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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

M1

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

- Prior studies are based only on self reports

Evidence-based instructional practices

anding of evidence-base
) at t dary

GAP

Traditional chemistry lecture

ciation for Engineering Education Conference, Fremantle, Australia, 2011.
view Special Topics-Physics Education Research **2009,** *5* (2), 020107.
Tewksbury, B. J. et al. *Journal of Geoscience Education* **2005**, *53*(3), 237-250.
National Research Council, *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*. The National Academic Press: Washington, DC 2012.

Slide 2

M1

- 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 incldued before to bring more meaning to this statement? Does it make sense to start there? Look at how the dBER report appraoches 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

M25

- "A reliable baseline understanding of faculty instructional practices in the sciences and engineering … is needed" DBER Report 2012

National Research Council, *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*. The National Academic Press: Washington, DC 2012.

Slide 3

M25

- 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 incldued before to bring more meaning to this statement? Does it make sense to start there? Look at how the dBER report appraoches 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

M2 MM1

Disciplinary Differences

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

	Physics	Engineering
Just in Time Teaching	8%	15%
Peer Instruction	28%	18%

Borrego, M. et al. 2011 Australasion Association for Engineering Education Conference, Fremantle, Australia, 2011.
Henderson, C., & Dancy, M. H. *Physical Review Special Topics-Physics Education Research* **2009,** *5* (2), 020107.

Slide 4

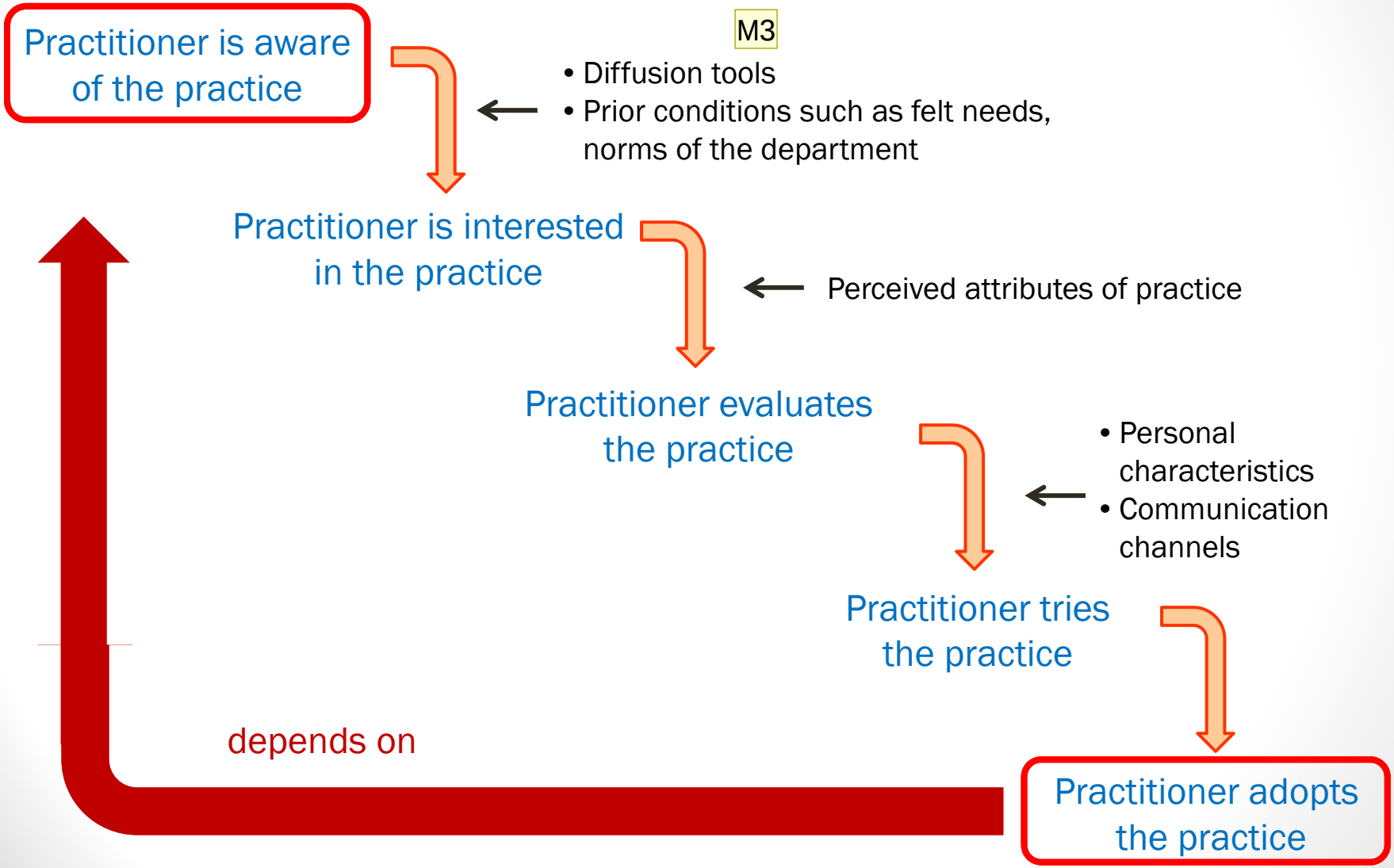
M2 - Bullet points needed and aligned with each others.
- APA or ACS citations
- in the title there is a - between evidence and based; it should eb here as well;
- spell out jitt and PI; spell out R1 as well
- compare your title to the content of the slide: does it make sense? What is the message you 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



Rogers, E.M. *Diffusion of innovations*. Free Press: 1995.

Slide 5

M3 - formatting does not work: either use a diffrent 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

M4

Rogers, E.M. *Diffusion of innovations*. Free Press: 1995.

Slide 6

M4

- 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

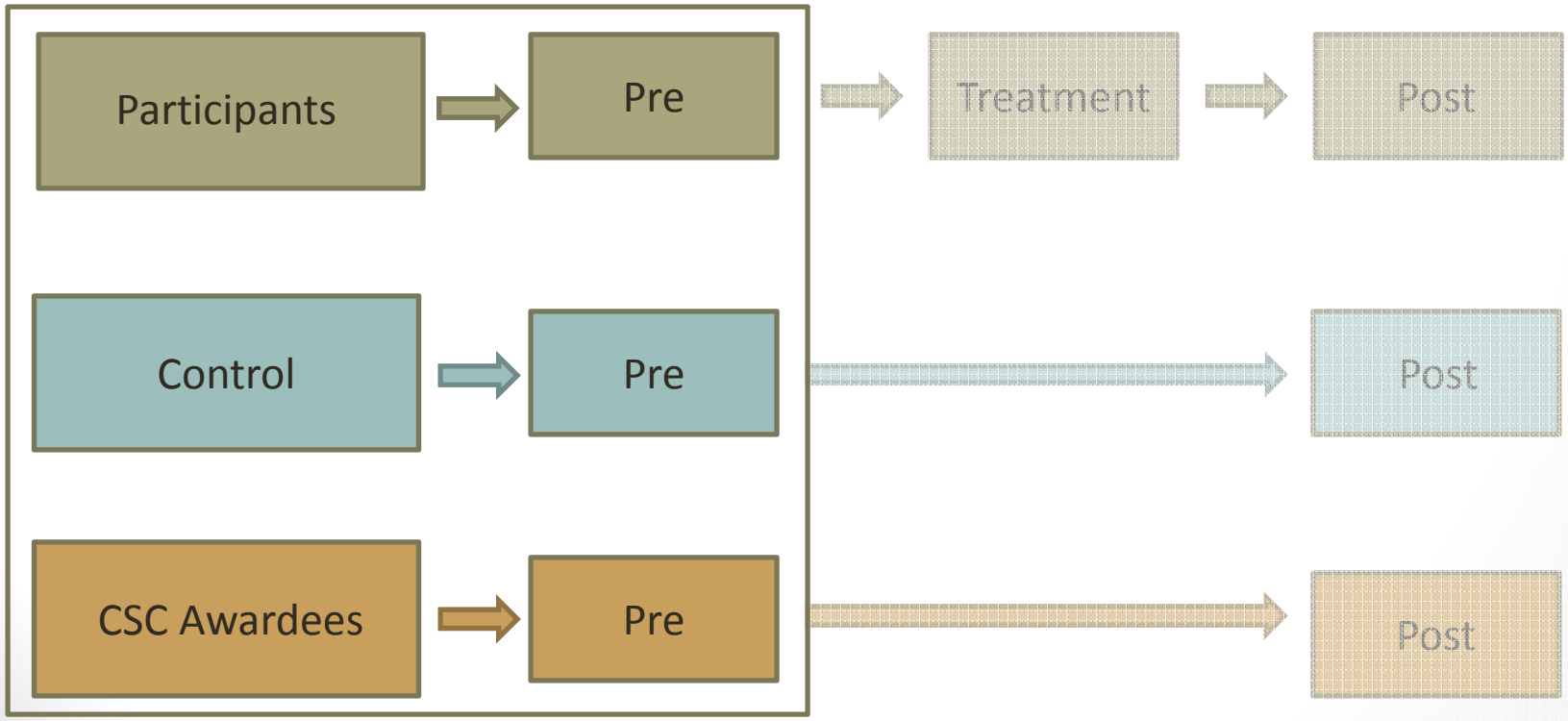
To what extent have chemistry faculty adopted EBIPs in their classrooms?

Rogers, E.M. *Diffusion of innovations*. Free Press: 1995.

Methods

M5

- Context of study
  - Evaluation of the Cottrell Scholar Collaborative (CSC) New Faculty Workshop
- Methodological design: quasi-experimental



Slide 8

M5

- 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

M7

		Participants	Control Group	CSC Awardees
	Number of faculty	25	57	21
Teaching Experience	Years of experience	1-2	3-4	5+
	Courses taught per semester (mean)	1	1	1
Appointment	Teaching	31%	40%	29%
	Research	55%	47%	54%
	Service	14%	13%	17%

All faculty are at research intensive institutions.

Slide 9

M7

- R1: spellout
- make the table fit the appropriate area
- rotate "teaching experiuence" 180
- it should not say assignment but appointment
- elimiate 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

M24

- Instrument
  - Online Survey
- Sections of survey
  - Background
  - Approaches to Teaching Inventory
  - Awareness of and reported implementation of EBIPs
    - Instructional practices (20)
      - E.g. Think Pair Share or POGIL
- Timeline
  - 20 minutes to complete on average

	Groups Involved	Administered	Duration
Pre survey	All groups	July 24th	2 weeks
Workshop	Only participants	August 9th	1.5 days
Post Survey	All groups	August 15th	2 weeks

Henderson, C., & Dancy, M. H. *Physical Review Special Topics-Physics Education Research* **2009,** *5* (2), 020107.

Hora, M.T. Wisconsin Center for Education Research. CCHER Project.

Prieto, L. R.; Altmaier, E. M., *Research in Higher Education* **1994**, 35 (4), 481-497.

Tewksbury, B. J. et al. *Journal of Geoscience Education* **2005**, *53*(3), 237-250.

Trigwell, K. et al., *Higher Education Research & Development* **2005**, 24 (4), 349-360.

Slide 10

M24

- 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

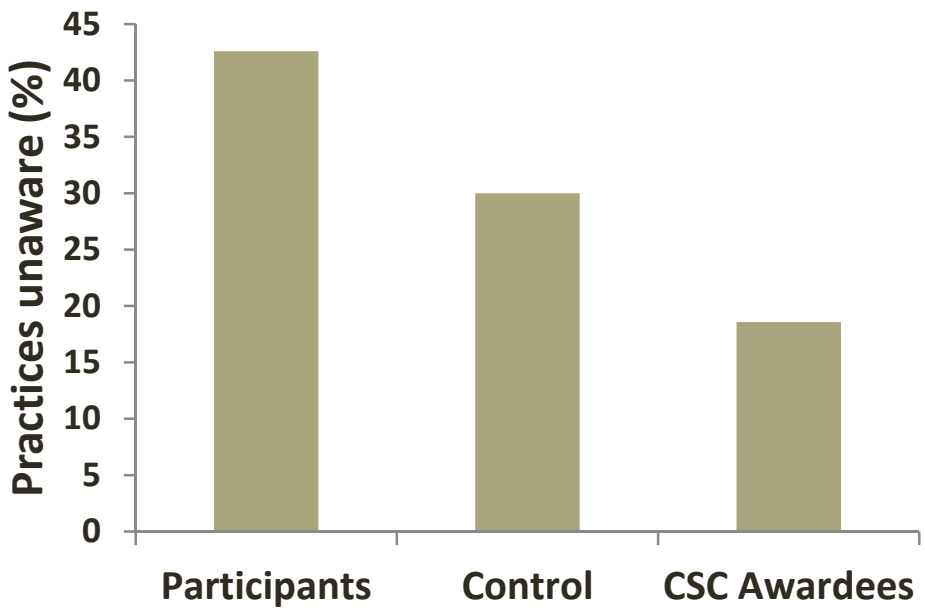
- For analysis
  - Unaware
  - Familiar (non user)
  - Past adopter
  - Current adopter

Findings: Instructional Practices

M8

Level of unfamiliarity

- On average, faculty were not aware of 30% practices
- Significant variations existed between groups; $F(2,99)= 7.616$ $p<0.01$



Slide 12

M8

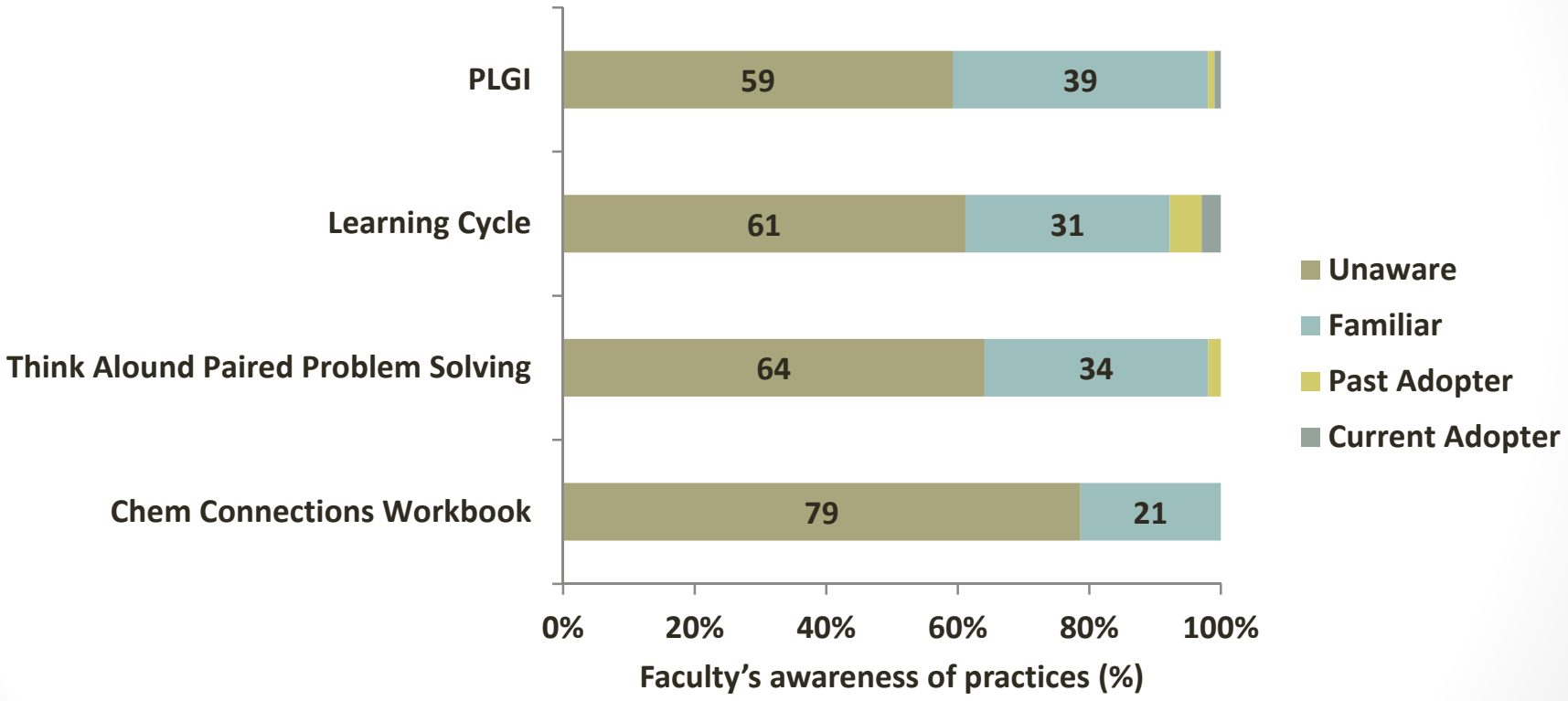
- use different colors and titles to identify better what findings you are talking about
- were unknown to whom: control group, participants, CSc?
- what do you mean variations between groups: make a short sentence
- what does your y axis represent
- make the font bigger on your graph
- delete the grid form your graph
- center your graph

Marilyne Stains, 3/10/2013

Findings: Instructional Practices

M9

Unfamiliar Instructional Practices



Slide 13

M9

- 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

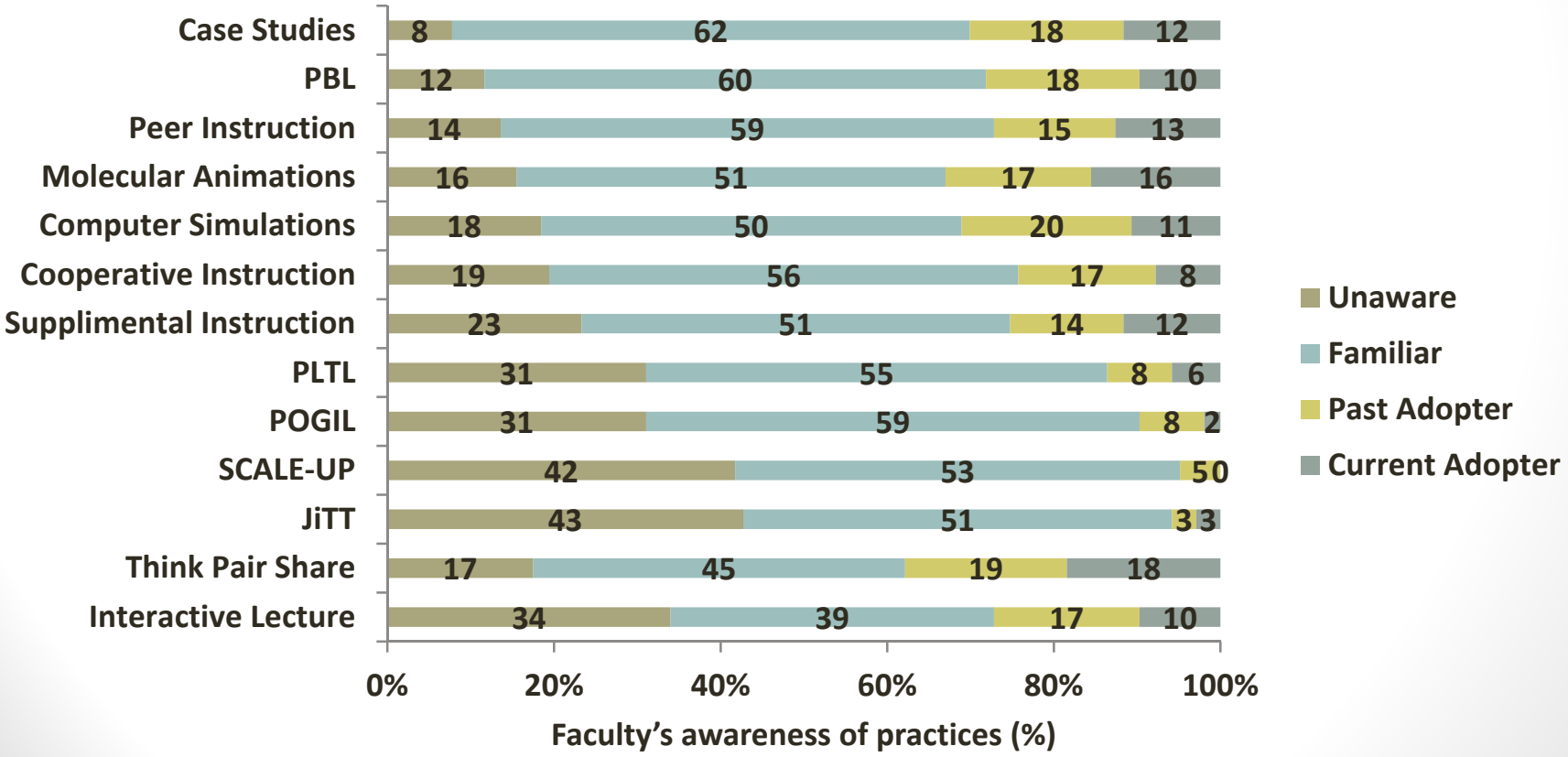
Marilyne Stains, 3/10/2013

Findings: Instructional Practices

M10

Level of Awareness (non-users)

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



Slide 14

M10 again think about your audience: what do you mean not used: never used? used in the past but not currently?
- add numebrs inside the bars
- spell out the practices except for POGIL, PBL, SCALE-UP and JiTT and PLTL
- nobody will knwo what LINT is!
- what does your x axis represent?
- bigger font: right now nobody in the back of the room will be able t oread your categories
- same as previous slide for titels and making clear what you are talking about on this slide
- TPS, LINT are below the 50% treshold for familiar, they should be grouped at the bottom and you should make sure to highlight them as being dffernt than the others in term of the proportion: for all the others, 50% of the participants stated them as familiar; not these two.

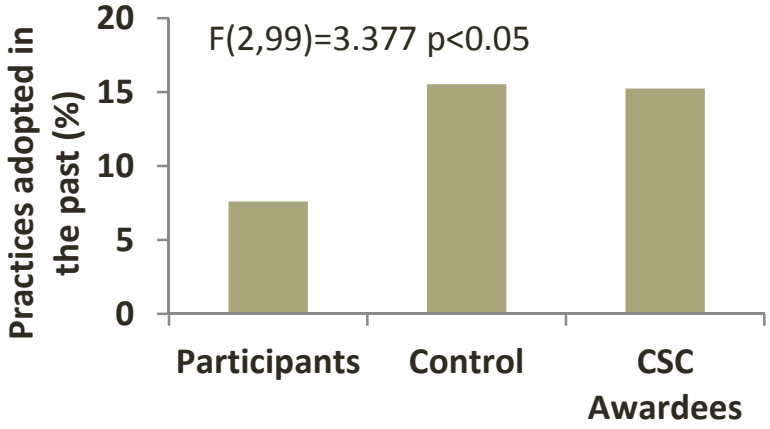
Marilyne Stains, 3/10/2013

Findings: Instructional Practices

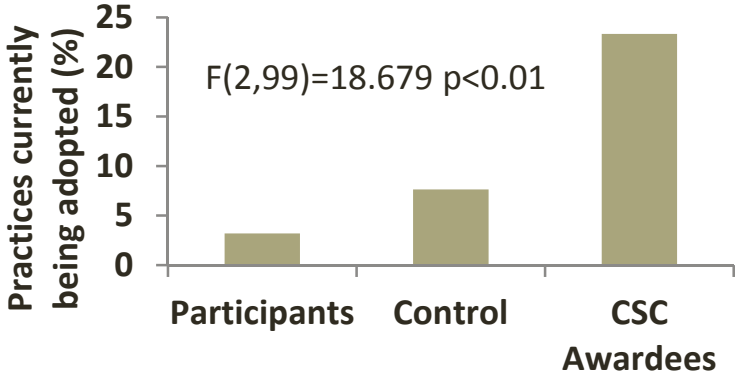
M11

Level of Adoption

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



- On average, faculty reported current adoption of 11%



Slide 15

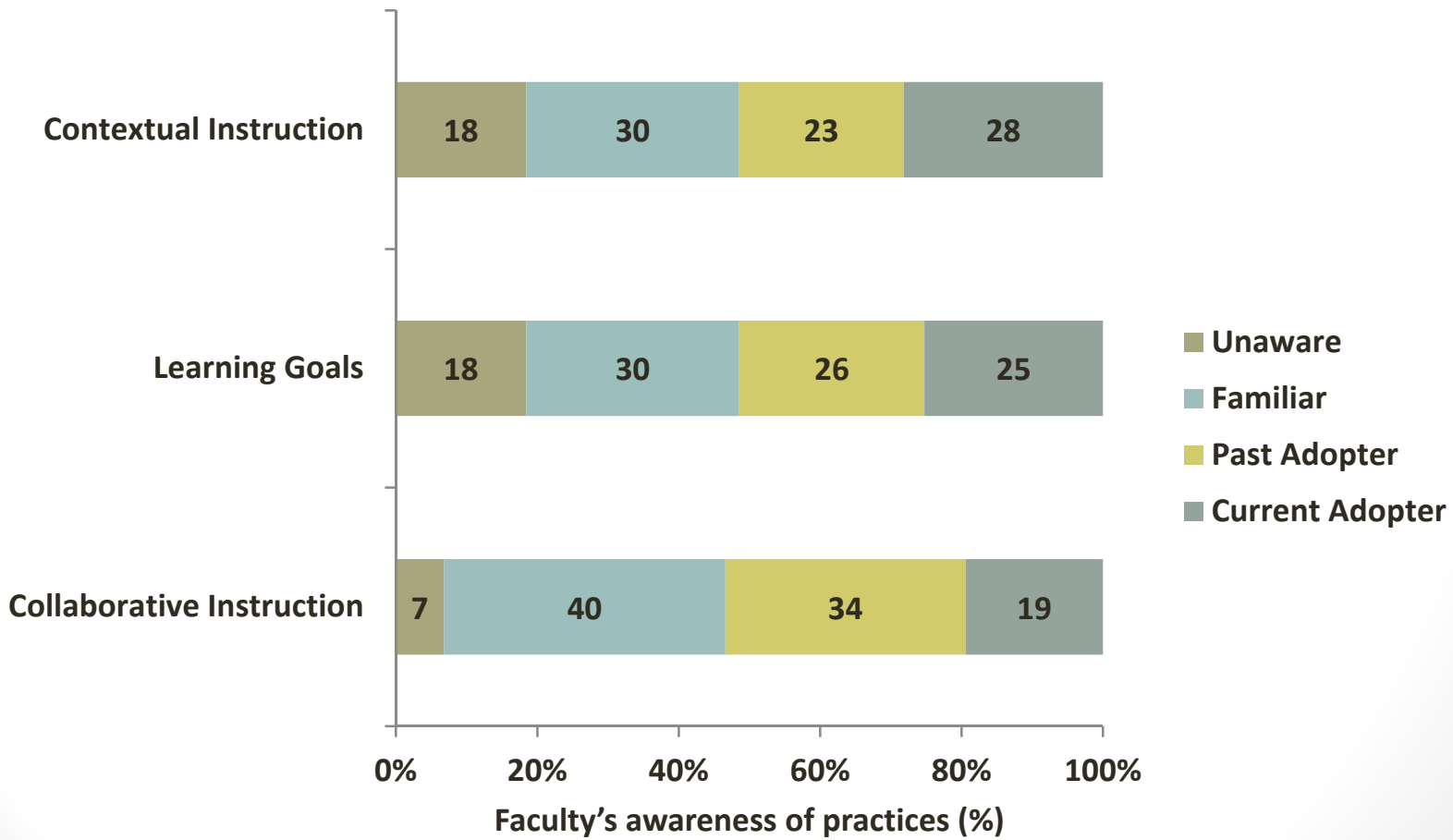
M11 why are the figures not centerd?or aligned with text in a way that makes sense?
Either center them below the text or aligned them both on the right side with text on the left: be consistent
- again i would say user rather than use
- same thing for the titels as before
- add a bullet to explainr the 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

M12

Adopted Practices



Slide 16

M12 - same as before for graphs, title etc.

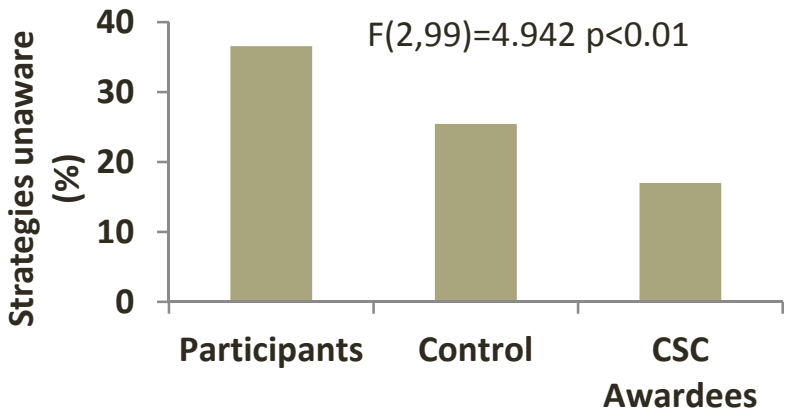
- i count 20 practice being represented between all the graphs: is that correct? I thought it was 21?
Marilyne Stains, 3/10/2013

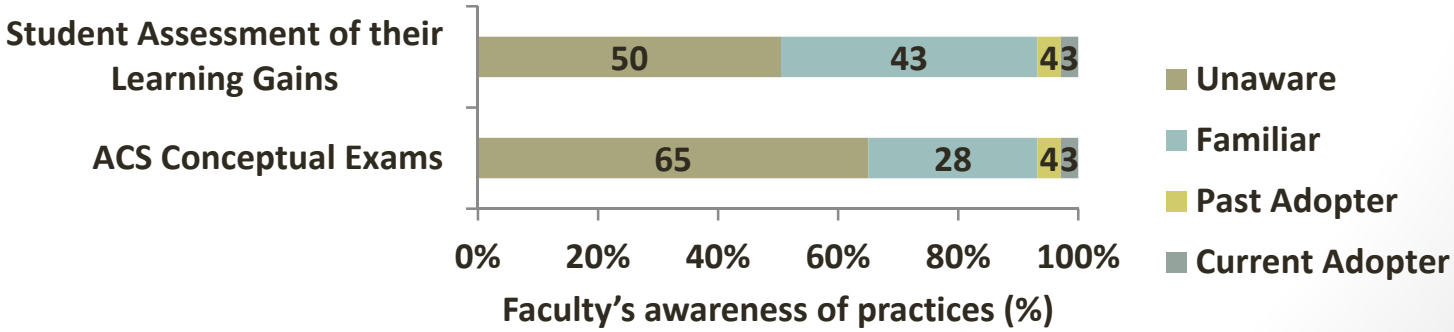
Findings: Assessment Strategies

M13

Level of Unfamiliarity

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





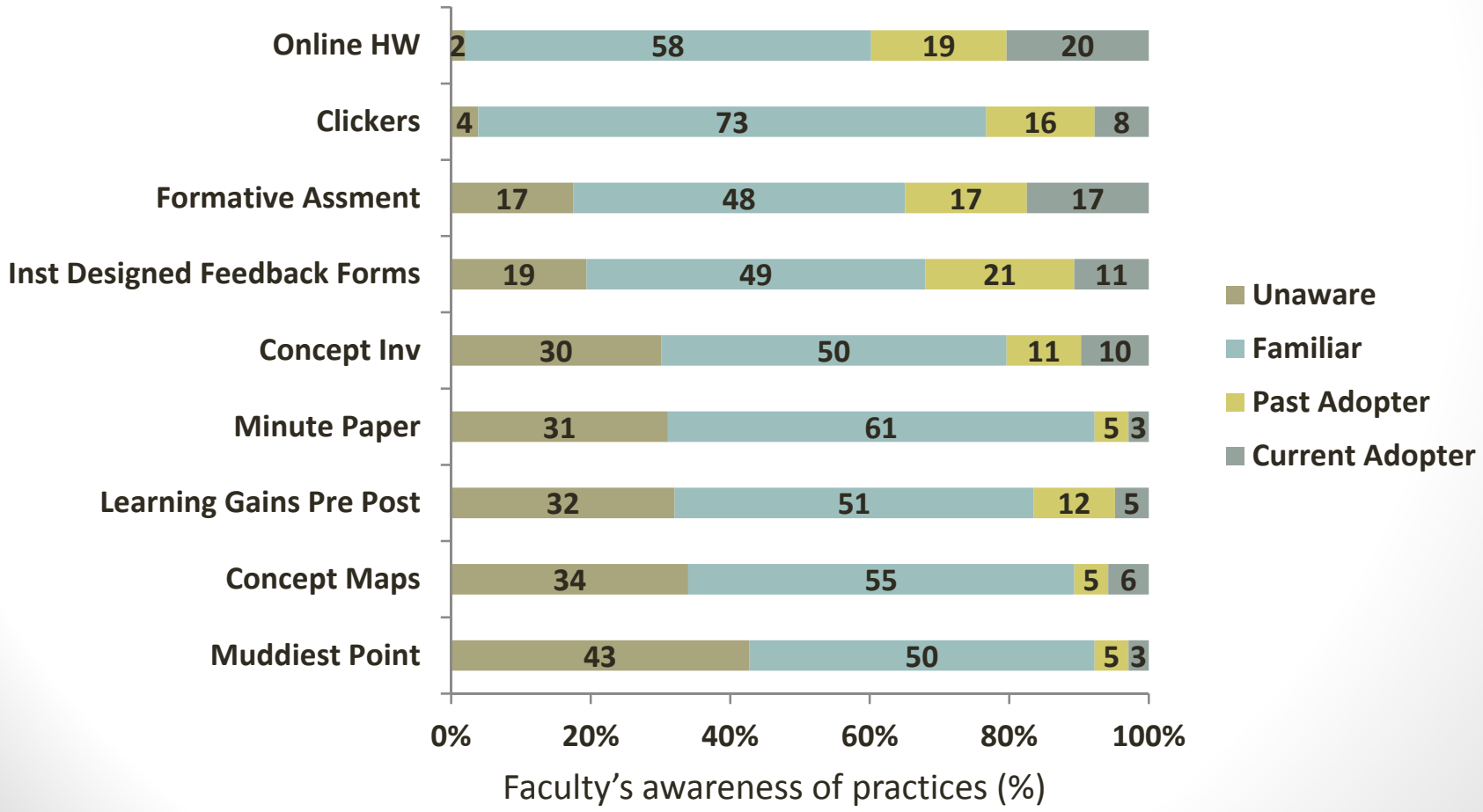
Slide 17

M13 - 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)

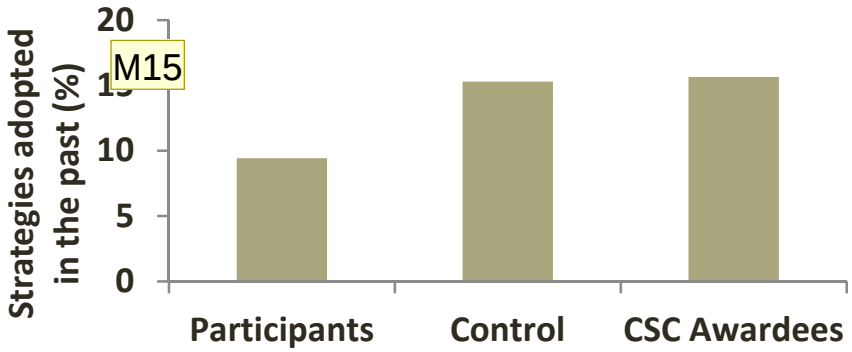
- On average, faculty were aware of 47% of the strategies



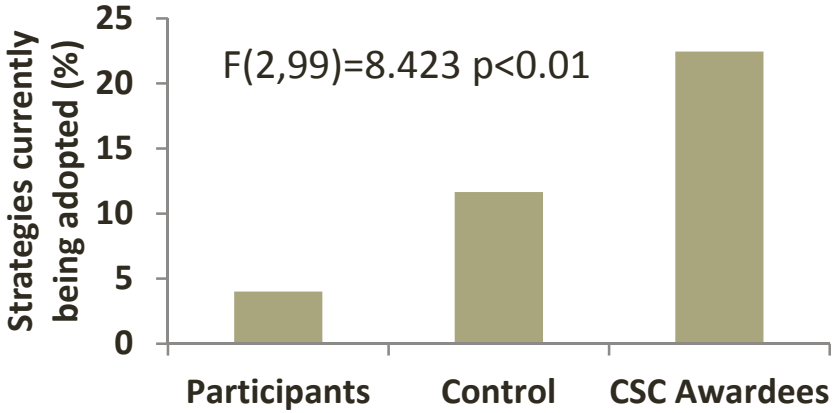
Findings: Assessment Strategies

Level of Adoption

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



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



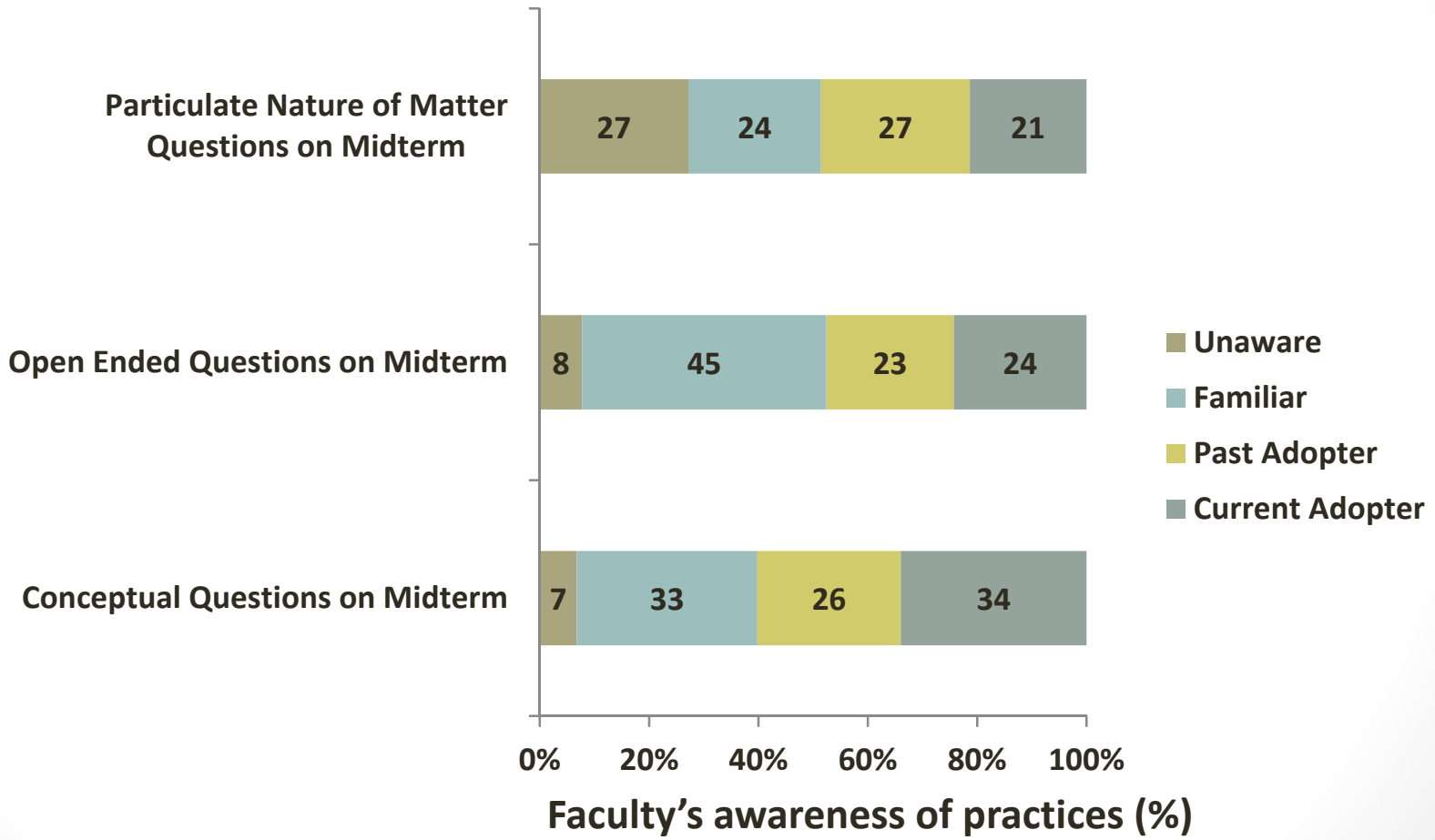
Slide 19

M15 missing a graph!
Marilyne Stains, 3/10/2013

Findings: Assessment Strategies

M16

Adopted Practices



Slide 20

M16 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

M17

Discussion

Practitioner is aware of the practice

To what extent are chemistry faculty aware of EBIPs?

62% of those in the survey

Practitioner is interested in the practice

Practitioner evaluates the practice

Practitioner tries the practice

Practitioner adopts the practice

Rogers, E.M. *Diffusion of innovations*. Free Press: 1995.

Slide 21

M17 the title of your slide is misspelled and ppt let you know that!

the 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

M18

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?

Rogers, E.M. *Diffusion of innovations*. Free Press: 1995.

Slide 22

M18 thinmabout your audience again and try to make the number stateemnt a bit more clear

- align your question and results with the arrow

Marilyne Stains, 3/10/2013

Conclusion

M19

What factors are influencing faculty's decisions?

Practitioner is aware of the practice

65%

Practitioner is interested in the practice

57%

Practitioner evaluates the practice

Practitioner tries the practice

23%

Practitioner adopts the practice

12%

Instructional Practices

Assessment Strategies

Rogers, E.M. *Diffusion of innovations*. Free Press: 1995.

Slide 23

M19 relate these questions mark to the theoretical framework; this would help you transition to future work
Marilyne Stains, 3/10/2013

Future Directions

M21

- Identification of factors
- Enhancing validity
  - Observational study
  - Expansion to a more representative sample
    - Focus on multiple levels of institutions

	Two –year	Four-year (B.A.)	Four-year (Grad)
Just in Time Teaching	7%	11%	8%
Peer Instruction	19%	38%	28%

Henderson, C., & Dancy, M. H. *Physical Review Special Topics-Physics Education Research* **2009,** *5* (2), 020107.

Slide 24

M21 - 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 sldie more visually appealing
- move validation of the survey to the end and indicate why it is needed.

Marilyne Stains, 3/10/2013

M22

Thank you for your time

mmoffitt@unl.edu

Slide 25

M22 the N is too big

Marilyne Stains, 3/10/2013

References

M23

- Borrego, M., Cutler, S., Froyd, J., Prince, M., & Henderson, C. *Faculty Use of Research Based Instructional Strategies*. Paper presented at the Australasian Association for Engineering Education, Fremantle, Australia, 2011.
- National Research Council, *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*. The National Academic Press: Washington, DC 2012.
- Henderson, C., & Dancy, M. H. Impact of physics education research on the teaching of introductory quantitative physics in the United States. *Physical Review Special Topics-Physics Education Research* **2009***, 5*(2), 020107.
- Hora, M.T. Wisconsin Center for Education Research. CCHER Project.
- Prieto, L. R.; Altmaier, E. M., The relationship of prior training and previous teaching experience to self-efficacy among graduate teaching assistants. *Research in Higher Education* **1994,** *35* (4), 481-497.
- Rogers, E.M. *Diffusion of innovations*. Free Press: 1995.
- Tewksbury, B. J., Mogk, D. W., Macdonald, R. H., & Manduca, C. A. Teaching methods in undergraduate geoscience courses: Results of the 2004 On the Cutting Edge survey of US faculty. *Journal of Geoscience Education* **2005***, 53*(3), 237-250.
- Trigwell, K.; Prosser, M.; Ginns, P., Phenomenographic pedagogy and a revised approaches to teaching inventory. *Higher Education Research & Development* **2005,** *24* (4), 349-360.

Slide 26

M23 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