Mixed methods in educational psychology inquiry

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ABSTRACT

Mixed methods research has the potential to advance theory and enhance the usefulness of research findings. However, the success of a mixed methods research inquiry is tied to how well researchers integrate the quantitative and qualitative strands, and to how well researchers address the standards for quality in quantitative, qualitative, and mixed methods. In this introduction article, we define mixed methods research and discuss what mixed methods research can offer to the field of educational psychology. Then we consider what constitutes integration and rigor in mixed methods research and describe three core mixed methods research designs. Following this overview, we briefly introduce each article to this special issue, along with the commentary by Vicki Plano Clark. We also discuss how the use of mixed methods can help address common educational problems including: (a) identifying and exploring socially-situated and contextualized learning processes; (b) providing insights into differences across individuals with respect to educational outcomes; and, (c) building instruments that reflect the experiences of individuals who will be assessed by these instruments. Finally, we close with thoughts on the future of mixed methods research.

1. Introduction

There has been greater acceptance and use of mixed methods research since the turn of the century (Burch & Heinrich, 2015; Creswell, 2010). One reason for this shift is the need for different approaches to investigate complex educational and social issues (DeCuir-Gunby & Schutz, 2017; Ivankova & Kawamura, 2010). Another reason is that major funding agencies, such as the National Science Foundation and Institute of Education Sciences, have begun encouraging researchers to use mixed methods research rather than singular research method approaches (Mixed Methods in Education Research IES Technical Working Group, 2015; Plano Clark, 2010). A third reason is that research communities have helped to establish mixed methods approaches as an acceptable and scientifically-legitimate approach to inquiry (Biddle & Schafft, 2015; Creswell & Plano Clark, 2018; Teddlie & Tashakkori, 2009). Mixed method inquiry is a relatively new approach to conducting research in educational psychology compared to quantitative and even qualitative approaches. Thus, it is important for researchers who conduct or evaluate mixed methods research (e.g., members of doctoral committees, journal manuscript reviews, or funding agencies) to understand what characterizes high-quality mixed methods inquiry (DeCuir-Gunby & Schutz, 2017).

Our primary goal for this special issue was to support the development of mixed methods research as an approach to inquiry in educational psychology by showcasing high-quality mixed methods research studies conducted by educational psychologists across a range of topics. We asked contributors to this special issue to describe some of the key features of their research inquiries so the rationale for various decisions related to their respective study designs and the steps taken to ensure rigor were stated explicitly in the articles. By encouraging authors to describe what decisions they made and actions they took, as well as why, we aimed to promote the transparency of the research process for readers. Further, we asked authors to provide procedural diagrams (Creswell & Plano Clark, 2018; Ivankova, Creswell, & Stick, 2006) to show when the different methods used and the points of integration between them.

This special issue introduction article consists of seven main sections. First, we define mixed methods research. Second, we consider broadly what mixed methods research can offer to educational psychology. In the third and fourth sections we describe key areas of foci for the special issue (i.e., integration and rigor). Fifth, we describe three core mixed methods research designs and discuss each article with respect to design, rigor, and the value-added contributions. Sixth, we briefly identify common problem spaces in educational psychology and how mixed methods may help researchers address these challenges. Finally, we close with observations about the direction of the field in terms of the use of mixed methods research and a cautionary note.

2. Defining mixed methods research

Mixed methods research can be defined as "research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both quantitative and qualitative approaches" (Tashakkori & Creswell, 2007, p. 4). Mixed methods research differs from multiple method research in which an investigator uses two or more methods from the *same* methodological tradition (i.e., more than one quantitative approach, or more than one qualitative approach, in a single study). In mixed methods research, an investigator combines at least one quantitative method and one qualitative method in a way that potentially maximizes the strengths and minimizes weaknesses of each respective method. For instance, survey data can be collected from a large number of participants in a relatively short time frame (potential strength) but may provide limited insights into reasons underlying individuals' responses (potential weakness). Interviews can be conducted with a sample of participants who can provide in-depth descriptions about a phenomenon of interest (potential strength); however, data collection and analysis can be time-intensive and involves a smaller number of participants (potential weakness). The intent is to triangulate

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the data sets using both research methods traditions to offset potential limitations or bias introduced *within* each respective tradition (Creamer, 2018). This, in turn, can enhance the usefulness and interpretability of the findings.

Two particularly relevant characteristics of mixed methods research are methodological eclecticism and paradigm pluralism (Teddlie & Tashakkori, 2012). *Methodological eclecticism* means that researchers knowledgably select, use, and integrate the most appropriate methods from a wide variety of quantitative, qualitative and mixed approaches to thoroughly investigate the phenomena of interest. This contrasts with the incompatibility thesis, which "posits that qualitative and quantitative research paradigms, including their associated methods, cannot and should not be mixed" (Johnson & Onwuegbuzie, 2004, p. 14). *Paradigm pluralism* refers to "the belief that a variety of paradigms may serve as the underlying philosophy for the use of mixed methods" (Teddlie & Tashakkori, 2012; p. 779).

Although there are multiple worldviews available to guide mixed methods research, pragmatism tends to be the overarching philosophy espoused by the majority of mixed methods scholars (Lincoln, Lynham, & Guba, 2011; Tashakkori & Teddlie, 2003; Teddlie & Tashakkori, 2012). The focus tends to be on the usefulness or consequences of research, which includes the role of ethics and values in the context of community and the social good (Maxcy, 2003); the importance of the research question rather than the method; and the use of a number of methods to address research topics (Creswell & Plano Clark, 2018).

3. The value of mixed methods research in educational psychology

There are substantive demands in terms of effort, time, and expertise associated with designing and conducting a rigorous mixed methods study (Creswell & Plano Clark, 2018; McKim, 2017). However, there are a number of general benefits to using mixed methods, including: (a) gaining a deeper and broader understanding of the phenomenon (Hurmerinta-Peltomäki & Nummela, 2006), (b) providing readers greater confidence in the findings and conclusions drawn from the study (O'Cathain, Murphy, & Nicholl, 2010), and (c) enabling readers to more easily comprehend the significance of a study's findings and grasp the meaning of complex phenomena (McKim, 2017; Onwuegbuzie & Leech, 2004). Our work on this special issue was guided in part by a desire to leverage these general benefits and to stimulate conversation amongst educational psychologists about the value of mixed methods research to the investigation of phenomena in our field. We approached this special issue with the following questions: (1) What do mixed methods approaches offer to educational psychology researchers? (2) Why do we believe that educational psychological training programs and researchers should invest in the development of expertise in mixed methods research?

In educational psychology, researchers typically adopt a positivist or post positivist methodology (general inquiry worldview) and methods (strategies and procedures for conducting research) that are quantitative in nature (see Lincoln et al., 2011 for discussion). For instance, researchers have predominantly used quantitative data collection methods and analyses aligned with the general linear model (Kaplan, Katz, & Flum, 2012; Koopmans, 2014). The dominance of a single method for conducting research in a field of study can be problematic for a number of reasons, most notably the potential restriction of knowledge that can result in a less comprehensive understanding of phenomena under study. Rather than designing studies and choosing methods on the basis of theoretical propositions and related research questions, researchers may adhere to preferred designs and methods within their communities of practice or select methods with which they have the greatest experience and training (Hilpert & Marchand, 2018; Kaplan et al., 2012).

While considering research trends in educational psychology, Dumas, Alexander, and Singer (2015) noted that advances in statistical modeling not only allow researchers to test existing theoretical models more comprehensively, but also enable researchers to develop those theoretical models. Similarly, mixed methods research can potentially enable researchers to develop and test theories in educational psychology within a range of contexts and with a variety of populations to yield new knowledge that is relevant to practitioners, interdisciplinary scholars, and emerging researchers in our own field. An increase in the use of mixed methods approaches to inquiry in educational psychology, may lead to an expansion of research questions that address underexplored aspects of theoretical models which have not been easily investigated by our traditional, more familiar approaches (Rozin, 2001, 2009). For instance, researchers may use mixed methods approaches to identify if, when, and why the experiences of individuals may diverge from overall patterns, leading in some cases to new areas for theoretical exploration (e.g., Butz & Usher, 2015).

Further, engagement in mixed methods research may offer opportunities for scholars to reflect more critically on the research process itself. Engaging in mixed methods research requires knowledge of quantitative, qualitative, and mixed methods and careful evaluation of choices, such as sampling and processes involved in data collection and analysis (e.g., Bergman, 2011; Greene, 2007) at multiple points in the inquiry. This critical reflection may contribute to rigor in the field as we think more carefully about the assumptions underlying our research designs and methods and how these align with our theoretical assumptions (DeCuir-Gunby & Schutz, 2014; Hilpert & Marchand, 2018; Kaplan et al., 2012). Researchers may gain greater critical awareness of the role that their worldviews play in research process. An additional benefit is that increasing and expanding our research methods expertise can allow us to have more meaningful conversations with colleagues in other domains in education, particularly with those who tend to use qualitative or mixed methods. Conversations with researchers in other fields investigating similar topics but with different research methods may spark interdisciplinary partnerships. These are more likely to be fruitful when common ground with respect to research methods are identified.

4. Integration

A high-quality mixed methods research study consists of more than just the use of quantitative and qualitative strands in the same study. A defining feature of mixed methods research is that the researcher integrates the quantitative and qualitative strands. *Integration* occurs when an investigator intentionally combines quantitative and qualitative approaches in a study such that their combination provides a more comprehensive understanding of the topic (Fetters & Molina-Azorin, 2017). Thus, *when* and *how* the two strands are integrated plays an essential role in establishing the quality of the study design, and ultimately of the quality of the inferences and conclusions drawn from the study.

The term *yield* refers to the insights that a mixed methods study can provide that would not be possible from a quantitative study or a qualitative study alone (O'Cathain, Murphy, & Nicholl, 2007). As such, the integration of the quantitative and qualitative strands in a study influences the yield. Integration can occur at one stage, or multiple stages. *Fully-integrated mixed methods research* is "an approach to mixed methods research where there is the intention to mix or integrate the qualitative and quantitative strands of study throughout each of the stages or phases of the research process" (Creamer, 2018, p. 12). Conversely, the use of quantitative and qualitative strands in a study that are not integrated at all provides limited or no yield. Thus, integration in mixed methods involves more than just the presence of quantitative and qualitative data; it matters when and how the quantitative and qualitative strands are integrated. Later in this article we explain how the authors in this special issue achieved integration in their studies to provide greater insights about their topics.

Despite consensus about the importance of integration in mixed

Table 1
Types of core mixed methods research designs.

	Types of Core Mixed Methods Research Designs		
	Convergent	Explanatory sequential	Exploratory sequential
Timing of data collection	Concurrent	Sequential	Sequential
Timing of data analysis	Independent	Dependent	Dependent
Intent of integration	Generate interpretations that extend the breadth and range of the inquiry and/or seek corroboration	Use the qualitative strand to elaborate, enhance, or explain some finding of interest from the quantitative strand	To use the qualitative phase to create or build a follow-up quantitative instrument or intervention
Examples from special issue	Schmidt et al. (this issue), Usher et al. (this issue) and White et al. (this issue; Fig. 1)	Matthews and López (this issue)	Kumar et al. (this issue)

methods research, there are a variety of views about how researchers can achieve integration in a mixed methods research inquiry (Bryman, 2006; Creamer, 2018; Fetters, Curry, & Creswell, 2013; Greene & Caracelli, 1997a, 1997b; McCrudden & McTigue, 2018; O'Cathain et al., 2007; Woolley, 2009; Yin, 2006). These discussions reflect the development of mixed methods as a relatively new research paradigm and the generative nature of the paradigm for addressing questions in dynamic, complex, and interdisciplinary research contexts. A comparison of the different approaches to integration is beyond the scope of this introduction (see Creamer, 2018; Creswell & Plano Clark, 2018; Fetters et al., 2013; Greene, 2007; and Teddlie & Tashakkori, 2009 for some different approaches). However, in this special issue, we encouraged the contributing authors to explicitly indicate how they achieved integration in their respective studies.

5. Rigor

The success of a mixed methods research inquiry is tied to how well researchers meet the standards for quality in quantitative, qualitative, and mixed methods approaches. Research methods scholars have developed strategies and guidelines for ensuring rigor in the research process. Thus, researchers interested in conducting quality mixed methods research must be familiar with the strategies and guidelines used in all three general approaches.

Issues related to internal and external validity (Benson, 1998; Shadish, Cook, & Campbell, 2002) play a prominent role in quantitative study designs and inferences about results. When evaluating the rigor of a quantitative study, we make judgments about the evidence provided for reliability and for validity. This type of evidence is critical to our interpretation of the results from a quantitative study. For instance, when using a survey, coefficient alpha can be used to determine whether survey items in a scale are internally consistent and confirmatory factor analysis can be used to determine whether the scale actually measures the construct the researcher claims it measures. The results are problematic if the scale does not measure a particular construct in a particular context.

Similarly, qualitative researchers have developed several ways to establish rigor. One way is through the researcher positionality statement, which is the researchers' description of their views on the topic under study (e.g., how did they get interested in the topic, why is it important to them). This statement is important in both qualitative and quantitative approaches because researcher perspective plays an influential role in all phases of the investigation (e.g., research questions, participant selection, data analysis). This statement helps the reader understand the findings and highlights the researchers' reflexivity (i.e., self-awareness of how ones' thoughts and views can affect the research process). Further, there are a number of ways researchers can provide evidence for the credibility/trustworthiness of their findings, such as evidence of prolonged engagement with the participants, whereby the goal is to provide a thick rich description that reflects the complexities of an experience that participants describe to the researcher. The thick description is also enhanced with member-checks where the researcher revisits the participants with the data to get the participants thoughts on what the researcher is finding (however, see Morse, 1998). Finally, discussing how audit trails (i.e., in-depth description of the steps the researcher has taken), peer debriefing (i.e., dialoguing about results with colleagues, experts in the field), and using triangulation (i.e., the integration of different methods or data sources) can provide evidence for the credibility/trustworthiness the findings (Levitt et al., 2018; Morse, 2015).

Mixed methods researchers have also developed criteria for evaluating the quality of mixed methods research studies (Creamer, 2018; Levitt et al., 2018; O'Cathain, 2010; O'Cathain, Murphy, & Nicholl, 2008). For instance, researchers synthesize the literature, formulate research questions, and articulate a clear rationale/justification for implementing a mixed methods design, and the accompanying research methods, to address those questions. In addition, researchers need to implement both the quantitative and qualitative methods with the previously established rigor for both approaches. As might be expected, the usefulness of the findings from a mixed method study can be compromised if either the quantitative or qualitative data collection and analysis lack sufficient rigor. Usefulness may also be compromised if a mixed methods study lacks integration or a clear explanation of integration approaches. Therefore, it is important that the integration of the approaches is appropriate and presented with sufficient detail so the reader can see how the findings fit together and tie back to the research questions. Finally, any inferences that emerge from the study should be connected back to the purpose of the study, the research questions, and findings on which the inferences were based.

6. Research designs

Researchers can use mixed methods research designs when they pose quantitative and qualitative research questions in the same study, or when a research question contains elements of both (DeCuir-Gunby & Schutz, 2017). There are three core mixed methods research designs: convergent, explanatory sequential, and exploratory sequential (Creswell & Plano Clark, 2018; Plano Clark & Ivankova, 2016), each of which was utilized by at least one set of authors in this special issue. Table 1 provides a general overview of three core mixed method research designs and Fig. 1 depicts these three core designs. These three core designs differ with respect to the timing of the data collection and the timing of the data analyses. With respect to data *collection*, data for the quantitative and qualitative strands can be collected (nearly) concurrently or sequentially. With respect to data *analysis*, the implementation of the second strand is either independent from or dependent upon the data analysis from the first strand. We organized the articles in this section based on their use of the three core mixed methods research designs.

6.1. Convergent design

The first core design is a *convergent design* (also referred to as a concurrent or parallel design). With this type of design, the data for the

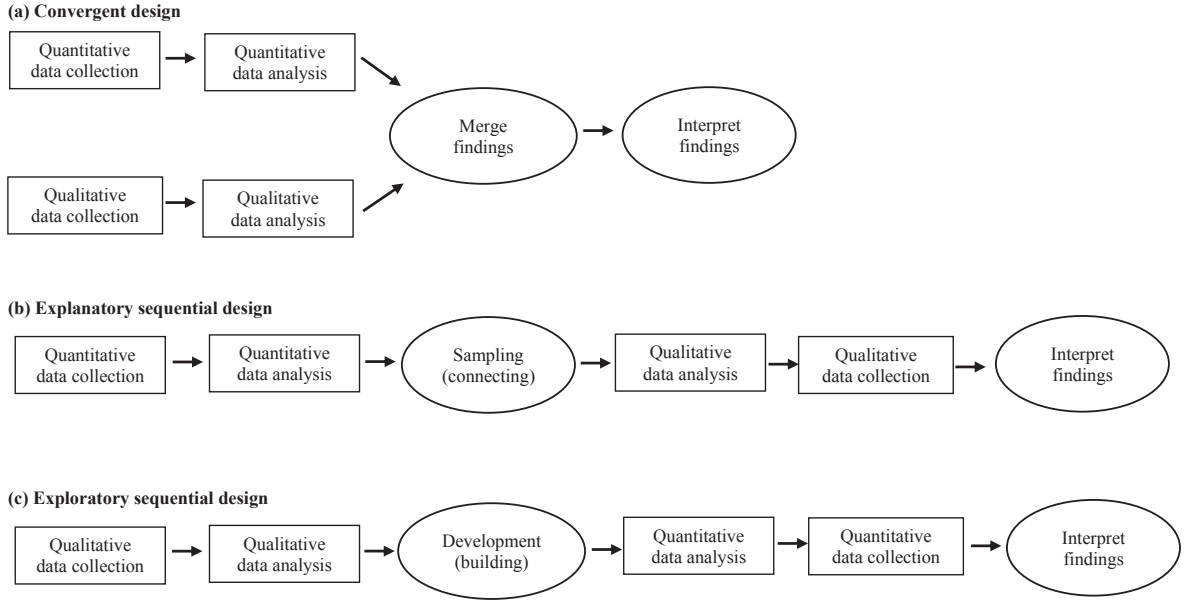

Fig. 1. Core mixed methods research designs.
Sources: Adapted from Creswell and Plano Clark (2018) and Plano Clark and Ivankova (2016).

quantitative and qualitative strands are collected in approximately the same timeframe, the data for both strands are analyzed independently, and then the data from both strands are integrated during interpretation to identify possible sources of convergence or divergence (Fig. 1a). The implementation of neither strand is contingent upon the data analysis of the other strand. The intent of integrating the two strands is often to generate interpretations that extend the breadth and range of the inquiry and/or seek corroboration of results from the two strands (Creswell & Plano Clark, 2018). Three of the articles in the special issue (Schmidt, Kafkas, Maier, Shumow, & Kackar-Cam, this issue; Usher, Ford, Lee, & Weidner, this issue; White, DeCuir-Gunby, & Kim, this issue) used a convergent design, although they achieved integration in different ways.

Schmidt et al. (this issue; Fig. 1) used a convergent mixed methods study design to investigate teachers' use of instructional strategies that are meant to promote students' beliefs about the value or usefulness of course content beyond the immediate instructional context (i.e., relevance). In the qualitative strand, they conducted classroom observations over a seven-week time-period and teacher interviews at the completion of the observation period to evaluate teachers' perceptions and communication of relevance during class, which provided evidence of prolonged engagement with the participants. For the classroom observations, observers recorded activities and teacher-student interactions to identify instances in which teachers explicitly talked about why science content mattered. These qualitative data were then coded and transformed into frequencies (quantized; Sandelowski, Voils, & Knafl, 2009). The researchers conducted the teacher interviews to gain insights into teachers' perspectives about how they communicate the value of science in and out of the classroom. In the quantitative strand, they measured students' perceptions of science utility on an end of class questionnaire item periodically over the seven-week time frame in which they conducted the classroom observations. Student perceptions were measured following class meetings in which observations took place. Thus, they achieved integration through data transformation, which refers to converting one data type into the other type of data (e.g., quantitizing qualitative data) and integrating it with the data that have not been transformed using triangulation to provide evidence for the credibility/trustworthiness of the results.

Integrating the two strands enhanced their study by enabling the researchers to evaluate overlapping yet different facets of relevance. Specifically, the interview data enabled the researchers to gain insights into teacher beliefs about science utility and their views about how they communicated science utility to their students, whereas the classroom observation data were used to describe actual teacher behaviors. Further, these behaviors could be considered in light of student survey data, developed from existing measures, to evaluate the extent to which teacher behaviors were related to student perceptions of science utility. Scale reliability was reported as internal consistency. Thus, the convergent design made it possible to investigate teacher-student interactions related to the relevance of science content, provide teachers' views of their practices, and gather student perceptions of science in light of these teaching practices, thus providing mixed methods rigor.

Usher et al. (this issue; Fig. 1a) used a convergent mixed methods study design to investigate sources of self-efficacy beliefs for mathematics and science, and self-efficacy beliefs regarding mathematics and science for middle and high school students in a rural, high-poverty area in Appalachia. In the quantitative strand, students completed sources of self-efficacy belief scales for mathematics and science, and self-efficacy belief scales for mathematics and science. The authors used confirmatory factor analysis to examine the internal structure of the sources of self-efficacy belief scales in mathematics and science and reported coefficient alphas. The quantitative results from structural equation models (SEM) indicated that mastery experience and physiological state both predicted mathematics self-efficacy, whereas only mastery experience predicted science self-efficacy.

Somewhat surprisingly, neither vicarious experience nor social persuasion predicted self-efficacy for mathematics or science. Further, physiological state did not predict science self-efficacy. Participants' responses to open-ended questions about what raised and lowered their self-efficacy in mathematics and science contextualized the quantitative findings. The researchers used data conversion or transformation with the qualitative data. Specifically, they converted the qualitative codes to quantitative data (quantized), which enabled them to identify convergence and divergence between the two data sets when they interpreted the findings (Sandelowski et al., 2009). The qualitative findings corroborated the results from the quantitative strand regarding significant predictors of self-efficacy. However, by including participant voices, the qualitative findings depicted a broader view of mastery experience in which both direct experience (i.e., one's past experiences in performing tasks) and performance evaluation (e.g., feedback about

one's performance on a task) were prevalent sources of students' self-efficacy beliefs for mathematics and science.

Integrating the two strands enhanced the study by enabling the researchers to identify convergence and divergence between the data from the closed-ended questionnaire items and the open-ended interview prompts. Further, by integrating and interpreting the quantitative and qualitative findings, the researchers were able to identify patterns that were not apparent in the quantitative data alone. For instance, although neither vicarious experience nor social persuasion individually predicted self-efficacy in the SEM models, students incorporated these sources with other sources in their responses to the open-ended questions. Thus, the convergent design made it possible to investigate what types of experiences support and undermine student self-efficacy, how students use information to judge what they can do, and to identify divergent results between each method.

White et al. (this issue; Fig. 1) used a convergent mixed methods study design to investigate the relations among racial identity, science identity, science self-efficacy beliefs, and science achievement for African American students at historically Black colleges and universities (HBCUs). In the quantitative strand, 347 students completed questionnaires pertaining to their racial identity, science identity, and science self-efficacy and self-reported their science college grade-point average. The quantitative results from the path analysis indicated a significant positive relation between science identity and science self-efficacy, and that science self-efficacy meditated the indirect relation between science identity and college science achievement. Similarly, science self-efficacy mediated a marginal relation between racial identity and college science achievement.

In the qualitative strand, the researchers used a Critical Race Theory lens and conducted individual interviews with 14 African American science students who had participated in the quantitative strand. The interview protocol elicited participants' views about the influence of the HBCU environment on the constructs measured in the quantitative strand (achieving integration through building; Fetters et al., 2013), with a focus on their pre-college experiences with science and more recent experiences that had shaped their science and racial identities. When the researchers merged the two data sets, they found the qualitative findings corroborated the results from the quantitative strand. Students indicated that receiving recognition as African American scientists was very important to them, and recognition is one of the most salient aspects of an individual's science identity. However, science identity is much more domain general, whereas self-efficacy is more domain or even task specific. Thus, it is possible that students who have a stronger domain-general science identity may have different levels of science self-efficacy based on the specific domain, which may be related to achievement in their science classes.

Integrating the two strands enhanced their study by enabling the researchers to identify convergence between the closed-ended questionnaire items and the open-ended interview prompts. Further, by integrating the quantitative and qualitative findings, the researchers were able to corroborate and explain patterns from the path analysis. Thus, the convergent design made it possible to investigate similarities and differences between students' identities and their science self-efficacy, and their relations to science achievement.

6.2. Explanatory sequential design

The second core design is an *explanatory sequential design*. With this type of design, the data for the quantitative strand are collected and analyzed, followed by the collection and analysis of the data for the qualitative strand (Fig. 1b). Importantly, the quantitative strand informs the sampling procedure for the subsequent qualitative strand because the qualitative data are used to explain some finding from the quantitative strand. Then, the data for both strands are brought together and the qualitative strand is used to explain or illuminate a particular finding from the quantitative strand. Thus, the data collection and analysis for the quantitative strand precede the data collection for the qualitative strand, and the quantitative and qualitative strands are dependent; the implementation of the qualitative strand is contingent upon the data analysis from the quantitative strand. The intent of integrating the two strands is often to use the qualitative strand to elaborate, enhance, or explain some finding of interest from the quantitative strand (Creswell & Plano Clark, 2018). One article (Matthews & López, this issue) in the special issue used an explanatory sequential design.

Matthews and López (this issue; Fig. 2) used an explanatory sequential design to investigate the relations among teacher beliefs, teacher behaviors that affirm students' ethnicity and culture, and mathematics achievement for Latino children in primary school. In the quantitative strand, the teachers completed survey items about their critical awareness (i.e., knowledge about teaching historically marginalized students), expectations for student success, and their use of asset-based pedagogy (i.e., incorporation of cultural content and the Spanish language in their classroom instruction; CCI). For the reliability and validity of the CCI, the researchers reported internal consistency and confirmatory factor analysis evidence for the scale. Next, the researchers used multi-path models to identify predictors of student achievement. The quantitative results indicated that teacher expectations directly predicted student mathematics achievement but not use of asset-based pedagogy, while teachers' critical awareness indirectly predicted mathematics achievement via teacher reported use of asset-based pedagogy.

To further explain these findings, the researchers used the survey data to identify teachers for follow-up interviews. Specifically, they purposefully sampled and interviewed teachers who had the highest scores on the survey items that measured critical awareness and expectations for student success. Thus, they integrated the quantitative and qualitative strands through sampling, (specifically extreme-case sampling), a form of integration known as *connecting* (Fetters et al., 2013). Further, the researchers used the survey items from the quantitative strand to develop the interview protocol for the qualitative strand. Thus, they integrated the data collection procedures from both strands, a form of integration known as *building* (Fetters et al., 2013). The interview data enabled the researchers to provide an in-depth description of the teachers' beliefs and how they affirmed their students' ethnicity and culture in the classroom and curriculum. In the qualitative analysis phase, rigor was enhanced by using a constant comparative approach to ensure the voices of the participants in developing their theory. As such, the qualitative findings indicated a key difference in teacher goals for using asset-based pedagogies. Some teachers described using asset-based pedagogies to realize socio-engagement goals (i.e., building community and promoting equity and awareness of cultures), whereas other teachers described using asset-based pedagogies to realize academic goals (i.e., leveraging students' funds of knowledge academic learning). Further, teachers who espoused academic goals conveyed a deeper understanding of cultural marginalization.

Integrating the two strands enhanced their study in two main ways. First, including the qualitative strand made it possible to potentially explain why neither teacher critical awareness nor cultural content integration directly predicted student mathematics achievement. Second, the interview data indicated that despite having similar quantitative profiles, teachers who had high self-reported critical awareness and expectations espoused different goals, which influenced their classroom practices and engagement with students. The researchers concluded that both critical awareness and high expectations in concert were predictive of the implementation of culturally responsive teaching leading to growth in student learning. Thus, the explanatory design enabled the researchers to provide a more comprehensive understanding of the topic than would have been possible with just a quantitative approach.

6.3. Exploratory sequential design

The third core design is an *exploratory sequential design*. With this type of design, the data for the qualitative strand are collected and analyzed, followed by the collection and analysis of the data for the quantitative strand (Fig. 1c). Importantly, the qualitative strand informs the data collection for the subsequent quantitative strand. Then, the data for both strands are brought together to evaluate the generalizability of the initial qualitative findings. Thus, data collection for the qualitative strand precedes data collection for the quantitative strand, and data collection for the quantitative strand is dependent upon the data analysis from the qualitative strand. The intent of integrating the two strands is often to use the qualitative phase to create or build a follow-up quantitative instrument or intervention (Creswell & Plano Clark, 2018). One article in the special issue (Kumar et al., this issue) used an exploratory sequential design.

Kumar et al. (this issue; Fig. 1) used an exploratory sequential design to investigate features of culturally responsive learning environments across 12 middle schools in two geographically-close school districts. In the qualitative strand, they conducted 57 focus-group interviews with 333 students from different cultural backgrounds about their interactions with others and their experiences in their middle schools; thus, providing ample evidence of prolonged engagement with the participants. They identified four general themes from the interview data about student perceptions of cultural responsiveness in their schools: (a) perceptions of teachers as respectful/prejudiced and culturally respective/insensitive, (b) culturally responsive and inclusive curriculum, (c) intergroup relationships, and (d) school policies and practices. Based on these data, they developed items for a questionnaire. Thus, they integrated the data collection procedure from the qualitative strand to the data collection procedure for the quantitative strand, a form of integration known as *building* (Fetters et al., 2013). Specifically, themes from interview data were used to generate survey items to be evaluated in the quantitative strand.

In the follow-up quantitative strand, a different sample of students (n = 2894) whose backgrounds mirrored the students who were interviewed, completed the questionnaire. To provide reliability and validity evidence, the researchers reported internal consistency for the three scales following a confirmatory factor analysis: (a) promoting cultural openness and positive intergroup relations, (b) providing culturally inclusive and responsive curriculum, and (c) establishing culturally responsive school practices and policies.

Integration of the two strands enhanced their study by providing evidence of the generalizability of the qualitative findings to a large sample. The qualitative strand enabled the researchers to identify features of culturally inclusive and responsive curricular learning environments (CIRCLEs) based on student focus group interviews and to develop questionnaire items. In the quantitative strand, they tested the applicability and psychometric generalizability of CIRCLE questionnaire to a large sample. Thus, the exploratory sequential design enabled the researchers to develop and provide validity evidence for an instrument to measure the features of CIRCLEs.

6.4. Commentary

We close this special issue with a commentary by Plano Clark (this issue), a specialist in mixed methods research. Plano Clark's work focuses on designs for conducting mixed methods research, examining procedural aspects of these designs, and examining broader questions about contexts for the adoption and use of mixed methods. Her work has been at the forefront of mixed methods research. For example, in 2011, she co-led the development of *Best Practices for Mixed Methods in the Health Sciences* for NIH's Office of Behavioral and Social Sciences Research and she is a founding co-editor of SAGE's *Mixed Methods Research Series*. Plano Clark situates each of the empirical articles in a core research design, describes the importance of integration to mixed methods research, and discusses four strategies the authors use to integrate the quantitative and qualitative approaches in their studies.

7. Addressing challenges in educational psychology

During the submission process, we asked authors to consider the question of what could be learned about their topics of study by using mixed methods designs that could not be learned from mono-method approaches. In reading across studies, we also noted the value-added feature of mixed methods with respect to common problem spaces in research in educational psychology in three specific areas: (a) to identify and explore socially-situated and contextualized learning processes; (b) to provide insights into differences across individuals with respect to educational outcomes such as learning and motivation; and (c) to build instruments that reflect the experiences of individuals who will be assessed by these instruments. In the following paragraphs we elaborate on how the use of mixed methods approaches may be helpful for expanding the research findings in each of these spaces.

Educational psychologists have called for research that expands our understanding of the socially-situated or contextualized nature of learning processes (e.g., Nolen, Horn, & Ward, 2015; Schutz, 2014). Mixed methods research offers promise to further our knowledge about the socially-embedded nature of learning. For instance, researchers can use large-scale multilevel modeling to investigate the influence of individual- and group-level variables (and their interactions) on different outcomes of interest (Raudenbush & Bryk, 2002). As a complement to such quantitative approaches, qualitative research can be instrumental in gaining insights into how individuals, such as students, make meaning of their social context and how the explicit and implicit messages students receive from relational partners, such as teachers or peers, and school structures influence their learning experiences (e.g., Gray, Hope, & Matthews, 2018; Kurtz-Costas & Woods, 2017). Both approaches offer value in considering interactions amongst learners and their environments. However, researchers who use both approaches in a study may gain a deeper and broader understanding of the role of individual- and group-level variables on student outcomes and have greater confidence in their findings and conclusions. Articles in this special issue integrated general quantitative patterns and in-depth narrative responses from participants to reveal how specific environmental and social cues and supports created unique experiences for learners. Importantly, all articles in the special issue investigated and discussed contextual aspects of learning that were afforded by their use of mixed methods research.

A related issue is that while there are many studies in the educational psychology literature that conduct analyses to look for differences across groups (e.g., poverty level, gender, race) there is limited research exploring whether these are appropriate distinctions to make or reasons why groups of individuals may systematically respond differently to measures of outcomes (DeCuir-Gunby & Schutz, 2014). In other words, when researchers control for group differences or test for moderation effects across groups, there is rarely any meaningful investigation into reasons or rationales for these findings from the perspectives of individuals. Researchers may draw upon theory to explain their findings, but often these theoretical explanations remain empirically underexplored. Articles in this special issue illustrate how mixed methods can be used to explore distinct experiences that contribute to systematic variation across and within groups, particularly by including the voices of the participants.

Finally, mixed methods also holds promise for addressing measurement issues in educational psychology, particularly related to capturing subjective experiences (Benson, 1998). Rather than using existing theory and research experts to generate survey items, mixed methods approaches can be used to incorporate the experiences of potentially relevant populations during instrument development. Such an approach may be particularly important when researchers investigate constructs that are race-focused (DeCuir-Gunby & Schutz,

2014) or when they administer an instrument to a widely diverse group of participants. Instruments developed and normed with homogenous groups reflect the values, experiences, and beliefs of that group. In educational psychology, many commonly used instruments have been validated using white, middle-class, samples; thus, many of the instruments reflect the values, experiences, and beliefs of these samples. However, the use of these instruments in research with diverse samples is susceptible to bias in favor of participants that are similar to the original norming sample.

Researchers in educational psychology have attempted to redress this problem by testing for measurement invariance amongst groups to eliminate measurement equivalence issues on survey responses (Schwartz et al., 2014). However, even this approach does not address the issue that the survey items themselves may not capture the heterogenous experiences of the individuals in the participating sample. When mixed methods approaches are used to generate items inclusive of the experiences of the intended population, the instrument can more authentically reflects student experiences, increasing the credibility of findings that result from the use of the instrument. This special issue offers a helpful example of how instruments can be developed or refined to ensure that measures reflect diverse cultural experiences (Kumar et al., this issue) and conversely, that conclusions drawn from the use of these measures are reflective of substantive findings and not an artifact of measurement problems.

8. Conclusion and the future of mixed methods in educational psychology

As indicated, our primary goal for this special issue was to support the development of mixed methods research in educational psychology. To realize this goal, we sought to showcase high-quality mixed methods research studies conducted by educational psychology researchers across a range of topics. We believe this special issue has accomplished that goal by presenting articles that demonstrate rigor, integration of methods, and results that may not have emerged from single method approaches. As such, we think the use of mixed methods by educational psychologists has an important future yet acknowledge that mixed method inquiry is not a panacea.

However, it is also important to acknowledge that using a mixed methods approach is not for the "faint of heart." First, mixed methods research requires knowledge and skills in not just one area of research methods but in three (i.e., qualitative, quantitative, and mixed methods). Researchers in these three areas of research methods have developed expectations and standards for good practice and rigor. This can be a particularly challenging for researchers if they have had little or no education or training in qualitative research methods. This can result in "QUAL-light" research (Teddlie & Tashakkori, 2012, p. 777), the use of "qualitative data as 'handmaiden' or 'second best' to the quantitative data", or the use of mixed methods that leads to the "'adding and stirring' of qualitative methods that often takes the form of sprinkling in some vignettes to provide narrative examples of the conclusions already reached by means of quantitative methods" (Hesse-Biber, 2010, p. 457). Therefore, researchers interested in using mixed methods for their research must also understand and meet those expectations and standards for good practice and rigor in their own work.

Second, in most cases, a mixed methods study, by its very nature, has the potential to use more resources. Collecting and analyzing data from two approaches has the potential to be more resource-demanding (e.g., time, funding) than using a single method (Bergman, 2011); thus, using a second research method in most cases will increase the time and cost of the project. To ensure adequate expertise and resources, mixed methods research is often conducted as a team approach (Creswell, Klassen, Plano Clark, & Smith, 2011). In fact, all the articles in this special issue were conducted by multiple author teams. Working as a collaborative research team can entail its own challenges (Fiore, 2008) but may represent a fruitful avenue for researchers committed to executing mixed methods studies.

Lastly, journal editors may experience difficulties when handling the review and evaluation of mixed methods manuscripts. In the field of educational psychology, most journals have a long history of publishing predominantly quantitatively-focused research, although this trend is changing. Nevertheless, it is important for members of editorial boards or reviewers to be sufficiently well-versed or trained in mixed methods research to adequately evaluate mixed methods studies, particularly in terms of standards for rigor or integration. While researchers on editorial boards may know, understand, and expect to review manuscripts that use quantitative methods, they may have less understanding of rigor for manuscripts that include qualitative or mixed methods. In addition, mixed methods manuscripts tend to be longer than mono-methods manuscripts, and manuscripts that report mixed methods research may approach the page/word limit restriction imposed by some journals. These challenges may discourage researchers from conducting mixed methods research studies or from submitting them to educational psychology journals. As educational psychologists grow more comfortable with producing, consuming, and reviewing mixed methods research, our ability to offer critical appraisal of the quality of the work and contributions to the field will be enhanced.

We were encouraged by the quality of work the authors in this special issue produced and wish to thank them for their efforts in conducting and reporting their respective studies. We look forward to reading high-quality mixed methods studies that extend into areas not represented by this special issue. For instance, although none of the articles in the special issue used interventions and experimental research, we believe that mixed methods research can be beneficial for researchers who implement interventions or experimental research to explain intervention challenges, failures, and successes. Mixed methods can help researchers investigate participant experiences during an intervention (e.g., Koster, Bouwer, & van den Bergh, 2017), which can be used to improve or adapt an intervention, or to elaborate or explain between-group and within-group differences (e.g., McCrudden, Magliano, & Schraw, 2010). Ultimately the promise for mixed methods research in educational psychology will emerge from needs within our field and be realized by the creativity of our community of scholars.

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