



The distinction between inquiry-based instruction and non-inquiry-based instruction in higher education: A case study of what happens as inquiry in 16 education courses in three universities



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HIGHLIGHTS

- We did a collective case study of inquiry in 16 preservice teacher-education courses.
- Purposively sampled instructors said they took an inquiry-based approach or not.
- Data included interviews, instructional plans, syllabi, and classroom observations.
- Inquiry instruction differed most in course planning, learning-assessment, and roles.
- Co-construction and small-group participation in instructional activities differed.

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ABSTRACT

This collective case study describes instructional plans and observed inquiry-based instruction (IBI) in 16 undergraduate education teacher-preparation courses purposively sampled from instructors who said they did or did not take an IBI approach. Open coding and content analysis of interview transcripts, recordings of observed instruction, syllabi, and cross-case comparisons informed what was alike, different, and unique for IBI and non-IBI. We used negative cases, data triangulation, audit trail, and interrater reliability for 25% of the codes. IBI and non-IBI differed most in course-planning, student-learning assessment, co-construction of instruction, and the nature and quantity of teacher and student roles and talk.

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Research, scholarship, and teaching are the cornerstones of universities' primary mission. However, undergraduate students' engagement in inquiry has been a direct research object only since the 1980s (Barrows & Tamblyn, 1980). Personal experiences with inquiry and learning to teach with inquiry are both relevant to teachers', including higher-education instructors', ability to create inquiry-based learning situations for their students. Inquiry-based instruction (IBI) embraces several models in the literature, but three defining characteristics appear to be common across the models and descriptions of IBI: (a) Student's interests contribute to

what happens in classrooms, (b) at least some of the curriculum is coconstructed, and (c) there is exchange, diversification, sharing, or adoption of new roles by learners and teachers (Aulls & Shore, 2008). However, these common characteristics are not meant to be limiting because individual higher-education instructors, a population generally not formally educated as teachers, might bring a number of inquiry practices to their classes from their disciplinary scholarship. To date, no research has empirically distinguished IBI and non-IBI dimensions in a range of teacher-education courses, or described the common and unique underlying dimensions of instruction that occur in courses taught by instructors who say they incorporate inquiry learning in their undergraduate instruction in general and specifically in teacher education. Spronken-Smith, Walker, Batchelor, O'Steen, and Angelo

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(2012) observed that their survey-based study of inquiry outcomes in 15 courses in different disciplines obtained data only from IBI classes, therefore the contribution of IBI beyond other approaches could not be estimated. We used L. W. Anderson and Burns's (1989) model of six dimensions of instruction to frame our analysis of interviews, classroom observations, and artifacts such as written course syllabi distributed to students. We focused on what actually happens as inquiry in the classes.

International use of common terms varies, sometimes totally reversed. We used “instruction” rather than “teaching” to focus not only on what the teacher does but also on what students do, instructor–student interactions, and the learning context. We used the North American term “course” for what is elsewhere referred to as a “subject” or “module” within a program of study and normally involving about three hours of weekly instructor contact with a group of students over approximately four months.

1. Literature review

There has not been prior research directly on the topic of this study, but there are many studies that have informed the work and provided theoretical context and models for its conduct.

1.1. Inquiry instruction and learning in undergraduate higher education

Research reports exist about undergraduate IBI in the USA (e.g., Ball & Pelco, 2006; Boyer Commission, 1998; Handelsman, Miller, & Pfund, 2007; Park Rogers & Abell, 2008; Stokking, Van der Schaaf, Jaspers, & Erkens, 2004), Canada (e.g., Aulls & Shore, 2008; Barrows & Tamblyn, 1980; Chichekian, Hua, & Shore, 2013; Redden, Simon, & Aulls, 2008), New Zealand (e.g., Spronken-Smith, Bullard, Ray, Roberts, & Keiffer, 2008)—this paper also presented examples from the USA and UK; Spronken-Smith et al., 2011; Volkmann, Abell, & Sgagacz, 2005), and the UK (e.g., Brew, 2003; Healey & Jenkins, 2009). This research was largely limited to qualitative case studies of single courses and quasi-experimental studies comparing two approaches to inquiry instruction or one IBI and one non-IBI course (Spronken-Smith & Walker, 2010); Spronken-Smith et al.'s (2012) study is a notable exception. Spronken-Smith et al. (2011) claimed that they could only identify two research reports on the use of inquiry throughout an undergraduate degree program, one in the Health Sciences (Ai et al., 2008) and one in microbiology (Lee, Hyman, & Luginbuhl, 2007).

Renewed impetus to study undergraduate inquiry instruction and learning was provided by the Boyer Commission (1998) recommendations that undergraduate students in any discipline should have the opportunity from the first year of university to learn about and experience inquiry, and that research-intensive universities should lead the way. Some universities enacted several Boyer-report suggestions, but the overall impact was spotty (Boyer Commission, 2001; Katkin, 2003). Before Boyer, opportunities for undergraduates to learn about and experience inquiry were provided primarily through student-initiated, faculty-supported research projects, and the initiatives of individual instructors who made efforts to improve their learners' experiences without explicitly tying these to notions of inquiry. For example, the Undergraduate Research Opportunities Program at the Massachusetts Institute of Technology began in 1969 (Cohen & MacVicar, 1976). These were conducted outside courses contributing degree credit.

A relatively small body of research has addressed undergraduate inquiry instruction. Spronken-Smith et al. (2008) reported three studies offering evidence of positive undergraduate student-learning outcomes (Justice, Rice, Warry, & Laurie, 2007; Prince &

Felder, 2006; Spronken-Smith & Walker, 2010). One meta-analysis of science undergraduate courses provided evidence for the use of small-group instruction in science courses. Superior higher-order learning outcomes ensued, one frequently noted dimension of IBI models. IBI was related to similar general outcomes (Ball & Pelco, 2006; Levy & Petrulis, 2012; Spronken-Smith et al., 2008), with more positive impact on learning than non-IBI courses (Justice et al., 2007). Students rated some kinds of IBI most highly, for example, open, discovery-oriented inquiry (Spronken-Smith et al., 2012). Case-based and project-based learning were associated with more evidence of positive learning outcomes than other kinds of inquiry such as problem-based learning (Loyens & Rikers, 2011).

Growing emphasis on IBI educational reforms in K-to-12 education also prompted interest in using IBI approaches within undergraduate courses. More matriculating students will be prepared to engage in IBI and expect professors to use and build upon their inquiry-specific thinking skills and provide course-time for student participation in projects they or others initiate. This is especially likely if students spent extended time doing a research project within their secondary education; survey data (Kurotsuchi Inkelas, Swan, Pretlow, & Jones, 2012) confirmed that undergraduate students who systematically engaged in doing a research study in the arts, humanities, or sciences in an International Baccalaureate (IB) program believed they were better prepared to undertake university inquiry requirements than students who had other secondary schooling experiences. IB graduates reported more involvement in doing research, and more highly valued the opportunity to engage in undergraduate inquiry.

1.2. Inquiry instruction and learning in undergraduate teacher education

Multiple meta-analyses spanning 20 years clearly supported the importance of designing undergraduate teacher-education courses that help K-to-12 preservice teachers learn how to teach content and skills through IBI processes in ways that lead to enhanced higher-order thinking and learning outcomes (e.g., American Association for the Advancement of Science, 1993; Bredderman, 1983; Furtak, Seidel, Iverson, & Briggs, 2012; National Research Council, 1996, 2000, 2012; Organization for Economic Cooperation and Development, 2009; Schroeder, Scott, Tolson, Huang, & Lee, 2007; Shymansky, Hedges, & Woodworth, 1990). Minner, Levy, and Century's (2010) synthesis of 138 K-to-12 qualitative research studies also reported a “clear, positive trend in favor of inquiry based-teaching” (p. 474).

Nevertheless, the issue arises of whether or not undergraduate student-teachers typically have been exposed to preparation and engagement in inquiry projects and are provided the opportunity to learn how to actually do or teach through inquiry as opposed to merely becoming informed about it. In a year-long qualitative study of 60 students in two research-intensive British universities (Wray, 2013), all the first- and second-year undergraduates reported not having experienced any IBI or being asked to use their earlier-learned, higher-order, inquiry-relevant skills. Wray's results challenged the claim that students' prior experiences directly influence education professors' inquiry-instructional practices, yet confirmed that IBI-trained secondary graduates expect to encounter situations in which inquiry skills are needed. Alkhaer and Dolan (2011) also reported lack of awareness of IBI effects in several disciplines. More large-scale qualitative studies are needed to describe whether education professors have a rich conception of inquiry as a process and as instruction, and how well what happens as instruction during a course aligns with their conceptions of inquiry.

Instructors' conceptions of what they desire to teach can be

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