

Singer-Freeman, K. E. & Verbeke, K. (2023). Reflective questions effectively measure impact, stimulate content integration, and support future planning. *Intersection: A journal at the intersection of assessment and learning*, 5(1), 35-48.

## Reflective Questions Effectively Measure Impact, Stimulate Content Integration, and Support Future Planning

Karen E. Singer-Freeman, Ph.D., Kristi Verbeke, Ph.D.

### Author Note

Karen E. Singer-Freeman ORCID iD: <https://orcid.org/0000-0001-5365-9667>

We have no conflicts of interest to disclose

---

Intersection: A Journal at the Intersection of Assessment and Learning

Vol 5, Issue 1, 2024

---

**Abstract:** We share a case study on our use of three reflective questions to demonstrate ways in which simple questions can be coded to reveal rich evidence of impact and engagement. At the end of a three-hour inclusive teaching practices workshop for 23 faculty and administrators from a single science department, 22 participants completed an anonymous three-question survey. Simple coding techniques facilitated a thorough evaluation of knowledge acquisition, the integration of new content with current knowledge, the robustness of individual plans for implementing changes, and the identification of potential departmental future actions.

**Keywords:** *evaluation, reflection, professional development*

## Introduction

Evaluations of professional development activities generally seek to assess the worth of a program and to identify areas for improvement. There are validated measures of pedagogical approach, appreciation, and literacy (Behar-Horenstein & Niu, 2013; Hurney et al., 2020; Kocuglu et al., 2022; Walter et al., 2017). However, scales are unlikely to encourage deep processing or integration between the current learning and existing practices. Additionally, forced-choice questions that rely on Likert-scale responses are susceptible to a number of biases including a social desirability bias in which individuals respond in ways that will make them appear to be a good person rather than reporting their true beliefs, and an acquiescence bias in which individuals respond similarly to all questions rather than varying responses in ways that capture subtle differences between their feelings about different questions (Podsakoff, et al., 2003). To evaluate the worth and impact of professional development initiatives, we have begun using reflective open-ended questions. These questions can provide insight into the participants' perceptions of an event by evaluating metacognitive awareness, knowledge gaps, and the strength of future plans. Additionally, reflective questions have the potential to increase the impact of an experience by encouraging prioritization of learning and the description of areas for future learning or action.

In students, reflective writing supports metacognition, self-evaluation, and future planning towards long-term goals (Singer-Freeman & Bastone, 2019; Yancey, 2016). When planning is included in reflective writing assignments, students actively engage with and assess their learning experiences while envisioning and charting a path towards long-term educational objectives (Singer-Freeman et al.,

2017). In the realm of program evaluation, mixed-methods evaluation plans that systematically integrate reflective components are viewed as a best practice (Patton, 2008). By incorporating reflective elements into the evaluation process, a more comprehensive understanding of program outcomes and participant experiences is attained, enriching the evaluative framework and enhancing the overall validity of the evaluation. However, responses to open-ended questions are often underutilized because evaluators fail to systematically code and interpret these responses. We have found that the use of simple coding categories that align with programmatic and evaluation goals greatly enhances our understanding of our qualitative responses.

In the current paper we share a case study on our use of three reflective questions to evaluate a workshop on inclusive teaching practices that was conducted with a science department. We suggest ways in which simple questions can be coded to reveal rich evidence of impact and engagement and demonstrate the efficacy of simple coding techniques to evaluate knowledge acquisition, the assimilation of new content with existing practices, the strength of individual plans for change implementation, and the identification of potential departmental actions.

## Methods

### Institutional Setting

The study was conducted at a highly selective university with high research activity. The three-hour workshop took place during the week before classes began and included sessions on three evidence-based techniques for increasing equity in science classes: active learning, increased structure, and prosocial orientation. The workshop was designed and facilitated by four full-time staff in the campus Center for Teaching and Learning (CTL). It was attended by 23 of the 26 faculty and administrators affiliated with the department. Attendees read at least one of three selected research articles relating to the workshop topics before the session. During the workshop all three readings were summarized and participants had opportunities to discuss two of the three topics in depth with a group of colleagues.

### Research Design

At the end of the workshop 22 of the 23 faculty who were in attendance completed an anonymous three-question survey. The questions are reported in Table 1 along with our evaluation and impact goals. As can be seen in Table 1, we had dual purposes for each reflective question. Question 1 was used to evaluate impact by revealing the extent to which the different areas of content that were presented were prioritized as important in participant responses. We believe this is a more authentic way of evaluating impact than the use of Likert-scale questions because it relies on recall rather than recognition and because it encourages prioritization. Question 1 was also intended to increase the impact of the workshop by increasing participants' retention of shared information. The act of prioritizing and writing about information that was deemed to be important is a form of deep processing that increases retention for the recalled material (Roediger & Karpicke, 2006).

Question 2 was a modified version of the muddiest point question introduced by Angelo and Cross (2012). Research reveals that the use of muddiest point questions supports pedagogical improvements and student success in undergraduate classes (Carberry et al., 2013; Menekse, 2020; Muteti et al., 2022). Our question was designed to provide us with information regarding ways to improve future events by highlighting any areas of content delivery that were unclear and to provide the department chair with directions for future programs by identifying areas of continuing interest. In previous uses of this question, we have seen responses in which participants question how material relates to their own practices or reflect on their comprehension of the materials (a form of deep processing). Accordingly, we were also interested in using responses to this question to look for evidence of integration between the material and the faculty members’ experiences with teaching. Finally, the question was intended to increase the impact of the workshop by encouraging deep processing of the material that was presented.

Question 3 was designed to encourage reflection-for-action (Schoen, 1987). Reflection-for-action describes a process in which people think carefully about their experiences and observations to inform and improve their future actions. It involves encouraging individuals to reflect on what they have done, what they have learned, and how they can use the new knowledge to make better decisions or take more effective actions in the future. The goal is to create a continuous cycle of learning from one’s experiences to enhance future performance or decision-making. We included Question 3 to evaluate whether participants planned to make changes to their pedagogy based on their experiences in the workshop and whether the department should consider pursuing organized activities to support improved pedagogy. Additionally, our approach was designed to amplify impact by motivating faculty participants to articulate plans for implementing specific changes in their teaching practices. This goal aligns with research in the field, emphasizing the importance of action-oriented reflection (Hatton & Smith, 1995). Reflective practices are most meaningful when they go beyond contemplation by prompting individuals to consider concrete strategies for improvement and innovation. By encouraging faculty to describe an actionable step, we seek to align with the broader educational literature. This focus on actionable plans serves not only to enrich the depth of our evaluation but also to contribute to the broader discourse on the practical application of reflective approaches in professional development settings.

**Table 1**

*Reflective Questions, Evaluation Goals, and Impact Goals*

Question	Evaluation Goal(s)	Impact Goal
What was your biggest takeaway from this session?	<ul style="list-style-type: none"> <li>Measure impact</li> </ul>	Increase retention of shared information

REFLECTIVE QUESTIONS EFFECTIVELY MEASURE IMPACT, STIMULATE CONTENT INTEGRATION, AND SUPPORT FUTURE PLANNING

Question	Evaluation Goal(s)	Impact Goal
What questions do you still have?	<ul style="list-style-type: none"> <li>Identify areas for improvement</li> <li>Measure integration of learning with practice</li> </ul>	Encourage integration with current practices, and planning
Where do you want to go from here?	<ul style="list-style-type: none"> <li>Measure plans to change</li> <li>Need for individual vs. departmental work</li> </ul>	Encourage planning and action

### Coding

The qualitative coding of anonymous responses discussed in this study was approved by our institutional review board (IRB00024592). All responses were initially conducted by a single coder and re-coded for reliability by a second coder. The coding categories are shown in Table 2 along with the number of responses that were classified in each category and sample statements. Because we had pre-established goals for the three reflective questions, we created a priori coding categories for each question. We then revised these categories to accommodate emerging themes that we identified during coding. For Question 1, three a priori coding categories were created to measure the extent to which the three content areas that were shared impacted participant views (course structure, prosocial orientation, and active learning). Two participants who mentioned two areas of content in response to Question 1 were included in both coding categories. A final a priori category was created for general statements that made no specific mention of any area of content. This coding category was created to measure the overall strength of the impact of the session. We hypothesized that responding to Question 1 with a general statement rather than specifically mentioning a content area would be an indication of reduced impact.

For Question 2, the a priori coding categories included clarification questions about any of the three content areas. After inspecting the data, these categories were omitted because there were no clarification questions about any of the three content areas. The remaining a priori category included questions that emerged from integration between the content and teaching experiences. However, during coding, three emergent themes were identified within this category: 1) Seeking knowledge about the mechanics of implementing a new technique; 2) Conducting research to learn more about a technique or the effects of the techniques use at the institution; 3) Consideration of ways in which the use of a new technique might impact the department. Accordingly, we added these three categories to our coding.

Finally, for Question 3 we planned to evaluate the strength of plans for changes by creating categories for faculty who expressed uncertainty about their plans using words such as “could” or “might,”

certainty by using words such as “will,” and avoidance by making a general statement that did not include any plans. We were also interested in whether faculty were most interested in making personal changes to their teaching or felt the most important area for change required a departmental initiative. To capture this distinction, each response that described a desired change was coded as either departmental or individual.

**Table 2**

*Coding Categories and Sample Statements for each Category*

Coding Category	Number of Responses	Sample Statements
1) What’s your biggest takeaway from today’s session?		
General statements not tied to specific session	9	<ul style="list-style-type: none"> <li>• <i>Relatively small changes in course design can have a very positive impact on the performance of underrepresented STEM students.</i></li> <li>• <i>There are lots of resources available to increase inclusivity in the classroom, including from my colleagues.</i></li> </ul>
Increasing course structure	8	<ul style="list-style-type: none"> <li>• <i>More structure in my classes should decrease the achievement gap for black and first-generation students.</i></li> <li>• <i>Course structure matters more than I realized</i></li> </ul>
Prosocial orientation	4	<ul style="list-style-type: none"> <li>• <i>I need to express more clearly why science matters and how it benefits society. This will be extremely important for increasing retention of students with a prosocial orientation.</i></li> <li>• <i>The importance of starting early with the "science matters stuff." I do a science identities assignment that comes at the end of the semester, I'm realizing how much more valuable this would be at the start of the semester for creating that buy-in, investment, and early belief in the prosocial aspects of the course.</i></li> </ul>
Active learning	5	<ul style="list-style-type: none"> <li>• <i>I feel like I can better think about how to incorporate active learning in my teaching.</i></li> </ul>

REFLECTIVE QUESTIONS EFFECTIVELY MEASURE IMPACT, STIMULATE CONTENT INTEGRATION, AND SUPPORT FUTURE PLANNING

Coding Category	Number of Responses	Sample Statements
		<ul style="list-style-type: none"> <li>• <i>Active-learning techniques have been shown to reduce the number of repeatable grades in STEM courses.</i></li> </ul>
2) What questions do you still have?		
Seek knowledge about mechanics of implementing	14	<ul style="list-style-type: none"> <li>• <i>How to implement spread-out lower-stake low-intensity content and activities without compromising material</i></li> <li>• <i>If there aren't points given for pre-reading questions, will they do them?</i></li> <li>• <i>What will be the most impactful with the time I have available to prepare?</i></li> </ul>
Conduct research	4	<ul style="list-style-type: none"> <li>• <i>I would like to partner with the CTL on faculty attitudes around content versus adding in educational supports for students that benefit all students.</i></li> <li>• <i>How do we measure our success in implementing these ideas?</i></li> </ul>
Impact on department	2	<ul style="list-style-type: none"> <li>• <i>How can these strategies support departmental certification by the American Chemical Society?</i></li> <li>• <i>How can a culture of inclusivity be established in a department when those who are most resistant to change are not present...</i></li> </ul>
3) Where do you want to go from here?		
Departmental initiatives	8	<ul style="list-style-type: none"> <li>• <i>I would like to have more conversations about content. We are very reluctant to "let go" of anything and that leads to conflicts and disparities in how faculty teach... Maybe there's more room for cutting than we are willing to admit</i></li> <li>• <i>I want to have more accountability. Teaching observations for all junior and visiting faculty would be a start. We need more collaboration and for people to ask each other 'Why are you doing that?' or "What learning outcome does that focus on?"</i></li> </ul>

Coding Category	Number of Responses	Sample Statements
Individual changes	14	<ul style="list-style-type: none"> <li>• <i>I'll try some pre class readings and graded homework</i></li> <li>• <i>Continue to increase course structure and implement more active learning to reduce learning gaps.</i></li> </ul>
Weak plans (would/might)	8	<ul style="list-style-type: none"> <li>• <i>I would like to design and implement active-learning and still be able to cover the required material.</i></li> <li>• <i>Can I commit to 1 pre-reading and 1 prep assignment each week? It would be a lot of work but extremely helpful...</i></li> </ul>
Strong plans (will/going to)	6	<ul style="list-style-type: none"> <li>• <i>I am going to add modifications to the course I am teaching and look at the results from students' perspective</i></li> <li>• <i>I will implement pre-lecture collective learning experiences in upper-level CHM classes</i></li> </ul>
No plans	2	<ul style="list-style-type: none"> <li>• <i>I think we all greatly enhanced our toolkit today! Hopefully many improvements to come!</i></li> <li>• <i>Today's activity was great. Loved using the articles as a starting point for the discussion. Also thought was super helpful the summary provided earlier.</i></li> </ul>

## Results

### Coding and Reliability

A reliability rate of 97% was calculated by dividing the total number of codes by the number of disagreements. The first coder re-coded the three codes that resulted in disagreements and changed two out of three of the codes to the classification given by the second coder.

### Evaluation of Content Coverage

The first question we hoped to address when reviewing the evaluation responses was whether participants were equally impacted by the three different areas of content that were covered during the workshop. If the three areas were equally impactful, we expected to see similar numbers of references to each of the three content areas in response to Question 1. Table 2 reports the total number of times each content area was mentioned in response to Question 1. We found that nine responses made general statements about the session without reference to any content area. Of the

15 responses that referenced specific content areas, eight described course structure, four described prosocial orientation, and five described active learning. This distribution of responses reveals that course structure was mentioned more frequently than either prosocial orientation or active learning by participants who selected content. However, it is noteworthy that nine participants (39%) made general statements that did not distinctly identify any specific topic. This pattern raises concerns about weaker engagement with the sessions among this subgroup of faculty. It seems possible that faculty who provided general statements may be less inclined to retain specific content knowledge compared to those who referenced a distinct area of learning.

We were able to learn more about the impact on these faculty by examining their responses to Questions 2 and 3. By doing this, we observed that three of the nine posed a question about the mechanics of implementing a specific change (with three questions mentioning active learning, one mentioning increased structure, and one mentioning prosocial orientation) and three described plans to make a specific change relating to one of the three content areas (with two planning to increase structure and one planning to increase prosocial orientation). Only four participants failed to mention any specific content area in response to any of the three questions. We conclude that the workshop's impact on faculty varied, with course structure appearing to have a larger impact than either prosocial orientation or active learning. Even after reviewing responses to Questions 2 and 3, it appears that a substantial proportion of participants (17%) provided only general statements. This finding has caused our team to consider whether we might find ways to include more engagement strategies during future workshops. For example, we have discussed embedding reflective writing activities into the body of future workshops rather than only including reflections in the final evaluation. By interspersing reflective writing with discussions of content, we might encourage more active engagement with each content area.

### Evaluation of Content Delivery

Question 2 was designed to identify areas for improvements and future programming. We were gratified to see that no participant expressed confusion about concepts and conclude that participants felt the content was effectively delivered.

### Evaluation of Deep Processing

Question 2 was also designed to encourage an integration between the content and participants' thoughts about their current teaching practices. As shown in Table 2, 20 participants (87%) showed evidence of integrative thought: 14 (61%) were interested in learning more about ways to implement the techniques given the constraints of the courses they teach, 4 (17%) wished to conduct research on how changes would impact students, and 2 (9%) wanted to have department conversations about how changes might impact the curriculum. We were interested to see that the largest proportion of faculty were interested in learning more about the mechanics of implementing the practices we discussed in their specific contexts. Rather than needing clarification, it appears that faculty are interested in learning more about ways to make these practices function in the context of science classes. This provides our center and the department chair with useful information about ways to further the work. This pattern of responses also suggests that faculty were actively working to integrate the content with



their thoughts about their courses and the curriculum. We believe this indicates a high level of engagement with the session.

### Evaluation of Reflection-for-Action

Question 3 was designed to evaluate the strength of faculty plans to enact change and to identify the level at which future work should take place. In Table 2 we see that 8 participants (35%) described a need for department-level work and 14 (61%) described a plan to make individual changes. This indicates that different groups of participants have strong interest in individual and departmental actions. We were also interested in evaluating the strength of individual plans for change. We observed a range of certainty in individual plans. Of the 14 participants with an individual plan, six participants (43%) described firm plans and eight participants (57%) described tentative plans. We consider the additional eight participants who described a need for departmental action to be tentative plans because they are suggesting an action that someone else should take rather than describing an action they will take. Overall, this indicates that only a minority of faculty used language indicative of a strong commitment to enact a change.

### Discussion

In this paper, we present a case study detailing our application of three reflective questions to assess the effectiveness of a workshop focused on inclusive teaching practices within a science department. We propose methods for coding straightforward questions to learn more about impact and engagement. The study showcases the effectiveness of uncomplicated coding techniques in evaluating knowledge acquisition, the integration of new content with existing knowledge, the robustness of individual plans for change, and the identification of potential departmental actions.

### Differing Impact of Content Areas

Satisfaction scales often capture a participant's general satisfaction with a session rather than their recall and appreciation of a specific element of a session (Bhattacharjee, 2012). We have previously found that it is not unusual for participants to rate all areas of content equally interesting, valuable, or informative when completing Likert-scale ratings. In contrast, when content is mentioned in response to an open-ended question, we can be confident that it was meaningful to a participant because they recalled it as something they wish to remember. If the content areas we presented held equal impact, we expected to see equivalent groups of faculty members referencing each distinct area—course structure, prosocial orientation, and active learning. However, we found that course structure received more attention than the other two content areas combined. This discrepancy prompts us to consider the possibility that course structure was more relevant to participants. Tailoring future workshops to address the implementation of increased course structure appears to be a promising direction for future work with this group of faculty members. It may also be worthwhile to explore the underlying reasons for the heightened attention to course structure and assess whether adjustments in emphasis are warranted.

### **Need for Increased Engagement Strategies**

Our analysis revealed that a sixth of the participants responded to all three questions without mentioning a single specific content area. This pattern raises questions about potential variations in engagement among the participants. One possibility is that participants might not have been fully engaged with the workshop, leading to a lack of specificity in their responses. To address this possibility, we might consider adapting the workshop's emphasis or delivery strategies to encourage a higher level of engagement. However, it is also possible that participants may not have been engaged with the evaluation questions. Although the questions were designed to be brief, survey fatigue can reduce the effort participants are willing to expend to respond to open-ended questions (Ben-Nun, 2008). This might be addressed by embedding reflective writing questions that can be used for evaluation into the body of the workshop rather than introducing them as a final evaluative activity (Hartmann et al., 2023). Further investigation into the nature of participant engagement, both during the workshop and in responding to evaluation queries, is essential for a comprehensive understanding of the observed patterns.

### **Effective Delivery of Content**

We found that no participants expressed confusion about the content that was presented. This suggests that the current delivery methods were effective, providing a strong foundation for future programming. The efficacy of content delivery was further supported by the large proportion of faculty (58%) who raised questions about ways the content related to their teaching experiences. By posing these integrative questions, faculty demonstrated that they understood the content area.

### **Strong Evidence of Conceptual Integration**

We found that a large majority of participants (87%) were interested in learning more about implementing the discussed techniques within the constraints of their courses, and smaller groups were interested in conducting research on the effects of any implemented changes (17%) or holding departmental discussions about possible curriculum revisions (9%). The strong interest in considering how the tactics might be implemented in courses indicates that we should consider dedicating more time in future workshops to discussing ways to integrate the content we share with the specific teaching practices of workshop participants. This could serve as the focus of reflective writing that is embedded into workshop activities to increase engagement. We also believe the large number of questions dedicated to the use of tactics in specific classes indicates that participants were actively integrating the content into their existing ideas about their current pedagogical practices. This was an important finding because integrating content with practice is one of our CTL faculty learning goals.

### **Attention to Individual vs. Departmental Action**

In responses to Questions 2 and 3 we found that a sizable proportion of faculty focused on needs for departmental action. When looking at individual responses, four participants only discussed departmental actions and an additional four participants discussed both individual and departmental actions. Together 35% of the sample discussed a need for departmental action. We are somewhat

concerned that some individuals felt that there were departmental barriers to making real changes. For example, one person wrote,

“As a department I would like us to have more conversations about content. We, as a whole, are very reluctant to “let go” of anything and that leads to conflicts between faculty (sometimes) and also disparities in how different faculty teach. Subsequent courses don't always think very carefully about what previous courses learned or didn't learn and what the subsequent courses should do about it. Maybe there is more room for “cutting” than we are willing to admit but that only works if we are on the same page about what to cut.”

Another wrote, “How can these teaching strategies support departmental certification by an outside professional society?” The prevalence of comments like these suggests that it will be important for the department to actively engage with faculty on a continuing basis in order to drive improvements.

### Strength of Plans for Change

Finally, Question 3 was designed to evaluate the strength of faculty plans for enacting change by coding the strength of the language used in the responses. Social Desirability bias can cause participants to overstate their intentions to enact strategies that were suggested to them in a professional development workshop if they are asked to directly evaluate the strength of their commitment using a Likert-scale response (Podsakoff, et al., 2003). When we examined the strength of language around future plans by comparing the use of “will” to “might,” we observed subtle differences in commitment to making changes that can be lost in more direct measures. Interestingly, our exploration of the strength of individual plans demonstrated that only six participants (26%) expressed firm commitments, eight (35%) described tentative personal plans, eight (35%) described tentative departmental actions, and two (9%) failed to describe any plans. We are interested in learning more about those who described departmental rather than personal plans. If individuals feel they cannot make personal changes until departmental steps are taken, this adds urgency to the need for more extensive departmental activity. We are also interested in learning more about those who expressed strong or weak plans and learning whether those who expressed strong plans are more likely to implement the changes they described than those who expressed weak plans.

### Limitations

The current work relies on a very small sample of anonymous responses. As such, we are unable to learn whether responses to the evaluation predict future activities. Additionally, we cannot differentiate responses from the two administrators who were present (a department chair and an associate dean) or based on faculty rank, or faculty demographics. We hope to explore these questions more fully in future work.

## Conclusions

This study has provided valuable insights into the use of reflective questions to evaluate a professional development workshop. We found all three content areas to have impacted groups of participants and found that participants were actively considering potential implementation strategies or challenges. The findings suggest a balanced interest in both individual and departmental actions for enacting change. This study offers valuable implications for future programming and underscores the ongoing commitment of faculty members towards enhancing their pedagogical practices.

Our simple evaluation strategy successfully achieved the predetermined evaluation goals of measuring impact, identifying areas for improvement, assessing the integration of learning with practice, evaluating the strengths of plans to change, and determining the relative need for individual versus departmental efforts. However, our ability to draw definitive conclusions regarding the impact of reflective questions on retention, integration, and planning was constrained by the anonymous nature of participant responses. The anonymity afforded individuals the freedom to express their thoughts candidly, fostering open and honest feedback. However, this also presented a challenge in linking specific responses to individual participants over time, impeding our capacity to track changes in retention, integration, or planning on an individual basis. Despite this limitation, the current evaluation has laid a solid foundation for ongoing improvements and adjustments, contributing to the overall enhancement of our initiatives.

Our findings underscore the importance of incorporating qualitative questions in evaluations of professional development. Although quantitative questions provide valuable insights, the nuanced variations in participant engagement, observed content preferences, and the depth of plans for change revealed through qualitative responses offer a rich understanding of the training's impact. Despite the additional effort required from participants and evaluators, the inclusion of qualitative questions proves essential in unlocking a more comprehensive and meaningful assessment that extends beyond the scope of quantitative inquiries alone. We encourage workshop facilitators and assessment practitioners to consider using the open-ended reflective questions and coding techniques described above to better assess the impact of their programs.

## References

- Angelo, T. A., & Cross, K. P. (2012). *Classroom assessment techniques*. Jossey Bass Wiley.
- Behar-Horenstein, L. S. & Niu, L. (2013). College Teachers' Instructional Practices: Exploratory and Confirmatory Factor Analyses. *Journal of Faculty Development*, 27(2), 38–45.
- Ben-Nun, P. (2008). Respondent fatigue. *Encyclopedia of Survey Research Methods*, 2, 742-743.
- Bhattacharjee, A. (2012). Social Science Research: Principles, Methods, and Practices. Textbooks Collection. 3. [https://digitalcommons.usf.edu/oa\\_textbooks/3](https://digitalcommons.usf.edu/oa_textbooks/3)
- Carberry, A., Krause, S., Ankeny, C., & Waters, C. (2013). "Unmuddying" course content using muddiest point reflections. *IEEE Frontiers in Education Conference (FIE)*, Oklahoma City, OK, USA, 2013, 937-942, doi: 10.1109/FIE.2013.6684966.
- Hartmann, A., Vinke-de Kruijff, J., & van Weesep, R. (2023). Asking the right questions: The role of reflection for learning in and between projects, *International Journal of Project Management*, 41, 5, <https://doi.org/10.1016/j.ijproman.2023.102494>.
- Hatton, N., & Smith, D. (1995). Reflection in teacher education: Towards definition and Implementation. *Teaching and Teacher Education*, 11(1), 33-49, [https://doi.org/10.1016/0742-051X\(94\)00012-U](https://doi.org/10.1016/0742-051X(94)00012-U).
- Hurney, C. A., Troisi, J. D., & Leaman, L. H. (2020). Development of a faculty appreciation of pedagogy scale. *To Improve the Academy: A Journal of Educational Development*, 39(2), 27-50. <https://doi.org/10.3998/tia.17063888.0039.202>
- Koçoğlu, E., Tekdal, D., & Çetinkaya, N. (2022). Pedagogical literacy scale: A scale development study. *Educational Research and Reviews*, 17(6), 176-186. <http://www.academicjournals.org/ERR>
- Menekse, M. (2020). The reflection-informed learning and instruction to improve students' academic success in undergraduate classrooms. *The Journal of Experimental Education*, 88(2), 183 -199, <https://doi.org/http://doi.org/10.1080/00220973.2019.1620159>
- Muteti, C. Z., Kerr, T., Mwavita, M., Mutambuki, J. M. (2022). Blending muddiest point activities with the common formative assessments bolsters the performance of marginalized student populations in general chemistry. *Chemistry Education Research and Practice*, 2022.
- Patton, M. Q. (2008). *Utilization-Focused Evaluation*, 4<sup>th</sup> Edition. Sage Publications, Inc
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Roediger III, H. L., & Karpicke, J. D. (2006). Test-enhanced learning: Taking memory tests improves long-term retention. *Psychological science*, 17(3), 249-255.
- Schön DA (1987). *Educating the Reflective Practitioner*. San Francisco, CA: Jossey-Bass.
- Singer-Freeman, K. E. & Bastone, L. (2019). Supporting persistence and identity development during applied learning experiences. *Journal of Applied Learning in Higher Education*, 8, 59-78 <https://www.missouriwestern.edu/appliedlearning/wp-content/uploads/sites/116/2020/12/JALHE-8.pdf>
- Singer-Freeman, K. E., Bastone, L., & Skrivanek, J. (2014). ePortfolios reveal an emerging community of underrepresented minority scholars. *International Journal of ePortfolio*, 4(1), 85-94. <http://www.theijep.com/pdf/IJEP131.pdf>
- Walter, E. M., Henderson, C. R., Beach, A. L. & Williams, C. T. (2016). Introducing the Postsecondary

Instructional Practices Survey (PIPS): A Concise, Interdisciplinary, and Easy-to-Score Survey. *CBE—Life Sciences Education*, 15(4), ar53. <https://doi.org/10.1187/cbe.15-09-0193>

Yancey, K. (2016) Introduction: Contextualizing reflection. In Kathleen Yancey (Ed.) *A Rhetoric of Reflection* 3-23, University Press of Colorado.

### About the Authors

Karen E. Singer-Freeman, Director of Research, Center for the Advancement of Teaching, Wake Forest University, [singerk@wfu.edu](mailto:singerk@wfu.edu)

Kristi Verveke, Director of Educational Development Center for the Advancement of Teaching, Wake Forest University, [verbekj@wfu.edu](mailto:verbekj@wfu.edu)