

Quantitative Abstract Review

Abstract Version 1

Abstract Version 2

Study Context

Science education is changing to prioritize cognitively demanding curricula delivered using student-centered pedagogy (AAAS, 2011). These curricular changes require elevated teaching practices. Professional development (PD) is often required to support instructors implementing reformed curriculum that is student-centered and cognitively demanding. PD is particularly important for graduate teaching assistants (TAs), as they receive little pedagogical training yet are primary instructors for undergraduate courses. Few studies separately examine the impact of PD and curriculum on TAs' teaching practices in higher education.

No theoretical or conceptual framework mentioned.
Score: 1

Context is described broadly but only one citation included to show connection to literature base.
Score: 2

Rationale for studying PD in context of TAs clearly articulated but not clear why impact of curriculum should be studied.
Score: 2

Context of PD with citations is described.
Score: 3

Rationale for studying both curriculum and PD in context of TAs clearly articulated.
Score: 3

Conceptual frameworks are mentioned but need to be described more.
Score: 2

Science education is changing to prioritize cognitively demanding curricula delivered using student-centered pedagogy (AAAS, 2011). These curricular changes require elevated teaching practices. Professional development (PD) is often required to support instructors implementing reformed curriculum that is student-centered and cognitively demanding (NRC, 2015; Davis & Krajcik, 2005). PD is particularly important for graduate teaching assistants (TAs), as they receive little pedagogical training yet are primary instructors for undergraduate courses (Reeves et al., 2016). It is critical to examine the combined effect of curriculum and PD on TAs' teaching practices, as effectiveness of PD can depend on the curriculum TAs teach (Addy & Blanchard, 2010). Few studies separately examine the impact of PD and curriculum on TAs' teaching practices in higher education. The conceptual frameworks guiding this study draw from professional development (Reeves et al. 2016), specifically models of change (Guskey 2002) and teacher pedagogical content knowledge (Gess-Newsome et al. 2019), specifically how to teach cognitively demanding content (Stein et al. 1996).

Study Design

Our research questions are: "How does reformed curriculum interact with curriculum-aligned PD that incorporates modeled teaching practices and opportunities for reflection to affect TA performative and planned teaching practices?" and "How does cognitive demand of curricular tasks affect TA teaching practices?"

First RQ is wordy and unclear. Second RQ is good.
Score: 2

Both RQs are clear.
Score: 3

This study describes the effects of a curriculum and PD intervention on two aspects of TAs' teaching practices: performative aspects and planned aspects. Intervention curriculum featured structured opportunities for reform-oriented teaching practices, and Intervention PD was situated in the context of these specific curriculum activities and modeled the teaching practices TAs were intended to use. Both the intervention curriculum and PD were implemented in a quasi-experimental design.

More details about study design and population needed. What is being measured? What classes are getting the intervention?
Score: 1

Study population described. Study design could be clarified. Did all intervention classes have both reformed curriculum and TA PD?
Score: 2

Our research questions are: "How does a reformed curriculum and PD that incorporates modeled teaching practices affect TA performative and planned teaching practices?" and "How does cognitive demand of curricular tasks affect TA teaching practices?"

This study describes the effects of a curriculum and PD intervention on two aspects of TAs' teaching practices: performative aspects (spontaneous in response to classroom events) and planned aspects (likely to be structured before class), both measured using the Reformed Teaching Observation Protocol (RTOP). Intervention curriculum featured structured opportunities for reform-oriented teaching practices, and Intervention PD was situated in the context of these specific curriculum activities and modeled the teaching practices TAs were intended to use. Both the intervention curriculum and PD were implemented in a quasi-experimental design in an introductory biology laboratory course (NTraditional = 21, NIntervention = 21).

RQs about effects of curriculum and PD on TA teaching practices is aligned with study design.
Score: 3

Because first RQ is unclear and study design lacks many details, it is difficult to determine if RQs and study design are aligned at all.
Score: 1

Analyses & Interpretation

TAs were recorded while teaching, and recordings were analyzed using the Reformed Teaching Observation Protocol (RTOP). Cognitive demand of the recorded tasks varied across curriculum type, and was determined using the Task Analysis Guide in Science (TAGS). Intervention curriculum and PD had an additive effect on TAs' teaching practices. Linear models showed that PD has a larger effect on performative practices ($\eta^2 = 0.15$, $\beta = 0.3$) than on planned practices ($\eta^2 = 0.05$, $\beta = 0.16$). Cognitive demand of curricular tasks has the largest effect on both performative ($\eta^2 = 0.22$, $\beta = 0.4$) and planned practices ($\eta^2 = 0.41$, $\beta = 0.6$).

Analyses described some, but more details needed (e.g., what are the treatments being analyzed?).
Score: 2

Analyses described some, but more details needed (e.g., what are all the treatments being analyzed?).
Score: 2

Not all statistical evidence reported and lack of clarity around what RTOP is measuring.
Score: 1

Statistical evidence included, but lack of clarity around what RTOP scores indicate about the impact of the reformed curriculum and TA PD on TA teaching practices.
Score: 2

TAs were recorded while teaching, and recordings were analyzed using RTOP. Cognitive demand of the recorded tasks varied across intervention and traditional curriculum types, and was determined using the Task Analysis Guide in Science (TAGS). Intervention curriculum and PD had an additive effect on TAs' teaching practices (measured by RTOP; $M_{Trad} = 32$, $M_{Int} = 49$, $F(2,69) = 46.1$, Cohen's $f = 1.2$, $p < 0.0001$). Linear models of TAs' performative and planned teaching practices that incorporated curricular task type (Traditional or Intervention), PD type (Traditional or Intervention), and the cognitive demand of the observed task indicate that PD has a larger effect on performative practices ($\eta^2 = 0.15$, $\beta = 0.3$) than on planned practices ($\eta^2 = 0.05$, $\beta = 0.16$). Cognitive demand of curricular tasks has the largest effect on both performative ($\eta^2 = 0.22$, $\beta = 0.4$) and planned practices ($\eta^2 = 0.41$, $\beta = 0.6$).

Study seems close to complete, but difficult to tell whether first RQ was completely addressed.
Score: 2

Study seems complete – both RQs addressed.
Score: 3

Contribution

This study suggests that curricular tasks that are planned to be cognitively demanding provide more structured opportunities for instructors to implement advanced teaching practices. Findings suggest strategies for improving teaching practices.

Does not connect main finding to literature in BER.
Score: 1

Explicitly addresses how it advances research in BER.
Score: 3

Needs stronger statement about why this is important for BER community.
Score: 2

Strong connection to improving TAs' teaching practices.
Score: 3

This study suggests that curricular tasks that are planned to be cognitively demanding provide more structured opportunities for instructors to implement advanced teaching practices. This supports prior work on high structure course design (e.g., Eddy & Hogan, 2014), extending the benefits to teaching assistants in addition to students. These results suggest while content-focused PD or cognitively demanding tasks individually have an effect, implementing both provides maximum impact on TAs' teaching practices. Findings suggest strategies to prioritize resource allocation when designing PD for TAs.

Only broad, vague statement about implications of findings; needs to be explained more.
Score: 1

Explain implications for teaching and learning more (e.g., what are the strategies?).
Score: 2