding of faculty instructional practices in the sciences and engineering ... is needed” DBER Report 2012

- the picture/figure should be a representation of the gap between research and practice; see how Brian Couch used pictures/figures to illustrate his points.

- The citation needs to be APA style or ACS style: pick one and be consistent throughout the talk

- you need to introduce what you mean by evidence-based teaching practices here.

- Why do you have that statement? Should something else be included before to bring more meaning to this statement? Does it make sense to start there? Look at how the dBER report approaches it (in what section of the chapter this statement fall in)

Always think: What is the message I want my listener to leave with?

Marilyne Stains, 3/10/2013
Disciplinary Differences

- Prior studies in other disciplines show differences in current implementation of EBIPs at research intensive institutions

<table>
<thead>
<tr>
<th></th>
<th>Physics</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Just in Time Teaching</td>
<td>8%</td>
<td>15%</td>
</tr>
<tr>
<td>Peer Instruction</td>
<td>28%</td>
<td>18%</td>
</tr>
</tbody>
</table>

- Bullet points needed and aligned with each others.
- APA or ACS citations
- In the title there is a - between evidence and based; it should be here as well;
- Spell out JITT and PI; spell out R1 as well
- Compare your title to the content of the slide: does it make sense? What is the message you want to send on this slide? How is it related to what you are presenting in this talk?

Marilyne Stains, 3/10/2013

MM1

Literature Discrepencies?
Matt Moffitt, 3/11/2013
Theoretical Framework
Innovation-decision Process

Practitioner is aware of the practice
• Diffusion tools
• Prior conditions such as felt needs, norms of the department

Practitioner is interested in the practice
Perceived attributes of practice
• Personal characteristics
• Communication channels

Practitioner evaluates the practice
Practitioner tries the practice

Practitioner adopts the practice

depends on

- formatting does not work: either use a different template or rework the figure

- citation

Marilyne Stains, 3/10/2013
Research Questions

To what extent are chemistry faculty aware of EBIPs?

- Practitioner is aware of the practice
- Practitioner is interested in the practice
- Practitioner evaluates the practice
- Practitioner tries the practice
- Practitioner adopts the practice

- the research question is really underemphasized in its current form
- since you have 2 RQ your title should be plural
- add chemistry to your question
- same for next slide

Marilyne Stains, 3/10/2013
Research Questions

Practitioner is aware of the practice

Practitioner is interested in the practice

Practitioner evaluates the practice

Practitioner tries the practice

Practitioner adopts the practice

To what extent have chemistry faculty adopted EBIPs in their classrooms?

Methods

• Context of study
  • Evaluation of the Cottrell Scholar Collaborative (CSC) New Faculty Workshop
• Methodological design: quasi-experimental
- Use colors, arrows to make this a bit more clear
- one bullet should read context and the other methodological design
- if you abbreviate CSC the add the abbreviation in you first statement
- add ACS and research corporation logo

Marilyne Stains, 3/10/2013
## Participants

All faculty are at research intensive institutions.

<table>
<thead>
<tr>
<th></th>
<th>Participants</th>
<th>Control Group</th>
<th>CSC Awardees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of faculty</td>
<td>25</td>
<td>57</td>
<td>21</td>
</tr>
<tr>
<td>Years of experience</td>
<td>1-2</td>
<td>3-4</td>
<td>5+</td>
</tr>
<tr>
<td>Courses taught per semester (mean)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Teaching</td>
<td>31%</td>
<td>40%</td>
<td>29%</td>
</tr>
<tr>
<td>Research</td>
<td>55%</td>
<td>47%</td>
<td>54%</td>
</tr>
<tr>
<td>Service</td>
<td>14%</td>
<td>13%</td>
<td>17%</td>
</tr>
</tbody>
</table>
M7

- R1: spellout
- make the table fit the appropriate area
- rotate "teaching experience" 180
- it should not say assignment but appointment
- eliminate the +/- 1 for courses taught; put (mean) after courses taught per semester
- since you have room spell out N
- we need to highlight the type of course people teach; this will help explain some of the results

Marilyne Stains, 3/10/2013
Data Collection

- Instrument
  - Online Survey
- Sections of survey
- Background
- Approaches to Teaching
  - Self Efficacy Toward Teaching Inventory
  - Awareness of and reported implementation of EBIPs
    - Instructional practices (20)
      - E.g. Think Pair Share or POGIL
- Awareness of and reported implementation of EBIPs
  - Instructional practices (20)
  - E.g. Think Pair Share or POGIL

<table>
<thead>
<tr>
<th>Groups Involved</th>
<th>Administered</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre survey</td>
<td>All groups</td>
<td>July 24^{th}</td>
</tr>
<tr>
<td>Workshop</td>
<td>Only participants</td>
<td>August 9^{th}</td>
</tr>
<tr>
<td>Post Survey</td>
<td>All groups</td>
<td>August 15^{th}</td>
</tr>
</tbody>
</table>

Hora, M.T. Wisconsin Center for Education Research. CHER Project.
- It should say that this is an online survey that takes about 20 minutes to fill out, window to answer, when were data collected
- nobody will know what the ATI is; how was the self-efficacy measured; need to have citation for these and the surveys that we drew from
- highlight the likert scale options for the section corresponding to this presentation
- how many EBIPs?

think about your audience: you are preparing this like everyone knows what you are talking about.

Marilyne Stains, 3/10/2013
Example Survey Item

• In your target course, please indicate your level of familiarity of the following instructional strategies or methods:

• 6 point likert scale
  • Never heard of it
  • Heard the name but don’t know much else
  • Familiar but have not used
  • Familiar and plan to implement
  • Have used all or part
  • Currently using all or part

• For analysis
  • Unaware
  • Familiar (non user)
  • Past adopter
  • Current adopter
Findings: Instructional Practices

Level of unfamiliarity

- On average, faculty were not aware of 30% practices
- Significant variations existed between groups; $F(2,99)= 7.616$, $p<0.01$
- use different colors and titles to identify better what findings you are talking about
- were unknown to whom: control group, participants, CSc?
- what do you mean variations between groups: make a short sentence
- what does your y axis represent
- make the font bigger on your graph
- delete the grid form your graph
- center your graph

Marilyne Stains, 3/10/2013
Findings: Instructional Practices

Unfamiliar Instructional Practices

- **PLGI**: 59% Unaware, 39% Familiar
- **Learning Cycle**: 61% Unaware, 31% Familiar
- **Think Aloud Paired Problem Solving**: 64% Unaware, 34% Familiar
- **Chem Connections Workbook**: 79% Unaware, 21% Familiar

Faculty’s awareness of practices (%)
- as we talked about put the number in the middle of each bar
- bigger font in your graph
- what is TAPPS; most people won't know
- i would say pust useR and current useR
- What does your x axis represent?
- remove grids

Marilyne Stains, 3/10/2013
Findings: Instructional Practices

Level of Awareness (non-users)

- On average, faculty were aware of 45% of the provided practices but were non users

<table>
<thead>
<tr>
<th>Practice</th>
<th>Unaware</th>
<th>Familiar</th>
<th>Past Adopter</th>
<th>Current Adopter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Studies</td>
<td>8</td>
<td>62</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>PBL</td>
<td>12</td>
<td>60</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Peer Instruction</td>
<td>14</td>
<td>59</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Molecular Animations</td>
<td>16</td>
<td>51</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>Computer Simulations</td>
<td>18</td>
<td>50</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Cooperative Instruction</td>
<td>19</td>
<td>56</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Supplimental Instruction</td>
<td>23</td>
<td>51</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>PLTL</td>
<td>31</td>
<td>55</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>POGIL</td>
<td>31</td>
<td>59</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>SCALE-UP</td>
<td>42</td>
<td>53</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>JiTT</td>
<td>43</td>
<td>51</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Think Pair Share</td>
<td>17</td>
<td>45</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Interactive Lecture</td>
<td>34</td>
<td>39</td>
<td>17</td>
<td>10</td>
</tr>
</tbody>
</table>
again think about your audience: what do you mean not used: never used? used in the past but not currently?
- add numbers inside the bars
- spell out the practices except for POGIL, PBL, SCALE-UP and JiTT and PLTL
- nobody will know what LINT is!
- what does your x axis represent?
- bigger font: right now nobody in the back of the room will be able to read your categories
- same as previous slide for titles and making clear what you are talking about on this slide
- TPS, LINT are below the 50% threshold for familiar, they should be grouped at the bottom and you should make sure to highlight them as being different than the others in term of the proportion: for all the others, 50% of the participants stated them as familiar; not these two.

Marilyne Stains, 3/10/2013
Findings: Instructional Practices

Level of Adoption

- On average, faculty reported the past adoption of 13%

- On average, faculty reported current adoption of 11%
why are the figures not centered or aligned with text in a way that makes sense?

Either center them below the text or aligned them both on the right side with text on the left: be consistent

- again I would say user rather than use
- same thing for the titles as before
- add a bullet to explain the statistics: right now your statistics do not match the statement you have prior; if you don't want to say anything, then put the statistic below the figure

Marilyne Stains, 3/10/2013
Findings: Instructional Practices

Adopted Practices

- **Contextual Instruction**
  - Unaware: 18
  - Familiar: 30
  - Past Adopter: 23
  - Current Adopter: 28

- **Learning Goals**
  - Unaware: 18
  - Familiar: 30
  - Past Adopter: 26
  - Current Adopter: 25

- **Collaborative Instruction**
  - Unaware: 7
  - Familiar: 40
  - Past Adopter: 34
  - Current Adopter: 19

Faculty’s awareness of practices (%)
- same as before for graphs, title etc.

- I count 20 practice being represented between all the graphs: is that correct? I thought it was 21?

Marilyne Stains, 3/10/2013
Findings: Assessment Strategies

Level of Unfamiliarity

- On average, faculty were unaware of 26% of the assessment strategies

\[ F(2,99) = 4.942 \quad p < 0.01 \]
- all the changes i asked for in the previous set of slides apply them to this set

Marilyne Stains, 3/10/2013
Findings: Assessment Strategies

Level of Awareness (non-users)

- On average, faculty were aware of 47% of the strategies

<table>
<thead>
<tr>
<th>Practice</th>
<th>Unaware</th>
<th>Familiar</th>
<th>Past Adopter</th>
<th>Current Adopter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online HW</td>
<td>2</td>
<td>58</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Clickers</td>
<td>4</td>
<td>73</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Formative Assessment</td>
<td>17</td>
<td>48</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Inst Designed Feedback Forms</td>
<td>19</td>
<td>49</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>Concept Inv</td>
<td>30</td>
<td>50</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Minute Paper</td>
<td>31</td>
<td>61</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Learning Gains Pre Post</td>
<td>32</td>
<td>51</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Concept Maps</td>
<td>34</td>
<td>55</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Muddiest Point</td>
<td>43</td>
<td>50</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>
Findings: Assessment Strategies

Level of Adoption

- On average, faculty reported that 13% were adopted in the past

\[ \text{F}(2,99)=8.423 \quad p<0.01 \]

- On average, faculty reported that 12% are being adopted currently

\[ \text{F}(2,99)=8.423 \quad p<0.01 \]
missing a graph!
Marilyne Stains, 3/10/2013
Findings: Assessment Strategies

Adopted Practices

- **Particulate Nature of Matter Questions on Midterm**
  - Unaware: 27
  - Familiar: 24
  - Past Adopter: 27
  - Current Adopter: 21

- **Open Ended Questions on Midterm**
  - Unaware: 8
  - Familiar: 45
  - Past Adopter: 23
  - Current Adopter: 24

- **Conceptual Questions on Midterm**
  - Unaware: 7
  - Familiar: 33
  - Past Adopter: 26
  - Current Adopter: 34

Faculty’s awareness of practices (%)
watch your graph title for consistency with the rest.

What does PNOM means (spell it out);

- open-ended midterm is a misleading statement: it could mean many differnt things.

Marilyne Stains, 3/10/2013
Discussion

Practitioner is aware of the practice

Practitioner is interested in the practice

Practitioner evaluates the practice

Practitioner tries the practice

Practitioner adopts the practice

To what extent are chemistry faculty aware of EBIPs?

62% of those in the survey

the title of your slide is misspelled and ppt let you know that!

color theme need to be worked out so that the RQ and results pop out more.

Marilyne Stains, 3/10/2013
Discussion

Practitioner is aware of the practice

Practitioner is interested in the practice

Practitioner evaluates the practice

Practitioner tries the practice

Practitioner adopts the practice

20% of EBIPs that faculty are familiar with

To what extent have chemistry faculty adopted EBIPs in their classrooms?

think about your audience again and try to make the number statement a bit more clear

- align your question and results with the arrow

Marilyne Stains, 3/10/2013
Conclusion

Practitioner is aware of the practice

Practitioner is interested in the practice

Practitioner evaluates the practice

Practitioner tries the practice

Practitioner adopts the practice

What factors are influencing faculty’s decisions?

65%

57%

23%

12%

M19


Instructional Practices

Assessment Strategies

What factors are influencing faculty’s decisions?
relate these questions mark to the theoretical framework; this would help you transition to future work

Marilyne Stains, 3/10/2013
Future Directions

- Identification of factors

- Enhancing validity
  - Observational study

- Expansion to a more representative sample
  - Focus on multiple levels of institutions

<table>
<thead>
<tr>
<th></th>
<th>Two –year</th>
<th>Four-year (B.A.)</th>
<th>Four-year (Grad)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Just in Time Teaching</td>
<td>7%</td>
<td>11%</td>
<td>8%</td>
</tr>
<tr>
<td>Peer Instruction</td>
<td>19%</td>
<td>38%</td>
<td>28%</td>
</tr>
</tbody>
</table>

- citation related to the need for observational study
- instead of national study, have "expension to more representative sample" or something like that; under neath include limitations from previous slide and delete previous slide
- make this slide more visually appealing
- move validation of the survey to the end and indicate why it is needed.

Marilyne Stains, 3/10/2013
Thank you for your time

mmoffitt@unl.edu
the N is too big

Marlyne Stains, 3/10/2013
References

• Hora, M.T. Wisconsin Center for Education Research. CCHER Project.
if you show this slide, you need to have full citations for all of them and use the same format and bold the title like you did for everything else.
Marilyne Stains, 3/10/2013