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# Sparking the Flame: Research as Inquiry for Aspiring Educators

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**Abstract**
The purpose of this study is to describe and report on the implementation of an inquiry-based module for future educators. Research consistently highlights a gap between the academic expectations of secondary school and the requirements of higher education, particularly concerning inquiry and research skills. While College-Career Ready (CCR) standards (Green et al., 2023) aim to bridge this divide, many first-year undergraduate students, including preservice teachers, still struggle with the shift toward inquiry and critical analysis. This study investigated the efficacy of an intensive, year-long inquiry-based learning (IBL) program called "Pathways for Success" (PFS), which was designed by university faculty to foster research skills among 229 (n=229) first-year and transfer undergraduates interested in teaching. A survey research design was used to answer the following research questions: 1) What is the Research as Inquiry Module and how was it implemented? 2) What were the undergraduate students' perceptions of the process of research and its application to their future? 3) What challenges, if any, did the undergraduate students identify about engaging in research? Findings reveal that students held positive perceptions of the module and its professional applications, yet they also identified key challenges, including formulating research questions and managing their time.

**Keywords:** clinical experiences, college-career ready, inquiry-based learning, inquiry processing cycle, teacher education

## Introduction

Higher education institutions across the United States are placing increasing emphasis on high-impact educational practices—particularly those that prioritize deep student engagement from the onset of the undergraduate experience. Undergraduate research opportunities, even for first-year students, are becoming central to the mission of colleges and universities seeking to cultivate active, independent thinkers (Kuh, 2008). The underlying aspiration is clear: students should not only acquire knowledge but learn how to generate it. This aspiration runs up against a practical reality—many first-year college students arrive on campus unprepared for the kind of independent, systematic inquiry that meaningful undergraduate research demands (Byker, 2015; Byker & Ezelle-Thomas, 2021; Byker & Sadula, 2022). While college-career ready (CCR) standards have been designed to prepare high school graduates for academic rigor, the gap between secondary schooling and the expectations of postsecondary research remains significant (Green et al., 2023).

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The shift toward autonomous learning, sustained inquiry, and critical analysis poses a challenge for many first-year learners who are more accustomed to teacher-directed instruction and standardized assessments.

In response to these challenges, many higher education institutions are adopting pedagogical approaches that emphasize inquiry, metacognition, and critical thinking (Dolapçıoğlu, 2020; O'Brien et al., 2023; Van Laarhoven et al., 2007). Inquiry-based learning (IBL), in particular, has gained traction as a promising method to support students' intellectual development and transition into the norms of scholarly research (Byker et al., 2023). This pedagogical commitment to inquiry is not new, but received renewed prominence with the work of the Boyer Commission at the turn of the 21st century. Convened by the Carnegie Foundation for the Advancement of Teaching, the Boyer Commission (1999) set out to reimagine undergraduate education at research universities. The Commission's final report outlined ten bold recommendations for reform, placing inquiry at the heart of undergraduate learning. The first recommendation called for making research-based learning the standard throughout the undergraduate curriculum. The second urged institutions to build the first-year experience around inquiry-based pedagogies. In doing so, the Commission explicitly recognized the power of inquiry not only as a learning strategy but as a foundational right of every college student.

In an evocative social justice metaphor, the Boyer Commission (1999) articulated what it called the undergraduate student's "Academic Bill of Rights" (p. 12). This rights-based framing rested on four key pillars: 1) inquiry-based learning; 2) the development of coherent and reasoned communication; 3) the appreciation of the arts, humanities, and sciences; and 4) comprehensive preparation for future academic and professional endeavors. By listing inquiry first among these four pillars, the Commission signaled its belief that inquiry is not simply one strategy among many but rather the cornerstone of an equitable and transformative undergraduate education. When institutions embrace inquiry, the report argued, they do more than prepare students for academic success—they prepare them to be thoughtful, articulate, and socially responsible leaders. Inquiry becomes a mechanism of educational justice, particularly when contrasted with the prevailing paradigm of lecture-dominated instruction that often marginalizes student voice and agency.

As such, this study focuses on the role of curiosity in catalyzing inquiry among first-year students. The setting of the study is a first-year undergraduate program, which we will refer to using the pseudonym PFS (Pathways for Success). For this article, we describe and report on the students' perceptions of engaging in a Research as Inquiry Module, which is part of the PFS program.

## Theoretical Framework

### Inquiry-based learning

Unlike traditional lecture-based instruction that emphasizes the passive reception of information, IBL repositions students as co-constructors of knowledge (Bacak & Byker, 2021; Chu et al., 2021; Donham & Andrews, 2023). It is a pedagogy that insists on rigor by giving students the autonomy and responsibility to pose meaningful questions, problem solve, and generate their own solutions and conclusions (Li et al., 2024). This insistence on rigor is not for the sake of compliance, but rather for empowerment. Through IBL, students pursue answers through structured investigation and articulate their findings through coherent communication, all while receiving intentional instructor guidance and scaffolding (Byker et al., 2023). To that end, IBL is learner-centered and frequently employs collaboration to achieve its goals (Chu et al., 2021). At its core, inquiry-based learning cultivates a spirit of curiosity, a disposition of thoughtfulness, and a commitment to clarity and logic in both written and spoken form. It is, as Dewey (1930) might argue, the very essence of democratic education – a way of teaching and learning that centers the student as a reflective, engaged, and purposeful inquirer.

**The Inquiry Processing Cycle**

Building on prior research on IBL, the Inquiry Processing Cycle is an instructive model developed by Byker et al. (2017) to teach the inquiry process effectively. This cycle is a dynamic framework that encapsulates the active components of inquiry, emphasizing curiosity and collaboration as central driving forces. The cycle itself is composed of six distinct yet interconnected processes:

1. Research Questions: The initial step where learners formulate clear, focused questions stemming from their curiosities.
2. Investigate Resources: Students actively seek out and explore various resources to find answers to their research questions.
3. Draft Conclusions: Learners begin to synthesize the information gathered, forming preliminary conclusions based on their investigations.
4. Create Writing: The insights and conclusions are then articulated through written communication, translating understanding into a structured format.
5. Present Artifacts: Students share their findings and the products of their inquiry (artifacts) with an audience, demonstrating their constructed meaning.
6. Reflect on Applications: The final stage involves critical reflection on the implications and real-world applications of their learning, deepening understanding and identifying future curiosities.

Each of these processes is sequential, building upon the preceding one, thereby guiding learners through a structured yet flexible journey of knowledge construction.

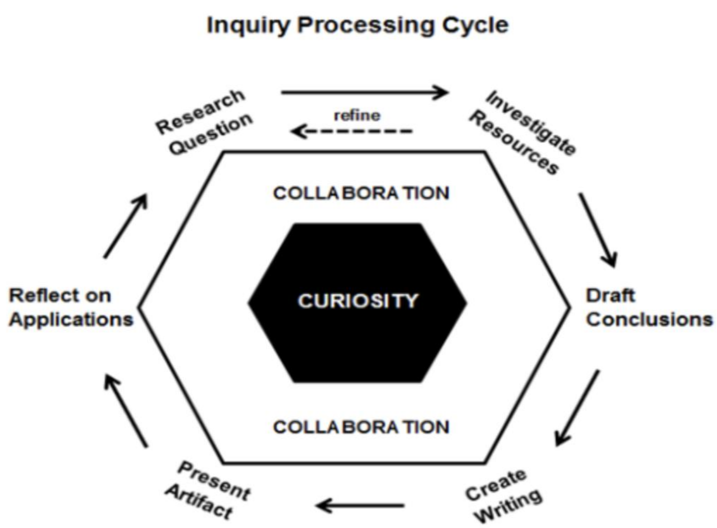


*Figure 1:* Inquiry Processing Cycle

**Literature Review**

**Inquiry-based modules and teacher preparation**

In recent years, many teacher preparation programs have implemented some form of inquiry-based or research as inquiry type modules. For instance, Northern Illinois University implemented Project ACCEPT, a program with first-year outcomes that involved enhanced curriculum and field experiences (Van Laarhoven et al., 2007). At another university, preservice teachers practiced inquiry through collaborative learning and consulting multiple credible sources including people, texts, and instructors (Dolapçıoğlu, 2020). Programs in teacher education might also include lesson planning, data collection, reflection, and video-recording experiences (O'Brien et al., 2023) which align with inquiry processes. According to O'Brian et al. (2007) reflection (e.g., through reflection logs) is critical in "first field experiences" for teacher candidates and a key component of inquiry-based learning.

Inquiry type modules have a number of benefits for learning, particularly for first-year teacher preparation students (Van Laarhoven et al., 2007) and through early implementation of clinical experience (Brownell et al., 2005). These benefits may include hands-on opportunities focused on practical skills, contributions to content knowledge development (Van Laarhoven et al., 2007) and promoting self-efficacy in addition to skills in knowledge acquisition and control (Dolapçıoğlu, 2020). O'Brien et al. (2023) suggest that instructional opportunities like small groups and one-on-one tutoring can scaffold teaching experiences for undergraduates, emphasizing the benefit of introducing such experiences in the first year of teacher preparation. Exposing undergraduates to the inquiry process also translates to developing teachers who engage in sustained learning and self-improvement throughout their careers. Teacher Inquiry itself involves addressing common *problems of practice* through inquiry and actionable research (Mertler, 2021). As cited by Mertler (2021), Henriksen et al. (2017) describe these *problems of practice* as uniquely navigable by practitioners because they "connect with broad or common educational issues but are also personal and uniquely tied to an educational context and its variables (p.142)".

Inquiry type learning is also beneficial for developing essential mindsets and skills for special education teachers (Brownell et al., 2005; Dolapçıoğlu, 2020). Dolapçıoğlu (2020) highlights that inquiry skills (including self-confidence in knowledge acquisition, knowledge acquisition, and knowledge control) are crucial for special education preservice teachers' self-efficacy. Similarly, Brownell et al. (2005) identifies a positivist or constructivist orientation toward teacher knowledge as a characteristic of strong special education programs. These orientations align with inquiry-based learning principles such as self-constructing and co-constructing knowledge and meaning making (Donham & Andrews, 2023).

**Clinical experiences for first-year students**

The inclusion and duration of clinical experiences that teacher preparation students (and especially first-year students) are exposed to can vary greatly from program to program. In a study by Van Laarhoven et al. (2007), first-year students at Northern Illinois University participated in clinical experiences in inclusive classrooms with a minimum requirement of 6 hours. Alternatively, the first field experience for preservice special education teachers at Illinois State University was a semester-long (O'Brian et al., 2007). Some clinical experiences are more intensive. For example, Kent and Giles (2016) described field experiences within an undergraduate, dual-certification teacher education program where students completed 450 hours of clinical experience over two semesters *before* student teaching. However, while Kent and Giles's (2016) study is a significant early experience for undergraduates, it is not explicitly limited to first-year students. Most recently, a systematic literature review of research on field experiences within special education teacher preparation programs from 2013 to 2020 found that on average, undergraduate students' clinical experiences were 42.1 hours or 8.5 weeks in duration (O'Brien et al., 2023). However, O'Brien et al. 's (2023) study was not limited to first-year or early undergraduate experiences.

The priorities and types of clinical experiences may differ from program to program; however, it is clear that the benefits of early clinical experience are plentiful. Clinical experiences provide students with hands-on opportunities to practice essential skills and content knowledge for working with diverse student populations (Kent & Giles, 2016; Van Laarhoven et al., 2007). This may include engaging with assistive technologies, functional behavioral assessment, instructional accommodations, and lesson planning with universal design as part of special education content development (Van Laarhoven et al., 2007). It might also include opportunities to gain practical views of teaching realities and challenges, and acquire valuable experience in classroom management and differentiating instruction (Kent & Giles, 2016). To be successful, clinical experiences should thoughtfully engage students in building connections between coursework and classroom practice (Kent & Giles, 2016). Reflection, such as in the form of reflection logs, is a critical part of building these connections and maximizing growth (O'Brian et al., 2007). With emotional support and pedagogical guidance from cooperating teachers, students in their first field experience may also grow from exposure to multiple roles such as observer, teacher assistant, teacher, and reflective practitioner (O'Brian et al., 2007).

**Connections between inclusion and inquiry**

There is an ever-growing need for qualified teachers who are confident and competent in teaching diverse student bodies in inclusive settings (Crispel & Kasperski, 2019). Brownell et al. (2005) emphasize that a focus on inclusion and cultural diversity is a characteristic of strong special education teacher preparation programs. Similarly, Boe et al. (2007) articulate that intensive preparation in pedagogy and practice is effective for beginning teachers in *both* special and general education. There is a significant positive correlation between increased knowledge of special education terminology and confidence in ability to meet students with disabilities' needs (Brown, et al., 2008). However, many general education teacher preparation programs do not require coursework or practice in special education settings (Crispel & Kasperski, 2019). This leaves mainstream educators feeling unprepared to work in inclusive classrooms, with low self-efficacy, and with less favorable attitudes towards inclusion (Crispel & Kasperski, 2019).

Because they promote self-efficacy in knowledge acquisition and actual knowledge acquisition, inquiry-type modules (Dolapçıoğlu, 2020) in general-education preparation coursework could be an effective solution to the challenges. Crispel and Kasperski's (2019) study focuses on the impact of special education training on the implementation of inclusion in mainstream classrooms. While the study does not explicitly use the term "inquiry," the findings implicitly suggest an inquiry-oriented approach. Namely, professional development provided to general education teachers led to acquiring special education knowledge, which in turn led to improvements in teaching quality and more sensitive and caring attitudes towards diverse student needs (Crispel & Kasperski, 2019). Knowledge acquisition (along with reflection on and implementation of that knowledge) is a core inquiry skill (Dolapçıoğlu, 2020). Therefore, providing the opportunity for inquiry (specifically inquiry centered on special education topics) could help general education teachers develop the necessary knowledge and skills to teach inclusively. Similarly, Harvey et al. (2010) investigate preservice teacher preparation programs for inclusion and highlight the importance of collaboration and coordinating training to compliment and respond to teacher experiences. Collaboration is at the center of Byker et al.'s (2017) Inquiry Processing Cycle, thus highlighting it as a key component of inquiry. Collaboration allows teachers to collectively inquire into challenges and solutions for diverse learners, while coordinating training with experiences encourages teachers to reflect on and learn from their practical encounters in inclusive classrooms, fostering a continuous cycle of inquiry and improvement.

However, many educators enter the field through non-traditional means, and it is important that these educators also be prepared to work in inclusive spaces. At the University of San Francisco, a lateral entry program used a two-year field-based internship model for in-service uncredentialed teachers (Andrews et al., 2003) The model was designed to recruit, train, and retain special educators for culturally diverse urban classrooms. Andrews et al. (2003) explicitly addresses the challenge of inclusion, emphasizing the necessity of exposing teachers to diverse models not always present in their own schools. Thus, such a model highlights the importance of inquiry and diverse field experiences for lateral entry programs in order to address issues of equity and inclusion.

Many researchers are approaching issues of inclusion and inquiry through the use of artificial intelligence (AI) and augmented reality (AR). Preservice teachers may use AI tools (such as ChatGPT) to conduct inquiries about teaching methods or curriculum, reflect on their practice, and receive direct and immediate feedback on various teaching scenarios and questions (Mocanu, 2024). A systematic literature review conducted by Mena et al. (2023) posits that AR may be a valuable tool for enhancing student learning and engagement for preservice teachers, however, it also indicated that further research is necessary to understand specifically if and how AR is beneficial as a form of practicum. The use of AI and AR may have benefits for improving access to inquiry and inclusion. For example, the use of AI and AR may be both an economic advantage and time-saver for teachers who must consistently adapt to new curriculums and pedagogies (Mocanu, 2024). Additionally, inquiry-work is challenging, and use of AI can make "complex concepts more accessible by offering interactive, step-by-step problem-solving guidance and simulating real-world scenarios" (Li et al., 2024, p.1939). However, considering such research, the authors of *this* article maintain that using the process of inquiry alongside real classroom experience has benefits that cannot be fully replicated in AI or AR settings, such as exposing preservice teachers to authentically diverse student bodies and experiences.

## Methodology

This study is based on a survey research design using convenience sampling (Goodfellow, 2023). The 20 question survey included a mix of Likert Scale questions and open-ended questions and was administered using Qualtrics, an online survey tool. The survey was found to have a Cronbach's Alpha of .82, which corresponds to good internal consistency. The combination of qualitative and quantitative data allowed for a more comprehensive and triangulated understanding of the phenomena under investigation (Creswell, 2021). The current study explores the impact of a year-long, intensive, inquiry-based learning (IBL) program, "Pathways for Success" (PFS), with a sample of 229 (n=229) first-year and transfer undergraduate students at a large, public, urban research university in the Southeastern region of the United States. These students, at the time of program enrollment, expressed interest in pursuing a career in teaching, although they had not yet declared a teaching major. All students participating in the PFS program through enrollment in an introductory teacher education course were asked to complete the survey. These introductory teacher education courses included a course exploring social, historical and philosophical ideas pertaining to education, and a course exploring student exceptionality, including those with disabilities, those participating in special education, giftedness, and other social, emotional, and behavioral exceptionalities.

The survey research design assisted in answering the study's research questions, which were:

1. What is the Research as Inquiry Module and how was it implemented?
2. What were the undergraduate students' perceptions of the process of research and its application to their future?
3. What challenges, if any, did undergraduate students identify about engaging in research?

### Participants

The majority of participants ranged from ages 18 to 22, however, 15 participants were between ages 23-33. 64.60 percent of participants identified as female, while 34.07 percent identified as male and 1.33 percent identified as outside the gender binary or chose not to answer. 47.60 percent of participating students identified as white, while 20.52 percent identified as Black or African American, 13.54 percent identified as Hispanic or Latine or Spanish Origin, 10.92 percent identified as Asian, 5.68 percent identified as two or more races, 0.44 percent identified as American Indian or Alaskan Native, and 1.31 percent identified as "other" and specified "Middle Eastern". These demographic characteristics mirror the teaching profession today, which is predominantly white and female (Wandix-White, 2023). Because most preservice teachers will work with racially diverse populations, these demographics highlight the importance of effective preservice preparation, such as IBL, that prioritizes inclusion, diversity, and self-reflection.

**PFS implementation and data collection**

A primary component of PFS is IBL, which is facilitated through the Research as Inquiry Module and a semester-long inquiry project designed to cultivate independent research skills. The project unfolds in three intentional phases: (1) developing and refining a research question; (2) locating and analyzing relevant resources; and (3) synthesizing findings into meaningful conclusions, insights, and ideas. Each phase is scaffolded to support the intellectual risk-taking and independent thinking that inquiry demands. Students begin by choosing a topic of personal interest—often linked to a passion, a social issue, or a potential career path—and then work closely with instructors to formulate a research question that is focused, feasible, and intellectually engaging.

Throughout the semester, multiple layers of support are woven into the fabric of the course to ensure that students are not only guided but encouraged. University librarians host specialized workshops to introduce students to the process of locating, evaluating, and citing peer-reviewed academic literature. These sessions are tailored to demystify the research process and empower students with the tools of scholarly inquiry. At the same time, students receive support from professors, graduate teaching assistants, and peer mentors who offer individualized feedback on their research plans and emerging ideas. This collaborative model reinforces the idea that inquiry is not a solitary act but a communal, dialogic process.

Beyond the classroom, students' curiosities are further stoked through exposure to academic and professional enrichment opportunities. Distinguished speaker sessions, career fairs, and program-specific orientations create bridges between students' academic inquiries and real-world applications. These experiences deepen students' understanding of their research topics and expand their sense of what is possible—academically, professionally, and civically. The inquiry project culminates in final presentations—both written and oral—allowing students to share their work with peers, faculty, and invited guests. These culminating experiences not only celebrate student learning but affirm that their questions, ideas, and voices matter.

In sum, the inquiry-based approach adopted in the PFS program reflects a broader shift in higher education toward student-centered, justice-oriented pedagogy. It is a pedagogy rooted in the belief that all students, regardless of background or preparation, have the right to ask powerful questions and the capacity to pursue meaningful answers. Through the intentional design of inquiry experiences, first-year students are not merely prepared for academic success—they are invited into the university as full participants in the intellectual life of the institution. As the Boyer Commission (1999) envisioned, such students will leave not only with degrees, but with the habits of mind and heart necessary for thoughtful leadership in a complex and changing world. After completing the PFS program, students were asked to complete the Research as Inquiry survey on Qualtrics. In addition to completing the Likert Scale questions, at least 90 percent of participants responded to each of the open-ended questions.

### Data analysis

Using Qualtrics, a comprehensive data report was downloaded. From there, the data report was read thoroughly, and quantitative data was pulled from the report based on the second and third research questions focusing on undergraduate perceptions of the research process and undergraduate perceptions of the challenges of the module. The quantitative data was automatically generated by the report.

Qualitative data was analyzed using a combination of deductive and inductive approaches to identify major themes (Creswell, 2021). First, the qualitative data was read thoroughly to identify responses that addressed the second and third research questions. Responses were pulled from the data report and grouped based on whether they addressed a perception or a challenge of the research process. Low-level codes were assigned to relevant data based on the participants' exact words. For instance, the participant response *to not be overwhelmed* was coded with "overwhelmed", while the participant response *research is best done in a collaborative setting* was coded with "collaboration". From there, participant responses were grouped into categories based on similar ideas and codes. For example, because ideas of time management (low level code) and overwhelm (low level code) were frequently discussed together, responses coded with these ideas were grouped into the theme "time management and overwhelm" which was also grouped under the third research question. Therefore, "time management and overwhelm" was identified as a theme of challenges within the research process. The most relevant ideas were selected for the findings detailed below.

## Findings

### Implementation of the Research as Inquiry Module

The Research as Inquiry Module is an educational framework designed to operationalize Inquiry-Based Learning (IBL) within a higher education context, specifically focusing on developing research skills. Rooted in constructivist pedagogy, IBL moves beyond simple information transfer, inviting learners to actively construct their own meaning from new knowledge and discourse (Donham & Andrews, 2023). The module aligns with the Boyer Commission's (1999) call for baccalaureate programs to embrace constructivist practices, particularly an inquiry-based curriculum for first-year undergraduates that introduces them to research.

Within PFS, the Research as Inquiry Module was implemented to prepare students to write an Inquiry Paper by fostering understanding of the inquiry process, enabling them to formulate research questions and connect curiosities, field observations, and literature. Implementation involved a video/readings, engaging in a clinical experience, writing an inquiry paper that included reviewing literature, and reflecting on the applications of the relationship between the literature and their clinical experience in the field. The module also served to instill in students an appreciation for the broader purpose and significance of the Inquiry Paper. It aimed to help them understand how the skills developed through this inquiry process—such as critical thinking, evidence-based reasoning, and effective communication—are not merely academic exercises but are directly relevant and invaluable for their future careers as professional educators. The module thus acts as a foundational experience, equipping future educators with essential research and inquiry skills that will inform their practice and promote continuous learning.

### Undergraduate perceptions of the module

Findings from the student survey indicate positive perceptions of the Research as Inquiry Module and its applications for future research. An overwhelming majority (89.78%) of students either strongly agreed or agreed that they gained more knowledge about the research process through participation in the module. A significant portion (87.11%) recognized the importance of research in their future profession after completing the module. Students also felt empowered by conducting research (89.33% strongly agreed or agreed) and saw it as a valuable, lifelong skill (91.52% strongly agreed or agreed). Over 90% of students felt more prepared for research, and a majority (64%) viewed themselves as researchers after completing the module.

***Key takeaways***

When asked to share what they would most remember from the module, students often identified the experience of presenting their research at conferences, the profound realization that collaboration enhances the research process, and understandings of the robust nature of the research process.

*Impact of presentation and dissemination*

Students highly valued the experience of presenting their research. One student reflected that *the ability to present my findings gave me a wonderful sense of validation*, while another wrote that they will most remember *feeling accomplished and knowledgeable when presenting my research*. Several students also shared that the opportunity to present at research symposia and conferences was a memorable and impactful experience, even when challenging. As another student put it, *I will remember the actual undergrad research conference because it was very out of my comfort zone but it was fun telling others what I researched throughout the semester*.

*Value of collaboration in research*

Students recognized that research is more effective and easier to achieve in collaborative settings: *research is best done in a collaborative setting as working with other students will help your process of research improve.* Students enjoyed peer collaboration and noted that their peers *were all very helpful.* Students also highlighted the effectiveness of teamwork in collecting and sharing information, contributing to a better understanding of topics; as one student stated, *working with team members allows for more information to be found and shared*.

*Research as a robust practice*

Students expressed sentiments indicating the robust nature of the research process. When asked what they would remember most about the process of research, 33 students reflected on the importance of locating credible sources. Students used terms such as credible, trustworthy, reliable, accurate, and "good" to describe the essential practice of finding relevant and credible resources. In this reflection, one student shared:

> *What I will remember most about the process of research from this semester is how important it is to carefully evaluate sources for credibility and reliability. It really stood out how the quality of the information you use can make or break your entire project.*

Another student reflected that

> *Engaging in research required me to analyze information, evaluate evidence, and draw logical conclusions. This skill was essential for distinguishing between credible sources and unreliable ones, ensuring that my research was based on accurate and relevant data.*

Students also reflected on ways that the process of research involved utilizing available resources including knowledgeable people (such as professors, clinical supervisors, and TAs,) databases, and other online tools such as AI. Upon reflection of using library databases for the first time, one student stated that *I will continue to use* [the database] *going forward*.

Upon completion of the Inquiry Project, several students reflected on the value of inquiry and changing one's mind or questions with more research. One student phrased this idea thus: *I also learned how crucial* *it is to approach a topic with an open mind, allowing the research process to guide my understanding and conclusions*. A different student reflected that the module taught them *how to form a thesis from gathered information instead of starting with a thesis and finding sources to support it.*

**Undergraduate students identified challenges**

Students identified key challenges throughout their research journeys. These challenges included formulating research questions, conducting investigations, time management, and dealing with feelings of overwhelm.

***Formulating research questions and conducting investigations***

As seen in Figure 2 below, students found that developing a strong, researchable question (28.44%) and engaging in the actual research process (e.g., library research, data collection) (28.89%) were the most challenging aspects of the Research as Inquiry Module. This feedback indicates difficulty at both the foundational and execution stages of inquiry.

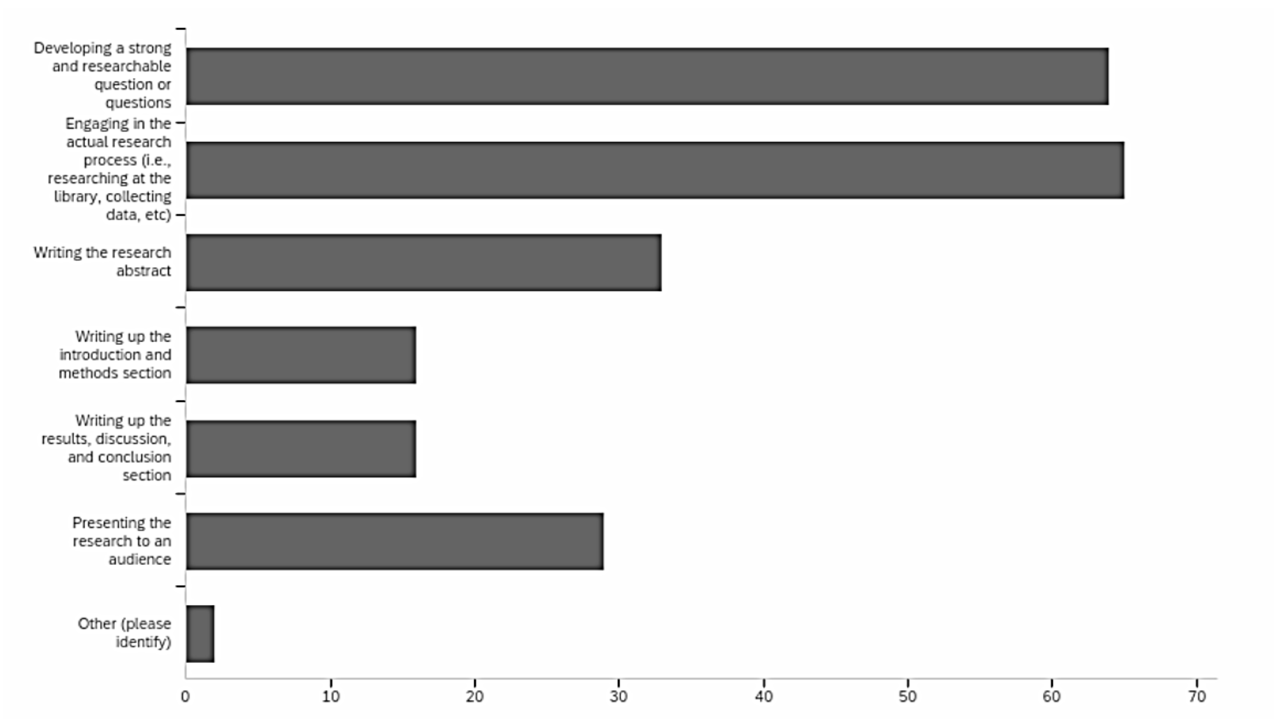


*Figure 2:* Student-reported Most Challenging Aspects of the Research as Inquiry Module

***Time management and overwhelm***

When answering the open-ended question, *What will you remember the most about the process of research from this semester?*, 24 out of 212 students expressed struggles with the demands on their time and feelings of being overwhelmed by the lengthy nature of research. Reflections emphasized ideas such as the *lengthy and time-consuming nature* of research, often taking longer than anticipated; the *importance of not being overwhelmed* and breaking the process into manageable sections; and the critical need for *staying organized, being patient, and managing time effectively* to avoid procrastination and reduce stress. This theme may be seen in the student responses below:

> *What I'll remember most about the research process this semester is how important it is to stay organized and manage my time.*

*It takes a lot of time to do research.*
*I will remember not to procrastinate and start early for a smoother research process.*
*What I will remember most about the process of research from this semester is the importance of staying organized and being patient. Research requires careful planning, consistent effort, and the ability to navigate through setbacks or challenges.*

These findings highlight that while students gained valuable skills, the initial stages of inquiry and the sustained effort required for research posed significant hurdles.

**Discussion**

The purpose of this study was to describe and report on students' perceptions of the PFS program's implementation of an inquiry project. To that end, findings from this study strongly align with Byker et al.'s (2017) Inquiry Processing Cycle. The findings particularly illuminate the importance of the "Present Artifact" stage and reinforce the pervasive nature of "Collaboration" within the cycle. These findings suggest that research is a robust and *cyclical* process which includes investigating resources, refining questions, drawing conclusions, and reflecting on applications (Byker & Sadula, 2022).

**Impact of presentation and dissemination ("present artifact")**

Student reflections from the study underscore the critical value of the "Present Artifact" stage in the Inquiry Processing Cycle. While Byker et al.'s (2017) cycle outlines this as the final step before reflecting on applications, the findings of this study reveal its profound impact on learning and emotional well-being. Students' sentiments of feeling "accomplished," "knowledgeable," and experiencing "validation" directly speak to the positive psychological outcomes of presenting research. This goes beyond merely sharing information; presenting solidifies understanding and affirms students' efforts throughout the entire inquiry process. Externalizing findings to an audience encourages students to begin embodying their research and developing identities as researchers (Medina et al., 2025). This could have significant implications for cultivating practitioners grounded in best-practice. In other words, the experience of presenting developed students who not only acquired knowledge about their field, but who also *viewed themselves as knowledgeable*, a disposition of self-efficacy (Dolapçıoğlu, 2020) which could result in more positive teacher quality and attitudes (Crispel & Kasperski, 2019). The presentation stage left students feeling accomplished and validated, thus experiencing self-confidence in their abilities to engage in knowledge acquisition (i.e. inquiry) (Dolapçıoğlu, 2020). Now, as students enter the profession, they carry with them the knowledge they acquired *and* dispositions of confidence both in what they already know as well as their ability to continue learning. Because of this, these students may also become participants in Teacher Inquiry (Mertler, 2021) and continue to find identity and meaning in researching problems of practice, thus improving their own teaching and schools.

Students' mentions of symposia and conferences, (particularly, a student stepping *out of my comfort zone, but it was fun telling others what I researched*) highlight that the "Present Artifact" stage is not just a perfunctory step. It's a transformative experience that builds confidence, communication skills, and a deeper engagement with the research community. Active dissemination transforms the inert "artifact" into a dynamic growth opportunity. Effective presentation ensures that the knowledge generated through inquiry does not remain isolated but contributes to broader understandings, potentially leading to new research questions or applications for others, and thus facilitating the larger academic conversation.

**Value of collaboration in research ("collaboration" at the core)**

The results of this study support the central role of "Collaboration" within the Inquiry Processing Cycle (Byker et al., 2017). The cycle diagram places "Collaboration" as a foundational element influencing all stages, and the student reflections confirm this by illustrating collaboration's benefits for improving the research process at various stages and leading to deeper understanding of topics.

The student statement, *research is best done in a collaborative setting as working with other students will help your process of research improve*, suggests that collaboration is not just about sharing workload, but about enhancing the quality and efficiency of the research itself. Students overall saw collaboration as a positive experience, noting that their *peers were all very helpful* and highlighting the *effectiveness of teamwork in collecting and sharing information*. These reflections highlight the practical benefits of collaboration, but they also demonstrate collaboration's impact on earlier stages in the cycle. For example, a student's reflection that teamwork led to *more efficient information gathering* might impact the "Investigate Resources" stage, while another student's comment that *diverse perspectives lead to better question refinement* could support collaboration in the "Research Question" stage of the cycle.

Students shared that *working with team members allows for more information to be found and shared* and that collaboration contributes to a *better understanding of topics*. These sentiments illustrate the impact of not only the information gathering phase but also the critical analysis and synthesis required for "Draft Conclusions" and "Create Writing." In this way, the diverse perspectives brought through collaboration can challenge assumptions and lead to more nuanced and comprehensive findings for students.

**Research is a robust and 'cyclical' process**

As noted in the findings, students' perceptions of the research process illustrate that it is a robust undertaking requiring careful attention to detail and planning. When examining these findings through the lens of the Inquiry Processing Cycle (Byker et al., 2017), the *cyclical* nature itself is illuminated. To that end, students' responses may be mapped onto the cycle for the following stages: "Investigate Resources", "Research Questions" and the "Refine" arrow, "Draft conclusions"/"Create Writing", and "Reflect on Applications".

*Investigate Resources*: Students reflected on the importance of locating credible sources and on the process of using resources available to them such as personnel, databases, and AI. Students' reflections illustrate that locating resources requires careful attention to detail and can shape the outcomes of ones' research project. In this way, students' responses emphasize the importance of the presence of "Investigate Resources" on the Inquiry Processing Cycle.

*Research Question (and the "refine" arrow back to it):* Upon completion of the Inquiry Project, several students reflected on the value of inquiry and changing one's mind or research questions with more information. The ideas shared by these students directly relate to Byker et al.'s (2017) inclusion of the "refine" arrow which points back to the research questions as a crucial step between generating research questions and investigating sources. In other words, student responses confirmed the importance of refining the research questions as understanding evolved through investigation.

*Draft Conclusions / Create Writing (implicitly, as part of the overall process):* While not explicitly stated as "drafting conclusions" or "creating writing," the reflections on analyzing information, evaluating evidence, and drawing logical conclusions (from the "Investigate Resources" section) are foundational steps that lead directly to these phases of the cycle. The student's statement about *form*[ing] *a thesis from gathered information* also points to the output of investigation leading to structured thought, which is part of drafting conclusions and creating writing.

*Reflect on Applications:* The students' reflections on the nature of the research process demonstrate a form of metacognition on the *application* of research skills. For instance, the following student's comment directly reflects on the practical application and impact of good research practices:

> *What I will remember most about the process of research from this semester is how important it is to carefully evaluate sources for credibility and reliability. It really stood out how the quality of the information you use can make or break your entire project.*

**Perceived challenges and the IPC**

Students' perceived challenges of inquiry may support Byker et al.'s (2017) placement of "Collaboration" and "Curiosity" at the center of the cycle. A majority of students felt that developing a strong, researchable question and engaging in the actual research process were the most challenging aspects of the inquiry process. Curiosity is at the heart of the cycle, so it makes sense that struggles with inquiry might reflect a struggle with curiosity (and therefore question formation). In other words, how can first-year students know *what* to be curious about until they experience common problems of practice? In Teacher Inquiry, questions arise from experiences in the field (Mertler, 2021) - something first-year students do not have yet. Perhaps curiosity is challenging because students have yet to experience the problems of practice that will inevitably insight questions. Similarly, clinical experiences are an essential step in the learning process for preservice teachers, and without sufficient ones, teachers frequently enter the classroom feeling surprised and unprepared for its realities (Kent & Giles, 2016).

However, student reflections showed that the inquiry process became easier through collaboration. Teamwork facilitated information sharing, and professors offered crucial support. Field experiences further highlighted collaboration's role in gaining insights and hands-on skills, as one student reflected that field experience was important for *discovering new insights and the valuable skills I gained from hands-on experience*. Ultimately, collaboration—with peers, professors, and school partners—nurtures both confidence and curiosity in the inquiry journey. Field experiences are essential to students' success in inquiry and in teaching itself, but for first-year students, collaboration and knowledge sharing can build a bridge between students' lack of experiences and the inquiry process.

Finally, the challenges identified by students also speak to the robust and cyclical nature of inquiry. Students' concerns with *staying organized, being patient, and managing time effectively* make sense when we view research as a complex process that requires thoughtful use of resources, revision, and reflection. In order to successfully engage in inquiry and experience depth of learning, students must invest the time and attention to move through each stage of the cycle.

## Conclusion

This study not only affirms the Inquiry Processing Cycle, it also provides rich qualitative data on the "Present Artifact" stage's profound personal and academic benefits and underscores the importance of leveraging "Collaboration" to address previously unnamed components of the cycle. In this section, key findings are highlighted and implications for teacher education inquiry and teacher practice are discussed.

This study highlights the role of presentations in student development, suggesting they offer more than just a platform for sharing research insights. Presentations are experiences in which *new* insights and personal growth emerge. Opportunities to present research facilitate the formation of researcher identity (Medina et al., 2025) by affirming students' knowledge and experiences in the inquiry process. In Byker et al.'s (2017) cycle, presentation is followed by reflection on applications and the formation of new research questions. However, this study offers that through presentation, students emerge as more experienced, thoughtful, and confident researchers. Therefore, we might reimagine the Inquiry Processing Cycle into an Enhanced Inquiry Processing Cycle, which includes the addition of reflection on *learning* and *mindset* (alongside the preexisting "applications"). This addition is illustrated in Figure 3 below. What this means is, in addition to reflecting on how their research might apply to their careers or education, students should also metacognitively reflect on the actual *experience* of inquiry. For instance, students might generate and respond to questions such as the following: *How has my understanding of the topic shifted or expanded?*; *What are my major takeaways from this research experience?*; *How have I grown or changed as a learner, researcher, and/or practitioner?*; *How can I use these inquiry skills or knowledge in the future?* By engaging in this reflection, students may take advantage of the rich learning and positive psychological benefits of presentation.

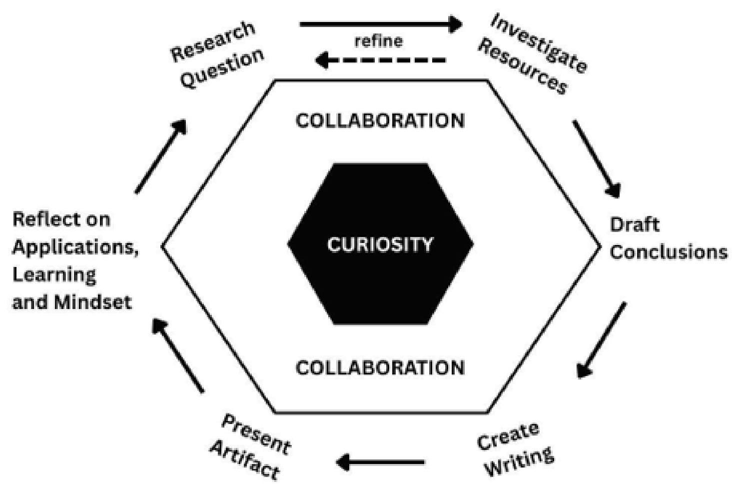


*Figure 3:* Enhanced Inquiry Processing Cycle

Reflection has long been established as a critical piece of teacher education development, but shifting to reflexivity, and *epistemic reflexivity* (by focusing on mindset and beliefs) allows this process to become more meaningful and transformative (Feucht et al., 2017). Reflection and reflexivity are differentiated by reflexivity's intentional process of internal dialog that challenges former beliefs and expectations, leading to change in educational practice (Feucht et al., 2017). By shifting from simply reflecting on applications to reflecting on the learning process and mindsets, we are trending towards a process of reflexivity that could have important implications for equitable school environments. This becomes especially true when inquiry engages with preservice teacher mindsets and beliefs around issues of race, gender, and inclusivity. Given that our population (and the teacher population as a whole) is predominantly white women, it would be worthwhile to engage this process of inquiry specifically around topics of equity, and to employ the lessons learned here about the benefits of not only inquiry, but presentation. By engaging in reflexivity during their undergraduate career, preservice teachers carry both more informed and more open mindsets as well as better developed skill sets and knowledge into their teaching careers and practices.

This study also revealed challenges of inquiry in the first year including generating research questions and managing the complex and lengthy nature of research. These difficulties may stem from a lack of practical experiences from which to draw curiosity and jumpstart the inquiry process, as well as inexperience with the academic skillsets necessary to be successful in large-scale inquiry projects. Findings revealed that collaboration may support students in gaining the experiences and academic skills necessary to successfully engage in the inquiry process. According to students, collaboration with peers, faculty, and school partners facilitated learning, provided support, and eased the research process. On one hand, these ideas affirm the central position of "Collaboration" in the Inquiry Processing Cycle. However, this study did not directly ask students to connect the challenges they faced with the support they received. Therefore, while we can infer that collaboration might offer support for inquiry challenges due to its frequently described benefits, the study does not directly confirm this link. Furthermore, the Inquiry Processing Cycle model, as it stands, does not directly account for the challenges students face concerning experience and time, or the support they believe is crucial in addressing these obstacles. Self-reported data is also a limitation to any survey research design. Even so, future research could explore the connection between challenges and support more explicitly to further develop the Enhanced Inquiry Processing Model (see Figure 3) in ways that illustrate how to help students navigate inquiry challenges while building independence as researchers.

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