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Community College Science Faculty's Perceptions on Fidelity of Implementation of a Strategic Plan

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This is to certify that the doctoral study by

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Walden University
2025

Abstract

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Allison J. L. Santillo

MS, University of Massachusetts Boston, 2003

BS, Mary Washington College, 1998

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

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May 2025

Abstract

The administration at a Mid-Atlantic regional community college in the United States created a strategic plan to increase students' critical thinking and metacognition skills by focusing on improving students' problem-solving skills with problem-based learning. However, the problem in this study was that the faculty's fidelity of implementation (FOI) a strategic plan to implement metacognition instruction at a community college in the Mid-Atlantic U. S. region had not been effectively monitored. The purpose of this basic qualitative study was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the community college's science faculty. Century et al.'s FOI framework outlined the focus of this study and guided the research question of how the college's science instructors perceived the FOI of metacognitive instruction according to the strategic plan's intended outcomes. Semistructured interview data from 10 science department faculty were thematically analyzed using a priori, open, and axial coding. The findings included three themes: (a) although they worked to elicit metacognition from students, instructors reported little improvement in student metacognition; (b) instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of learning; and (c) although instructors valued the plan's goals and used their judgment to use materials and assignments to benefit students, they indicated a lack of direction for implementation This study may affect positive social change by providing community college leaders with information on why the strategic plan did not reach its goals and recommendations to bridge the gap between what was intended and what was implemented in the plan.

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Dedication

For Dan, Lucian, Alex, Mom, Dad, and Meredyth. You hung in there with me the whole time while I studied, cried, cursed, and studied some more. I am forever grateful.

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Dr. Michael Vinella, Dr. Anissa Harris, my cohort, study site and participants, supportive department heads, deans, and school heads at work, as well as Angie who said that she prayed for me every day. And Terunofuji, my personal hero and the epitome of "Don't count me out. Ever."

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Section 1: The Problem

A community college in the Mid-Atlantic region of the United States created a strategic plan to increase graduating students' skills needed in the workforce, such as critical thinking and problem solving. To meet the goals delineated in their strategic plan, the administration of this community college created a quality enhancement plan (QEP) to increase critical thinking and soft skills by focusing on improving students' problem-solving skills beginning in Fall 2018 and continuing through Spring 2023 (QEP, 2017; College website, 2022). Ennis (1985) and Halpern (1998) posited that critical thinking is closely tied to metacognition, and student metacognition was listed as key to the goals of the strategic plan in the QEP (2017). The methodology of this 5-year plan was the incorporation of problem-based learning (PBL) in many classes, with PBL assignments scored according to a common Valid Assessment of Learning in Undergraduate Education (VALUE) rubric designed by the American Association of American Colleges and Universities (2009). However, faculty's metacognitive instruction, PBL assignments, and the use of the VALUE rubric had not been examined for fidelity to the strategic plan. Through this qualitative study, I sought to investigate the fidelity of implementation (FOI) of metacognitive instruction as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States.

The Local Problem

The problem this study addressed was that faculty's FOI of a strategic plan to implement metacognition instruction at a community college in the Mid-Atlantic U. S. region had not been effectively monitored according to the individual implementing the plan. This 2-year community college in the Mid-Atlantic region of the United States had approved a QEP (2017) published on the university website, which called for including PBL across multiple classes to improve students' critical thinking and soft skills that are needed in the workforce. Collected data indicated that students struggled with problem solving, scoring at or below the national average in most aspects of problem solving in 2014 data; this data provided the direction of focus for the strategic plan (QEP, 2017). The QEP (2017) also stated that "a review of the most recent [Community College Student Satisfaction and Engagement survey] data suggested that a focus on metacognition and self-regulation would benefit [the College's] students" (p. 9). According to Saiful et al. (2020), McNamara et al. (2019), and Siegesmund (2016) in their respective studies on undergraduate students, a university may consider including a methodology such as PBL in class content to increase critical thinking and metacognition among students. Data collected at the research site subsequent to the launch of the QEP consisted of scores on PBL exercises designed and scored by individual instructors; the PBL exercises themselves were not examined by the college, nor were instructors observed for fidelity to the QEP. According to the individual implementing the QEP, there was a gap in practice in ongoing monitoring of the faculty's FOI of the strategic plan to implement metacognition instruction at a community college in the Mid-Atlantic region of the United States (personal communication, Aug. 2021). This gap in practice made it difficult to determine if student outcomes are correlated with the strategic plan, as negative or ambiguous outcomes may have been due to causes such as implementation of the plan with low fidelity or even high fidelity implementation of a plan that was ill-suited to this college.

There was some evidence that may have indicated that the plan was not working as intended. Data sets regarding whether the QEP was increasing students' critical thinking yielded conflicting results, indicating a possibility that there may have been a lack of FOI of the QEP. A survey of graduating students in Spring of 2021 yielded data which indicated that students still ranked as weak to moderate in overall critical thinking and components of problem-solving skills (California Critical Thinking Skills Test, 2021). These students were among the first to encounter implementation of the QEP in many of their classes throughout their tenure at the college, as the QEP implementation began in Fall 2018. In contrast to these data, the CTL director reported in the November 2020 Strategic Plan update, presented at the November 2020 faculty meeting, that approximately one-third to one-half of students from 2018-2020 scored equivalent to third- and fourth-year college students on the PBLs from the strategic plan. In a personal communication in August of 2021, the CTL director opined that, as of Spring Semester 2021, there were "too many" top scores; for a community college, scores should be equivalent to first- and second-year students at a 4-year university (McConnell & Rhodes, 2017). Without monitoring the FOI of the QEP, it was difficult to know what to conclude from the conflicting data. However, monitoring was not an activity that was easily undertaken.

The Director of the Center for Teaching and Learning (CTL), the individual responsible for implementing the QEP, indicated that it was infeasible to observe instructors and examine individual assignments for FOI without additional staff in the CTL. Century et al. (2010) added the behaviors of an instructor in interacting with their students as a critical component of FOI and those behaviors need to be observed to determine if they are occurring according to plan. The lack of observations and analyses was evidence of the gap, as best practices were not being followed at the study site. However, the CTL Director was unable to complete observations or document analyses to evidence the quality of implementation.

Although local faculty were offered training and professional development in both PBL and VALUE rubric assessment since the launch of QEP, as of November 2020, only 25% of adjunct faculty completed the training. In contrast, 97% of the full-time faculty were trained. However, 74% of the faculty were part-time instructors; for example, only nine of the 44 science faculty were full-time instructors (College website, 2020; 2022). Additionally, the college did not offer professional development opportunities on critical thinking and metacognition themselves (College website, 2022). Century et al. (2010) pointed out that teachers may need a base-level of knowledge to successfully implement a program with fidelity and some teachers may initially lack that base knowledge, so training may potentially have been necessary. Maintaining the optional nature of training may have been further evidence of the gap between best practices and actual practices. It was unknown without ongoing monitoring whether the lack of required training on the components of the strategic plan was affecting instructors' FOI of the plan.

In Section 1, I describe the problem in the local context and the broader literature, purpose of this study, rationale for addressing the problem, definition of terms, and the significance of the problem. I also pose the research question, describe the conceptual framework, and provide a literature review of the broader problem. Finally, I describe a tentative direction for the project deliverable.

Rationale

The purpose of this basic qualitative study was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. Administrators at many institutes of higher learning seek to create graduates who not only know the content of their major's curriculum, but who have also acquired general competencies such as collaboration, problem-solving, and critical thinking, sometimes referred to as soft skills (McDonough, 2020; Ritter et al., 2018; Succi & Canovi, 2020). The community college where this study took place created a QEP to enable students to gain critical thinking and metacognition skills through integrating PBL into the classroom (QEP, 2017). According to Lakin and Rambo-Hernandez (2019) and Massey Combs et al. (2022), implementing a strategic plan with fidelity is key to its success. Thus, the local administrators in the community college were invested in implementing the QEP with fidelity. However, the individual in charge of the plan's implementation stated in a personal communication in August of 2021 that it was not feasible to observe instructors and examine individual assignments for FOI as recommended by Lakin and Rambo-Hernandez (2019). They acknowledged that the lack of monitoring the implementation fidelity and relying on initial faculty training to ensure fidelity were sources of concern for determining whether the QEP is working as intended. Without effective monitoring of FOI, however, it was impossible to determine which aspects of a plan were successful because of implementation with fidelity, which aspects failed despite implementation with fidelity, and what classroom practices succeeded or failed without implementation with fidelity.

This study had the potential to provide information to administration regarding the FOI of metacognitive instruction as perceived by the science faculty at this community college in the Mid-Atlantic region of the United States. This information may have enabled the college to determine whether any component of the QEP needed to be adjusted or whether the plan was even appropriate for the curriculum. Without monitoring, it was impossible to determine what components of the QEP were effective as the data sources were limited. Keller-Margulis (2012), McKenna et al. (2014), and Smith et al. (2018) each recommended gathering multiple data sources to gain a detailed view of learning. Smith et al. (2018) further stated that without data on FOI, collected data on outcomes provide incomplete information. Unfortunately, the task of monitoring the QEP was infeasible for me to undertake due to the scale of the task, the same reason it was not already being monitored. However, with this study, I could potentially help bridge the gap to some extent between the design of the QEP and its implementation by the faculty. The information that was gained is not a perfect equivalent to monitoring but it may have served as the basis for determining a viable alternative to direct monitoring. Bridging this gap may have enabled the college to meet the goals outlined in the QEP (QEP, 2017).

Definition of Terms

Fidelity of Implementation: “the extent to which the critical components of an intended program are present when that program is enacted” (Century et al., 2010, p. 202).

Metacognition: Awareness and control of cognition, or mental processes. Metacognition is divided into metacognitive knowledge and metacognitive regulation (Flavell, 1979; Flavell et al., 2002).

Significance of the Study

The significance of this study was that meeting the goals stated in the strategic plan may have required determining if the components of the strategic plan were being implemented with fidelity. In Spring 2021, graduating students’ metacognitive, critical thinking skills were measured as weak to moderate overall, despite the strategic plan being in effect for those students’ entire time at the college. Without exploring the FOI of the strategic plan, it was unclear if these weak skills were due to inadequate implementation of the plan as a whole or in part, or due to the choice of a plan which was inappropriate for this college. Another potential cause was perhaps a lag in positive effects during a new plan’s implementation and adjustment, a phenomenon called “implementation dip” (Fullan, 2011, p. 71), which can occur with even effective learning interventions. Although the scale of the task made monitoring infeasible for this study, the information gained may have begun to bridge the gap which may have existed between what was intended in the strategic plan and what was happening in its implementation. Gaining information about the FOI of metacognitive instruction may have led to positive social change by potentially identifying what parts of the strategic plan were working as intended and what parts, if any, were not effective. As a result of gaining more information about the FOI of its strategic plan, the college may have better made informed decisions regarding adjustments to its strategic plan. Meeting the goals of the strategic plan may have enabled the college to create graduates with skills in metacognition, critical thinking, and problem solving; possessing these skills may have enabled graduates to be more competitive in the workforce (McDonough, 2020).

Research Question

The problem this study addressed was that faculty's FOI of a strategic plan to implement metacognition instruction at a community college in the Mid-Atlantic U. S. region had not been effectively monitored according to the individual implementing the plan. In this basic qualitative study, I investigated the FOI of metacognitive instruction as perceived by the science faculty at this community college. To gain an understanding of their perceptions, the study was guided by the following research question:

RQ1: How do community college science instructors perceive the FOI of metacognition instruction according to the intended outcomes of the study site's strategic plan?

The research question was informed primarily by the FOI framework. FOI describes how to ensure the success of an initiative in a setting like a school, so implementation of a strategic plan with high FOI should hypothetically ensure the plan's success. Discovering the answer to this research question provided information, which may be useful to ensuring that success.

Review of the Literature

The research site, a 2-year community college in the Mid-Atlantic region of the United States, instituted a QEP to increase problem solving skills in students and provided faculty with professional development for PBL and the use of a common rubric. However, faculty's FOI of the strategic plan to implement metacognition instruction had not been effectively monitored according to the individual implementing the plan. The purpose of this basic qualitative study was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. The conceptual framework informing this study was Century et al.'s (2010) FOI. A further relevant theory that helped shape the study was Flavell's (1979) theory of metacognition.

Conceptual Framework

The conceptual framework grounding this basic qualitative study was Century et al.'s (2010) model for FOI. Century et al. (2010) operationalized FOI as "the extent to which the critical components of an intended program are present when that program is enacted" (p. 202). Century et al. (2010) built upon the work of Carroll et al. (2007), which listed the components of implementation fidelity as: (a) adherence to the content, frequency, duration, and coverage of the program as designed; (b) exposure or dose, which is the frequency and duration of the intervention; (c) quality of delivery, or whether an intervention is delivered in a way that gains the desired outcomes; (d) participant responsiveness in terms of whether instructors and students view an intervention as being relevant to them and therefore worthy of engagement; and (e) program differentiation. Century et al. (2010) combined and streamlined these components and defined the critical components of the FOI framework as structural, consisting of procedural and educative subcomponents, and instructional, consisting of pedagogical and student engagement subcomponents.

Century et al. (2010) stated that information about these critical components should be procured from the program developers, including their written materials, and the people involved in a program’s implementation. Program developers may benefit from staying abreast of recent relevant research to more easily create, assess, and improve evidence- and theory-based educational programs (Pope et al., 2019). The developers’ critical components would indicate the developers’ objectives regarding factors intended to lead to improved learning, while the implementers’ critical components would be influenced by their experiences and perceptions of the elements, they believed led to desired learning outcomes (Century et al., 2010). Both sets of critical components work together in a program to create a high FOI.

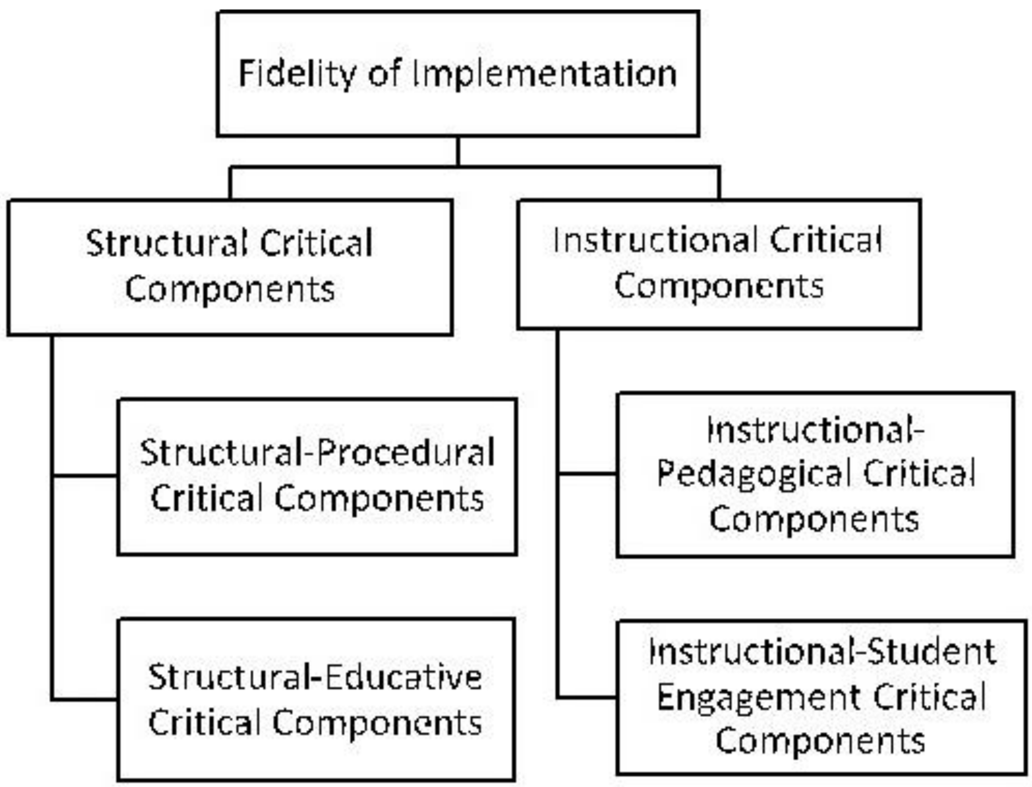
Daniel and Lemons (2018), McKeown et al. (2019), and Smith et al. (2018) tied high FOI of a program to improved learning outcomes in students to a statistically significant extent and Daniel and Lemons (2018) extrapolated that poor fidelity would link to poorer outcomes, agreeing with prior work by McKenna et al. (2014). Daniel and Lemons (2018) also found a correlation between teacher perceptions of their implementation fidelity and their perceived improvement in student learning outcomes, and Khoury et al. (2019) stated that self-assessments by teachers of their FOI strongly correlated with team-based assessments done with expert assistance. Overall, high FOI correlates with desirable student learning outcomes, and teacher assessment of their ability to implement with fidelity is consistent with experts' assessment (Daniel & Lemons, 2018), so in this study, the perceptions of the science faculty should have been able to give a sufficiently accurate view of their FOI of the QEP. However, the FOI framework has multiple components, each of which needs consideration.

Components of FOI

The critical components of the FOI framework fall into the two broad organizational categories of structural or instructional critical components (Century et al., 2010). Structural critical components indicate the program developers' intentions regarding the design and organization of a program while instructional critical components indicate their intentions about how participants should behave and interact during the implementation of the intervention (Century et al., 2010). Each broad category is further subdivided. Structural critical components are broken down into structural-procedural critical components, which are the organizing elements of a program that dictate what is to be done in an intervention, and structural-educative critical components, which detail the developers' expectations of what knowledge implementers need to possess to conduct an intervention as designed. Carroll et al. (2007) noted that detailed and simple interventions were more likely than vague or complex ones to be implemented with fidelity; they posited that there is more opportunity for inappropriate variation when information is unclear or overly complicated. Instructional critical components are subcategorized into instructional-pedagogical critical components, which consist of the actions, behaviors, and interactions the program's implementers should engage in during an intervention, and instructional-student engagement critical components, which consist of the actions, behaviors, and interactions expected of the program's recipients (Century et al., 2010). In an educational setting, these components deal with how teachers interact with students within the program and the expectations regarding student participation in the program. Figure 1 includes the organizational chart for the FOI framework.

Figure 1

Organizational Chart of the Critical Components of the FOI Framework



The components interact with one another to create a high FOI. To examine all critical components, Offerdahl et al. (2018) used prior empirical literature, information from experts, and the perceptions of their program's users and advocates in what they called a recursive process to design an effective learning program. Engaged students and instructors can positively influence FOI of a program, according to Mataniari et al. (2020); this conclusion agreed with findings about committed teachers' FOI by McKeown et al. (2019). Each component plays a role in ensuring a high FOI, and it benefits a program's designers to take in information from many sources to create a program which should lead to desirable learning outcomes and goals. Defining those goals should be an early step in the process.

The FOI framework can be useful for defining what the goals of an educational initiative are, but it is vital to measure all components of the initiative. Keller-Margulis (2012) reiterated the need to assess and monitor FOI of a program in their seminal article and Jankowski et al. (2018) described a growing trend in higher education that values connecting practices to learning outcomes and using collected data to assess the implementation of learning practices. Smith et al. (2017) provided examples of tools for establishing implementation fidelity of a defined learning outcome, a detailed intervention protocol, a fidelity checklist, and an instrument for assessment, all of which require sufficient time and expertise from assessment practitioners and faculty. Assessing FOI of a program makes it possible to correlate practices to learning outcome successes, but just measuring some components is insufficient to gain meaningful information.

Partial FOI information Insufficient

Century et al. (2010) stated that while not measuring FOI at all can lead to unexplained learning outcomes, looking at just part of implementation can also leave designers and implementers uninformed as to whether a single factor of implementation can sufficiently explain relationships between the intervention and learning outcomes (Century et al., 2010, p. 212). As Century et al. (2010) noted that FOI is usually measured with instruments oriented toward the structural elements of an intervention, it is not uncommon to collect information that is too incomplete for a true analysis of the intervention's effect on learning interventions, a conclusion which agrees with Carroll et al. (2007). Smith et al. (2018) found that integration of multiple data sources is necessary to interpret learning data accurately and completely, and accurately correlate specific critical components of a given learning intervention with learning gains. Ideally, detailed information on all the critical components of an intervention can be collected and the more detailed, the more complete the analysis may be (Smith et al., 2018).

In addition to measuring the presence of a critical component, it is important to measure the extent to which it is implemented. Data collection and analysis identifying both that can identify not just the presence of a critical component and the degree to which it was implemented can provide valuable information on the program's effect on learning outcomes. Century et al. (2010) noted that the use of "innovation configurations" or "innovation profiles" can identify degrees of implementation of critical components and can consider different combinations of said components in terms of their effects on student learning. As such, not only can it be determined whether a program at large is working as designed, but it can be determined exactly which components and in what combinations are leading to the desired learning outcomes (Century et al., 2010; Lakin & Rambo-Hernandez, 2019; Smith & Finney, 2020). A sizable benefit of this approach is that the question of how much adaptation is appropriate when implementing a given program can be answered (Century et al., 2010, p. 214). Century et al. (2010) did acknowledge that there is some disagreement in answering that question.

Disagreements on if Adaptations to the FOI Framework Are Appropriate

Some educators take a strict fidelity perspective in which the program should be implemented exactly as designed, while others take an adaptation perspective which involves changing a program to fit a given context. McNeill et al. (2018) noted that the overarching learning goals of the program should guide any adaptation rather than the structure of the program, as different contexts may require different educational approaches. Carroll et al. (2007) listed program differentiation as appropriate as a component of appropriate implementation fidelity, although they acknowledged that complex interventions were more prone to components not being implemented with fidelity more than simpler implementations. They further stated that if the most essential components of a program could not be identified, strict adherence to the entire program is necessary to maintain high fidelity, although real-world contexts might make strict adherence impractical (Carroll et al., 2007). Offerdahl et al. (2018) noted that adaptations may affect outcomes in positive or negative ways or may have no effect at all. Massey Combs et al. (2022) cited curriculum modifications as a contributor to low FOI in middle school classrooms.

Key to the FOI framework, though, is maintaining an awareness of the critical components that have been adapted and how the desired outcomes could be affected as a result (Lakin & Rambo-Hernandez, 2019; Offerdahl et al., 2018). Berkhout et al. (2018)

argued that as active learning strategies like PBL are dynamic, they can often be interpreted quite differently by different people, and their implementation can be influenced by student motivation, the quality of the assessments themselves, and the instructors. This argument was interesting for this study as the QEP's PBL assignments were written by each individual faculty member with potentially varying quality, and each faculty member went on to score their own students' PBL work via the common VALUE rubric, which itself may have been interpreted in varying manners. Offerdahl et al. (2018) noted that adaptation can result in misalignment between learning outcomes and formative assessment prompts, which may lead to a lack of information which inhibits locating gaps between students' present knowledge and their desired level of knowledge. An innovation profile can provide evaluators of a program to know which critical components or combinations thereof most directly relate to desired learning outcomes and therefore which components can be adapted and to what extent that adaptation is appropriate without inhibiting effectiveness of the program.

Influences on FOI

Century et al. (2010) did note that in defining the FOI framework, they found that there were many variables that, though they were not program critical components, were important to measure as they affected program implementation and outcomes. These variables included lack of time, lack of program specifications, lack of support, large numbers of students for each instructor, lack of materials and facilities, lack of knowledge and familiarity, and attitudes and beliefs about the interventions (Century et al., 2010; Effendi-Hasibuan & Mukminin, 2019), although Massey Combs et al. (2022)

stated that while curriculum modifications, lack of time, and student behavior were barriers to high FOI, class size and access to materials were far less inhibiting of fidelity. A well-designed program may address these variables to ensure a high FOI.

Century et al. (2010), in defining what structural-educative critical components are, noted that these components reflect that a program's developers are aware that a certain body of knowledge is required for a high FOI for a program; the example provided by Century et al. (2010) was the basic content and pedagogical knowledge needed by teachers, which Century et al. (2010) acknowledged was not always possessed by teachers in a classroom. Ab Kadir (2017) also listed content and pedagogical knowledge as necessary but went on to include pedagogical content knowledge, or how to teach a particular discipline (Shulman, 2013), and critical thinking knowledge as key for teachers to possess to help students become critical thinkers. Biology instructors with sufficient content knowledge and pedagogical content knowledge can adapt a program with high fidelity and create assessments which can both align with learning outcomes and generate sufficient and accurate data on student learning (Offerdahl et al., 2018). However, while Auerbach and Andrews (2018) concluded that faculty who use active learning tended to understand pedagogy, they found that college STEM faculty in particular had little teacher training; this dearth of training may lead to gaps in knowledge without which teachers do not know how to deliver instruction. This gap may lead to failure to implement both the structural-educative and instructional-pedagogical critical components.

The structural-procedural critical components also rely on instructor knowledge. Gaining accurate and complete information on student learning requires that instructors have knowledge on what learning outcome indicators to monitor and how to evaluate them; explicitly identifying the critical components of assessments help identify those indicators (Offerdahl et al., 2018). Further, without knowledge on how to instruct, those teachers may be unable to provide information to program designers or creators of professional development opportunities to improve the efficacy of those opportunities (Auerbach & Andrews, 2018). In assessing the implementation of an inquiry-based teaching instruction initiative in secondary schools in Indonesia, Effendi-Hasibuan and Mukminin (2019) found that most instructors did not implement the initiative partially due to lack of knowledge and familiarity with practicing inquiry. Even when college instructors viewed a subject such as critical thinking, problem solving, or technology literacy as crucial, a lack of contextual knowledge may lead to an inability to teach said topics (Haviz & Maris, 2020). As Century et al. (2010) linked teacher knowledge to FOI of a program, knowledge about critical thinking, metacognition, and problem solving, as well as how to teach and assess them, were necessary to implement a program like the QEP at the research site with high fidelity.

Professional Development's Effect on FOI. Training via professional development of faculty in a program ensures that they understand the critical components of the program. Garwood and Harris (2020) reported improvements after professional development in teachers' rates of program implementation and classroom management self-efficacy. Massey Combs et al. (2021) stated that online training was effective at improving FOI, although the quality of delivery online should include experiential learning and practice content delivery with feedback. Upon finding that education graduate students rated instruction quality as the top motivating factor for student learning, Sogunro (2017) concluded that higher education institutions should make professional development, including in instructing adults like many community college students, required for all faculty. Indeed, after use of the VALUE rubrics for 2 years, McConnell and Rhodes (2017) stated that after training, instructors could produce reliable results using the rubrics with high FOI to assess authentic student work and accurately show increases in students' critical thinking skills, quantitative literacy, and written communication. However, professional development does offer some challenges.

One challenge detailed by Efu (2020) was low participation in professional development; instructors reported time away from teaching duties, the professional development process, personal contexts, lack of consideration for instructors' professional identities, and institutional structures as being barriers to participation. Daniel and Lemons's (2018) study participants cited lack of planning time and the need for repeated training as barriers to implementation and continuation of a learning program, but after follow-up support was provided, teacher perceptions of their FOI and their students' learning outcomes improved. Jankowski et al. (2018) recommended that professional development more clearly align with assessment efforts, to ensure that collected data be sufficient and accurate regarding student learning outcomes. However, professional development may not be the most effective way to increase FOI.

Tubino et al. (2021) found, in evaluating the use of a large scale single PBL assessment with multiple instructors, that peer support via panel discussions of student performance and online peer communities were far more effective than direct training at improving instructor FOI. Tubino et al. (2021) concluded that for an educational program to be sustainable and far-reaching, educators should be involved in the design of the program and defining of its critical components; for engaged and involved faculty, clear information on processes and enactment are sufficient for high fidelity but for less engaged faculty, clear understanding of the educational principles as well as strong peer and institutional support are also necessary, agreeing with Smith et al.'s (2017) analysis. Smith et al. (2017) also emphasized ensuring faculty understand FOI and its methodologies, along with providing opportunities to practice identifying why each component should help students reach learning objectives.

Aligning with Tubino et al. (2021) findings, newer higher education faculty tended to be more open to new teaching practices than more established faculty as the more experienced faculty tended to recycle familiar, convenient practices despite a potential lack of benefit for students (Kirpalani, 2017); convenience could potentially inhibit the implementation of a program with high fidelity if it requires a faculty member to take on many new practices. Smith et al. (2017) found that components of a program were implemented with varying degrees of fidelity with some components being rarely or never implemented; however, they overall found that a new intervention could be implemented with moderate to high fidelity across various disciplines, class sizes, course types, and contexts. Overall, methods of increasing and supporting teacher knowledge which did not involve direct training may be equally or more effective at increasing faculty FOI.

Influence of Student Knowledge on FOI Monitoring. Student knowledge likewise can influence the accuracy of monitoring efforts of FOI of a program, as data collected from student assessment may be misleading. Sobieszczuk-Nowicka et al. (2018) found that undergraduates in plant physiology classes may end up with misconceptions stemming from oversimplification, lack of content knowledge, or anthropomorphizing plants. However, because they may have partial knowledge and know the correct vocabulary despite not fully understanding the material, their teachers may collect inaccurate assessment data of their mastery if the measurement instrument were not a good fit with the curriculum (Sobieszczuk-Nowicka et al., 2018). Regular, timely, actionable feedback in an iterative cycle was shown to improve student learning (Tubino et al., 2021), while the alignment of a course to use both active learning and plentiful opportunities for practice and feedback improved students' critical thinking skills and attitudes (Heft & Scharff, 2017). Offerdahl et al. (2018) noted that adaptations to the feedback cycle can be beneficial or detrimental to desired outcomes; if the feedback remains timely, regular, and actionable, adaptation is likely to be beneficial.

Although the study site used active learning in the form of the PBL assignments, the practice-feedback cycle recommended by Heft and Scharff (2017) and Tubino et al. (2021) may have been absent as faculty were required to do a VALUE rubric assessment of a PBL assignment once per semester in each class, removing the opportunity to implement any adjustments made to the measuring instruments. Further, Roohr et al.

(2017) stated that critical thinking gains in college students are nonlinear and tend to be statistically insignificant in the first year or two of college. Also, *the length of time in college classes* and *first-year GPA* were the only measured predictors of long-term learning gains. However, Mathers et al. (2018) stated that the gains after the first year and a half of coursework were moderate, although they were unable to attribute those gains purely to coursework as students who did not take relevant coursework also showed small learning gains. Mathers et al. (2018) questioned whether the low learning gains and lack of relationship of the gains to coursework was due to low FOI, as the coursework may not effectively create the desired learning objective. Most students at the study site are in their first year or two of college and would not, based on Roohr et al.'s (2017) findings, be expected to demonstrate large learning gains in their time there, making it particularly important to optimize the ability to monitor the QEP to ensure it operates as desired via a high FOI.

Influence of Teacher Attitudes on FOI. Even teachers' attitudes and beliefs can influence the extent to which a program is implemented with fidelity. Daniel and Lemons (2018) proposed that teachers may implement learning interventions with low fidelity because they believed that the program is not a good fit for their students or learning context. They also found that teachers most often continued an educational practice if they learned it in within the last 2 years, believed it improved student learning, and was convenient to use. This aligns with Kirpalani's (2017) findings regarding newer teachers being more likely to try a new intervention while experienced teachers tending to go with convenience in their practices. McKeown et al. (2019) likewise found a correlation between low FOI of a given component and the difficulty of implementing that component; McKeown et al. (2019) determined that low fidelity of modeling may further reduce outcomes that are already poor due to low FOI of the program. Daniel and Lemons (2018) also found a correlation between teacher assessments of their FOI and their observations of student learning outcome improvements, although they acknowledged a limitation in their methodology as the data were self-reported by the teachers.

Khoury et al. (2019) found that self-assessment of FOI strongly correlated to team-based assessments of fidelity with expert assistance, lending credence to Daniel and Lemons's (2018) findings. However, these perceptions did link to improved sustainability of a program with the converse also true; if a program was perceived to lead to poor learning outcomes, it was discarded readily (Daniel & Lemons, 2018). Daniel and Lemons's (2018) study participants cited lack of planning time and the need for repeated trainings as critical barriers to the implementation and sustaining with high fidelity of a learning program. However, after follow-up support was provided, teacher perceptions of their FOI and their students' learning outcomes improved.

Key Concepts and Variables

The conceptual framework of this study provides an outline to investigate community college science instructors' perceptions of their FOI of the QEP by incorporating metacognition via PBL assignments into their course content and assessing them according to a common rubric. All of the data sources indicated that students struggled with problem solving. The QEP was informed by concepts from the scholarly literature, namely metacognition, PBL itself, and critical thinking (QEP, 2017). In this literature review I described these concepts as well as critical thinking and instructors' self-efficacy with a focus on how each contributed to the FOI of the QEP.

Search Strategy

An examination of available literature was conducted involving multiple databases in Walden University's library, including Education Source, Academic Search Complete, Educational Resources Information (ERIC), EBSCO Host, JSTOR ProQuest, and Dissertations & Theses at Walden University. Additionally, Google Scholar, various textbooks, the libraries of three universities and a community college, and Internet sources including the study site's website were used. I conducted iterative Boolean searches, combining keywords with the connectors "AND" and "OR." The following terms were applied to the search: *college, university, higher education, postsecondary education, undergraduate, faculty, instructor, professor, college teacher, science education, science teaching, science learning, biology, chemistry, physics, STEM, fidelity of implementation, problem solving, problem-based learning, self-regulated learning, metacognition,* and *metacognitive.* Inclusion criteria were that the articles were available in the English language as full text. I focused on articles published after 2018, although some older relevant publications are included. Also, although I focused on the sciences and higher education faculty, I included some research on secondary science students and faculty, undergraduate science students, and preservice teachers in various fields where relevant to this study.

Metacognition

Metacognition consists of thinking about thinking itself (Flavell et al., 2002). The precise relationship between metacognitive and cognitive activity depends on context, as they are interrelated and iterative (Zohar & Ben David, 2009). Flavell (1979) separated metacognition into three parts: (a) metacognitive knowledge; (b) metacognitive experiences, goals, or tasks; and (c) actions or strategies. This framework was refined to metacognitive knowledge and metacognitive regulation (Flavell et al., 2002). It is possible metacognitive skill is partially linked to cognitive ability and increases with increased age, although in university students, linking metacognition with learning ability and performance yielded inconsistent results (Bernacki et al., 2020; Veenman et al., 2004). Both metacognitive knowledge and regulation should be studied, as they are different aspects of metacognition but are both important and interconnected.

Metacognitive Knowledge. Metacognitive knowledge includes knowledge of persons, tasks, and strategies, which consists of an awareness of levels of understanding information, what information is required for a task, and what learning strategies are needed to complete a task. All three types of metacognitive knowledge interact during problem solving. Metacognitive knowledge and metacognitive regulation were strongly correlated in studies, which may indicate they must work together in controlling cognition (Schraw & Dennison, 1994; Stanton et al., 2015, 2019; White et al., 2009). While Zohar and Barzilai (2013) noted a general trend in focusing on developing metacognitive regulation skills more than metacognitive knowledge, many undergraduates lacked sufficient metacognitive knowledge to use metacognitive regulatory skills (Stanton et al., 2015, 2019). So, that development of metacognitive regulation skills may have limited efficacy. For example, one might prefer to use an easier strategy because of familiarity and not notice the easier strategy does not help learning (Flavell et al., 2002; Stanton et al., 2019). The abandonment of the easier, less effective strategy requires a degree of metacognitive knowledge. To use that knowledge, though, requires metacognitive regulation, so both aspects of metacognition are needed.

Metacognitive Regulation. Metacognitive regulation skills include planning, monitoring, and evaluating cognition. These skills do not develop independent of metacognitive knowledge; rather, they develop along with metacognitive knowledge and can lead to increased metacognitive knowledge (Flavell et al., 2002; Schraw & Dennison, 1994). Effective problem solving sometimes requires the suppression of easier, more automatic strategies and responses, and inhibiting these automatic behaviors can be as important to metacognitive regulation as acquiring new strategies (Flavell et al., 2002; Rodriguez et al., 2018; Stanton et al., 2019). Although both college and high school instructors identified metacognitive regulation as key to effective instruction and could identify how to address gaps in instruction, they did not always display any changes in their teaching behaviors, relying on familiar, automatic strategies which were often absent of metacognitive regulation (Eilam, 2017; Wen, 2012). In short, it is not enough to have metacognitive knowledge. Metacognitive regulation is needed to put knowledge into action and to assemble the skills needed for critical thinking and problem solving.

Lack of Metacognition in Incoming College Students. Veenman et al. (2006) and Flavell et al. (2002) found that adults may lack metacognition to an extent that

Flavell et al. (2002) called “startling.” This population includes college students arriving in introductory science classes without metacognitive skills in place because they did not need to use metacognition in high school; as a result, these incoming freshmen tended to fail to assess their own learning (Bernacki et al., 2020; Dye & Stanton, 2017; McGuire, 2018; Ridlo & Lutfiya, 2017; Stanton et al., 2015, 2019; Zhao et al., 2014). Many students arriving at college are startled by the amount of required independent studying as some have never studied before outside of assigned classwork or homework, and therefore have never developed the metacognitive skills that delineate effective studying (McDowell, 2019; Medina, 2017). Sometimes students are reluctant to invest time and energy into developing metacognitive skills or they mistake prior knowledge or subjective perceptions for metacognitive skills (Stanton et al., 2019; Vrieling et al., 2018; Zlatkin-Troitschanskaia et al., 2020). Carpenter et al. (2020) noted in a meta-analysis that students frequently mistook following the organization of content during lecture as evidence of learning despite a lack of correlation with exam performance. Collectively, the literature contains plentiful evidence that college freshmen are not all arriving in their introductory science classes with metacognitive knowledge and regulatory skills. As a result, their study efforts may be inefficient or ineffective.

In utilizing study tactics, many students did not work to develop metacognitive skills. They studied familiar material and avoided new content even when aware that they did not know it or used familiar strategies despite potential awareness of the strategy’s ineffectiveness (Cook et al., 2013; Dye & Stanton, 2017; Iwamoto et al., 2017; Kornell & Bjork, 2007; Persky & Hudson, 2016; Stanton et al., 2019; Steiner, 2016). Carpenter et al. (2020), and Sabel et al. (2017) found that students strongly reported that effective learning strategies that required more effort did not work for them. It is a common theme in the literature that students do not link the discomfort of practicing with unfamiliar material or strategies with greater learning gains than adhering to the familiar.

Rodriguez et al. (2018) stated that lack of practice with unfamiliar but effective study skills may account for students' failure to improve grades and Hattie and Donoghue (2016) noted that low performing students especially tended to adhere to a few study strategies for all situations despite those strategies sometimes being inappropriate. Further, biology undergraduates who underperformed on exams tended to fail to consider what they should change in their study methods to improve future performance, although this particular phenomenon occurred more often in seniors than freshman (Stanton et al., 2019). However, Stanton et al. (2019) noted that senior level biology undergraduates generally displayed higher metacognition and better exam performance than freshmen, but also acknowledged that seniors are the students who may have already had the metacognitive skills to perform well enough in lower-level biology classes to progress to higher courses, a potential survivorship bias.

Hattie and Donoghue (2016) stated study groups and practice exams require metacognitive skills, but freshman biology undergraduates who used study groups tended to find them more distracting than helpful while practice exams were used to memorize answers rather than assess understanding (Dye & Stanton, 2017; Persky & Hudson, 2016; Stanton et al., 2019 These findings are in partial contrast to Halmo et al.'s (2022) finding that students working together often do tend to elicit metacognition from one another, albeit not consistently, when metacognition is studied in real time instead of surveyed at a later time. De Backer et al. (2020) also found that working together was inconsistent in increasing shared metacognition and learning regulation. Stanton et al. (2019) reported that senior biology undergraduates tended to value study groups and practice exams, although even they had difficulty in carrying out metacognitive study plans that they made. Complicating students' metacognitive study efforts is that study skills are often not explicitly taught.

Overall, most university students reported that the way they study was not something they learned from prior instructors (Iwamoto et al., 2017; Kornell & Bjork, 2007; Medina et al., 2017). Many undergraduates reported never being instructed in how to use learning objectives to inform study practices, although students were more likely to report getting detailed instructions in learning objective use in courses which involved data collection; also, students who have been shown what successful attainment of objectives entailed showed greater motivation in their study efforts (Hattie & Donoghue, 2016; Osueke et al., 2018). Interestingly, Čavić et al. (2023) found that project-based learning did not improve university students' motivation for learning physics, although it did improve metacognitive awareness in physics students, albeit not in technology students or in groups of students disaggregated by performance level. Undergraduate chemistry students reported that although they had been told they would need to be able to apply information in college, they had not been told how to do so, leading to an acknowledged need and desire for instruction in metacognition (Graham et al., 2019). Hattie (2015) stated that university students have varying metacognitive skills and need to be explicitly taught to fill in the gaps, an idea with which Dye and Stanton (2017), Halmo et al. (2024), McDowell (2019), Shukla and Dungungnoen (2016), Stanton et al. (2019), and Stanton et al. (2021) agreed. In addition, Ijirana et al. (2022) stated that explicit instruction in metacognition increases overall critical thinking in college students. Stanton et al. (2019) in particular stated that undergraduate biology students need guidance in how to use internal metacognitive assessment to gauge understanding of class content rather than solely relying on the external indicator of exam scores to determine the efficacy of a study plan. The end result is paltry metacognition skills in undergraduates, particularly freshmen who have not had the opportunity or motivation to exercise metacognition. The students, however, are not alone in their potential lack of metacognition.

Underdeveloped Metacognition in Instructors. Whether a given community college science instructor has metacognitive knowledge and regulation skills also varies, which may influence their perceived self-efficacy to design and score problem-based student assignments according to a common rubric. In a meta-analysis published in 2013, Zohar and Barzilai noted that instructors' knowledge of metacognition was understudied, and Bas and Sagirli (2017), McDowell (2019), and Lavi et al. (2019) found it remained understudied. Rivero and Lewis (2018) reported that many secondary science instructors reported using metacognition less than they should, due to not hearing about metacognition after their schooling, misconceptions, or not knowing how to incorporate metacognitive practices or needing more experience in doing so, while Dennis and Somerville (2023) stated that most higher education instructors do not understand metacognition and generally do not explicitly teach it. Higher education instructors' unfamiliarity with metacognition caused it to be rarely included in programs to implement higher order thinking and some instructors reported that they felt teaching metacognition on a superficial level might do more harm than not teaching it at all (Zohar & Lustov, 2018). Veenman et al. (2006) stated that many teachers lack sufficient metacognitive knowledge to teach it effectively; as Jiang et al. (2016) very eloquently stated, "the reality is that one cannot teach what one doesn't know" (p.404). This potential lack of familiarity with PBL may also result in a negative affective state caused by discomfort and uncertainty with the topic. This state may then cause low perceived self-efficacy among populations like this study's community college science instructors to incorporate metacognition and assess PBL into course content.

Implications

In the literature review, I described the importance for college science instructors to incorporate metacognition and assess PBL in their classes with a high FOI. In this study I investigated the FOI of metacognitive instruction in the science department at a community college in the Mid-Atlantic region of the United States, thereby helping the college meet the goals of the QEP. The direction for the project deliverable is a white paper providing recommendations to ensure optimized FOI of the strategic plan. Though the FOI framework was initially defined for mathematics and science curricula, Century et al. (2010) determined their framework's measurement tools could be easily customized for use in multiple programs. This study included a focus on the science faculty at the research site, but the recommendations of the white paper can be easily adapted to other disciplines in alignment with Century et al. (2010) work. The format and content of the white paper were dictated by the information gained from this study’s participants.

Summary

In this basic qualitative study, I investigated science faculty’s perceptions of the FOI of a strategic plan via metacognitive instruction at a community college in the Mid-Atlantic region of the United States. In Section 1, I described the local problem and situated it in the broader educational field. I provided a rationale for doing the study, defined important terms, and proposed what the study’s contribution to positive social change might be. I listed the research question that this study attempted to answer. A review of the literature provided a context for the study by examining what was known and unknown of the problem. Finally, I discussed potential implications of the study’s outcome, with a tentative project deliverable described. In Section 2, I describe the methodology and qualitative research design for this study, provide information about prospective participants and measures I used to protect their rights, and describe data collection and data analysis.

Section 2: The Methodology

The problem this study addressed was that Mid-Atlantic community college faculty's FOI of a strategic plan to implement metacognition instruction had not been effectively monitored according to the individual implementing the plan. The purpose of this basic qualitative study was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. This study involved interviewing science faculty in person and via Zoom to gain a complete view of their personal perceptions.

In this section, I describe and justify this study's methodology. I then describe the processes for prospective participant invitation and sampling. I describe the data collection instrument and its content validity. I also provide procedures for recruiting participants, participation, and data collection. Finally, I explain the data analysis methods.

Qualitative Research Design and Rationale

The central concept that was the focus of this study is FOI of an educational initiative. The problem this study addressed was that faculty's FOI of a strategic plan to implement metacognition instruction at a community college in the Mid-Atlantic U. S. region had not been effectively monitored according to the individual implementing the plan. This raised questions about what components of the plan were working as intended and to what extent they were working, along with questions about what components were failing to produce desired student outcomes. This study employed a basic qualitative design to explore the perceptions of the study participants, the study site's science faculty. I used the following research question to guide my study:

RQ1: How do community college science instructors perceive the FOI of metacognition instruction according to the intended outcomes of the study site's strategic plan?

In this study, I conducted interviews to investigate the problem through the perceptions of the science faculty, as they were the individuals doing the actual implementation of the strategic plan. As such, they could best describe their own views of what parts of the plan they understood and believed they were implementing as designed, versus what parts of the plan they may not have fully understood or believed they implemented well. These interviews as the data source for a basic qualitative design enabled the achievement of this study's purpose, which was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States.

Description of Design

A basic qualitative design is intended to gain an understanding of how people comprehend and interpret their personal experiences in their everyday context (Merriam, 2009; Yin, 2015). Qualitative research has a distinctive set of core characteristics illustrative of this study, listed by Yin (2015), consisting of (a) collection of data in participants' natural settings, rather than the artificial environment of a laboratory; (b) the researcher as the data collection instrument, rather than an external instrument such as a questionnaire (Ravitch & Carl, 2016); (c) large, abstract categories and themes are discovered in an inductive manner from data collected from multiple participants (Saldaña, 2016); and (d) the focus remaining on participants' perspectives (Merriam, 2009).

The basic qualitative study is the most common type of study in the educational field (Merriam, 2009); its primary goal is to discover the meanings and interpretations people give to their experiences, which are found via analysis to find the patterns in the collected data (Yin, 2015). Because the purpose of this study was to investigate the FOI of metacognitive instruction as perceived by the science faculty at this community college, a basic qualitative design was appropriate. However, there were other study designs that were considered and determined to be a poorer fit to the purpose of this study.

Justification

A basic qualitative approach was selected for this study as other study designs would not align with this study's parameters as effectively. A quantitative approach was not the best fit for this study because it would involve numerical data, which would not align with the problem, purpose, framework, and research question (Babbie, 2017). A qualitative approach was selected as the best approach to answer the research question.

Not all qualitative approaches, however, were equally able to collect the desired information. Qualitative grounded theory studies, which were introduced by Glaser and Strauss (1967, 2006), attempt to create theories through analysis of themes found in collected data. Although I sought out themes in the data, I did not aim to create a new theory, so grounded theory was not an appropriate approach. Case studies were defined by Yin (2015) as portraying the details of a particular set of events or context. This study explored perceptions, not events, so a case study was not appropriate. Ethnography involves participant observation through a cultural lens to analyze behavior and narrative research collects chronological stories of individuals' lives (Creswell, 2014) but this study sought perceptions, not behaviors nor a retelling of events. As I did not seek to provide accountability to an organization, evaluation research did not fit the needs of this study (Ravitch & Carl, 2016). Phenomenological research usually relies on interviews to collect data and seeks to examine participants' perceptions of phenomena (Ravitch & Carl, 2016). However, phenomenology also usually involves interactions between the researcher and participants prior to interviews (Merriam, 2009). The possibility that such interactions might influence the interviews should be avoided, so phenomenology was not an appropriate methodology. The research design that aligned most closely to the problem, purpose, research questions, and conceptual framework was the basic qualitative study, with participants purposefully sampled for interviews.

Participants

The purpose of this basic qualitative study was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. To achieve this purpose, the participant pool from which the sample was drawn consisted solely of science faculty, rather than administrators or students, each of whom have their own perceptions of the strategic plan. However, including those perceptions would have gone outside the boundaries of this study.

Description, Selection, and Justification of Desired Participants

The population for this study included individuals in the science faculty from a 2-year community college in the Mid-Atlantic region of the United States. The university had a full-time student population of approximately 2,000 with an additional 5000 part-time students who included 150 dual-enrollment students spread across five campuses (Fall 2021 enrollment report; USNews.com college snapshot, 2019). It had a 2021 student to faculty ratio of 47:1 (Community CollegeReview.com college snapshot, 2021). The science department, this study's population, consisted of 44 faculty members, across multiple disciplines including biology, anatomy and physiology, microbiology, chemistry, geology, environmental science, and physics (college webpage, 2021). From this population, any instructor with the following criteria was eligible to participate in this study: (a) employed by the College of Arts and Sciences at the study site for a minimum of one semester, (b) instructing at least one class section in any scientific discipline offered by the college, and (c) experienced in designing and the assessments prescribed by the strategic plan. To ensure maximal variation in participant perceptions, no other requirements were utilized, as I wanted varied experience levels and disciplines in participants.

I used a purposeful sampling method to select potential participants from the population of 44 science instructors. Advantages of using purposeful sampling were that it enabled me to ensure diversity in the participants along the dimension of interest and it could provide context-rich, detailed information from participants (Ravitch & Carl, 2016). Yin (2015) stated that purposeful sampling can provide the most relevant and plentiful data for answering qualitative research questions such as the questions driving this study. However, a drawback was that the resulting sample, in this case 10 instructors, may not be representative of the studied population of 44 science instructors, so the results may have had limited generalizability (Babbie, 2017; Ravitch & Carl, 2016). To reduce sampling bias, purposeful maximal variation sampling was employed to gain wide variation of teaching experience and perceptions within the participant sample (Ravitch & Carl, 2016).

I invited teachers to participate by contacting every fifth instructor from an alphabetical list of science instructors via email. I sought to recruit 12-15 science faculty members, from all levels and disciplines of science classes, from a community college in the Mid-Atlantic region of the United States. As a single iteration through the alphabetical list did not yield enough participants, further rounds of invitations occurred with previously contacted instructors removed from the list until 10 instructors had been recruited. As responses to emails were initially low, possibly due to a reluctance to say anything about the QEP that might be construed as critical, a network sampling method was undertaken after the fourth round of emails. In this method, interviewees were asked to help recruit further participants (Ravitch & Carl, 2016); the hope was that being approached by a peer may allay potential participants' possible discomfort with sharing their thoughts on the QEP.

Selection was via purposeful maximal variation sampling and network sampling to gain an adequate number of participants and wide variation of teaching experience and perceptions so that patterns among instructors, such as between experienced faculty or between those who teach introductory or advanced classes, could be sought. This sampling strategy enabled the identification of important patterns in perceptions common to the varied participants (Ravitch & Carl, 2016). Also, it allowed for a variety of perceptions. Yin (2015) also recommended interviewing participants with views that might disagree with one's preconceptions, thereby avoiding bias in the study. The 10 participants represented 23% of the science faculty, which consisted of 44 instructors, and was based on guidelines from Guest et al. (2006). The final sample size was determined when analysis provided no new insights with additional interviews, indicating that data saturation was reached (Guest et al., 2006).

Procedures for Gaining Access to Participants

To recruit the desired 10 participants from the community college's science department, I needed to adhere to a set of procedures to ensure that I had permission from both Walden University and the study site to collect data, that participation was voluntary, and that participants were treated and protected in an ethical manner. These procedures were followed sequentially, as no data collection could occur until approval from Walden University's Institutional Review Board (IRB) had been granted. An application was submitted to the Walden IRB, and once approved, the study site's Director of Planning, Research, and Institutional Effectiveness was contacted for their official approval (IRB approval number 03-23-23-0672241).

Establishing Feasibility to Collect Data

The procedures for gaining access to participants began after receiving approval from Walden University's IRB. The first line of communication consisted of an email to the study site's Director of Planning, Research, and Institutional Effectiveness to confirm approval to collect data. This email was followed up with an email to the co-chairs of the study site's science department containing information about the study. That information included the study's purpose and intention, the interview process, informed consent, and confidentiality. The email also offered clarification and requested approval to use the department as my study site, as they were the department gatekeepers (Ravitch & Carl, 2016).

Inviting Participants

Participants were identified through a list of emails provided by the study site's science department co-chairs and every fifth instructor on an alphabetical list contacted via email with a Participant Recruitment letter that explained the study specifics. Interested participants were asked to respond via email within two weeks of receipt of the initial email to provide time for questions and concerns. Three attempts were made to contact instructors, with a second email sent after two weeks of the initial email and a third email sent a week later. If contact was unsuccessful, an email will be sent to the next name on the alphabetical list. As initial interest in participation was low, network sampling was used after the fourth interview in which interviewees helped contact further participants in addition to the emails sent by me. The goal of the network sampling was to allay any concerns that potential participants had.

Qualifying Participants

Prospective participants were contacted via email and invited to participate, with information about the study included in that email; an Informed Consent form was emailed, outlining protective measure to minimize harm to the participants. These measures included the use of pseudonyms (Professor 1, Professor 2, Professor 3, etc.) to provide confidentiality, member checks to ensure the data adhere to the participants' intended meanings, and the storage of data in locked file cabinets and password-protected devices accessible only to the researcher (Ravitch & Carl, 2016). All instructors who were contacted had experience with the QEP, and their eligibility to participate was confirmed via email. Only participants teaching one or more of the sciences offered by the college, with at least one semester of experience with the strategic plan were eligible and were contacted to set up an interview.

Interview Set-Up Procedure

Upon gaining consent to gather data from the study site's Director of Planning, Research, and Institutional Effectiveness and the science department co-chairs, participants were identified through the co-chairs, and every fifth instructor on an alphabetical list was contacted via email and invited to participate. The email contained information on the study's purpose and intention, the interview process, informed consent, and confidentiality. All participants signed an informed consent form. The form included the name and contact information of the researcher, the purpose of the study, potential risks and benefits of the study, the extent of confidentiality protections, and the conditions of participation, including the right to withdraw from the study without penalty (NIH Office of Extramural Research, 2008).

The recruitment email sent to prospective participants requested a meeting at the instructor's convenience. The semistructured interviews were on Zoom and were scheduled for 30-45 minutes, with each participant. Participants also had the option of an in person interview, though no participant chose that option. After the interview, a transcript was sent to each participant to ensure that their account is accurate and allowed them to add any additional information if they desired.

Establishing Researcher-Participant Working Relationship

To establish a positive researcher-participant working relationship with each participant, I built rapport in an ongoing, respectful manner in which I maintained transparency regarding who I was as a researcher (Ravitch & Carl, 2016). I occupied the same or similar position at the same institute of higher learning as my potential participants, so participants may have felt comfortable speaking with me as I sought to recruit participants with whom I did not have a relationship (Yin, 2015). Further, initiating contact through the science department co-chairs should have increased participants' comfort level with whether it was acceptable to the college to speak with me. Participant identities were protected via assigning each participant a pseudonym, with the first interviewee being identified as Professor 1 (P1), the second interviewee being identified as Professor 2 (P2), and so forth (see Ravitch & Carl, 2016). Finally, all participants knew what to expect both during and after their participation, in terms of follow-up and further communication via email prior to their interview (Ravitch & Carl, 2016).

Protection of Participants

To protect participants from any potential harm, ethical principles as outlined in the Belmont Report were adhered to, consisting of respect for persons, beneficence, and justice (NIH Office of Extramural Research, 2008). Respect for persons calls for informed consent by participants which allows them to weigh risks and benefits of volunteering for a study, as well as protection of their confidentiality. Beneficence requires that any possible benefits are maximized and any possible harms, physical or emotional, are minimized. Justice requires that participating individuals and groups are treated fairly and equitably in terms of bearing the burdens and reaping the benefits of the research. Participation was voluntary and no participant was required to complete the study if they did not choose (NIH Office of Extramural Research, 2008). The study was also under the supervision of an Institutional Review Board, who ensured that research adheres to ethical procedures.

Institutional permission to conduct this study was needed from both Walden University's Institutional Review Board (IRB) and the study site's Director of Planning, Research, and Institutional Effectiveness. Recruitment, including materials and processes were conducted in an ethical manner. The participant pool contained no minors and all participants signed an informed consent form. The form included the name and contract information of the researcher, the purpose of the study, potential risks and benefits of the study, the extent of confidentiality protections, and the conditions of participation, including the right to withdraw from the study without penalty (NIH Office of Extramural Research, 2008). If a participant withdrew, regardless of whether it was before, during, or after their interview, the next instructor on the alphabetical list of potential participants was contacted.

Participants' confidentiality was protected by assigning a pseudonym to each participant during data collection and analysis. The first interviewee was Professor 1 (P1), the second was Professor 2 (P2), and so on (Ravitch & Carl, 2016). All data were kept confidential. Interviews were recorded on a password-protected phone; audio files were downloaded and then erased from the phone, and I personally transcribed the data, to prevent exposure of any identifying information to any additional individuals. Any hard copies of documents were kept in a locked file cabinet and digital copies were kept in dual-factor authentication protected files in a password-protected computer, as well as on a separate password-protected hard drive (Cooper, 2016). Only the researcher had access to either the cabinet or the computer. At the conclusion of the study, the data were kept for 5 years and then destroyed, per Walden University's policies.

Data Collection

To answer the research question of what community college science instructors' perceptions of the FOI of metacognitive instruction were, I employed qualitative semistructured interviews of science instructors as a data collection source. Interviews serve as a common data collection method for basic qualitative studies (Merriam, 2009). Questions were open-ended to ensure that participants' perceptions could be fully explored and that the focus remained on those perceptions. In this section, I discussed the data collection method and instrumentation.

Instrumentation

In this study, I served as the researcher and used a semistructured interview guide as my only instrument. I used the same semistructured interview guide with every participant. This approach both provided consistency across interviews and allowed flexibility to pursue emerging topics (Ravitch & Carl, 2016; Yin, 2015). Interview questions were designed to ensure that the research questions may be answered by the researcher (see Appendix B); Yin (2015) pointed out that it is the task of the researcher to answer the overarching research questions, not the participants, whose input will not directly answer the questions, but rather will lead the researcher to the answers. Each interview was scheduled for 30-45 minutes at a time convenient to each participant. The interview protocol was researcher-generated and focused on the research question.

The interview questions were open-ended, allowing for a natural conversation between participant and researcher which was sufficient to answer the research questions (Ravitch & Carl, 2016). By keeping the interview questions open ended and focused on participants' perceptions, it was possible to elicit sufficient depth and detail. The semistructured format also allowed any new insights provided by a participant to be pursued with follow up probes (Rubin & Rubin, 2012). To ensure that the collected data accurately reflected participants' experiences, member checks and emic accounts, defined as accounts phrased in ways meaningful to the participants, were employed (Ravitch & Carl, 2016). The research questions should have been answerable via interviews with detail, depth, and nuance to capture the full picture of community college science instructors' perceptions of the FOI of metacognitive instruction as a part of a strategic plan.

Interview Items and Matrix. The semistructured interview guide included questions regarding demographics, instructors' understanding of metacognition and the strategic plan, and their perceptions of the FOI of the strategic plan. The full interview protocol is in Appendix B. The interview protocol was researcher-generated and focused on the research questions. Interview questions about training in the strategic plan and any monitoring that had been done of their implementation of the plan aligned with the problem. All of the questions aligned with the research question about participating science faculty's perceptions of their FOI and the strategic plan, as all of the answers were filtered through their own experiences of the strategic plan and their implementation of it. The interview questions were piloted via mock interviews with peers to ensure that the questions were appropriately open-ended and could elicit data that addressed the problem and research question of how do community college science instructors perceive the FOI of metacognition instruction according to the intended outcomes of the study site's strategic plan.

Processes for Generating, Gathering, and Recording Data. Interviews were recorded on a password-protected phone if the participant consents; audio files were downloaded and then erased from the phone and I personally transcribed the data, to prevent exposure of any identifying information to any additional individuals. Field notes were also taken during the interview, to assist with maintaining the integrity of participants' responses and the meaning they ascribe to them (Rubin & Rubin, 2012); Yin (2015) pointed out that these artifacts only record what the researcher has measured, rather than delineate what the participants find important. Also, a reflective journal was kept to reflect on any biases, assumptions, observations, and connections made during the data collection process.

Tracking interview data involved keeping confidential data from all sources in an Excel spreadsheet matrix to ensure ease of cross-referencing. Only the researcher had access to the password-protected computer where the Excel matrix was kept. All hard copies of data were kept in a locked file cabinet.

Procedures for Gaining Access to Participants

Upon gaining permission from both Walden University and the study site to collect data, . the co-chairs of the science department were contacted via email to explain the study's purpose and intention, the interview process, informed consent, and confidentiality, offer clarification, and to ask for approval to use the department as my study site. They were contacted first as they were the department gatekeepers (Ravitch & Carl, 2016). Further, the co-chairs were asked for a list of emails of the science faculty.

Afterwards, every fifth faculty member on an alphabetical list was emailed with a Participant Recruitment letter that explained the study specifics. Interested participants were asked to respond within two weeks, to provide time for questions and concerns. Three attempts were made to contact instructors, with a second email sent after two weeks of the initial email and a third email sent a week later. If contact was unsuccessful, an email was sent to the next name on the alphabetical list.

Upon a response from an interested participant, a link to a Google form was sent, in which participants filled out a pre-qualification survey to determine eligibility to participate in the study. Questions on the survey asked about their scientific discipline, teaching experience, and their experience with the strategic plan initiative. Only participants teaching one or more of the sciences offered by the college, with at least one semester of experience with the strategic plan were eligible and were contacted to set up an interview. After eligibility to participate was established, an Informed Consent form was emailed, outlining protective measure to minimize harm to the participants. These measures included the use of pseudonyms (Professor 1, Professor 2, Professor 3, etc.), to provide confidentiality, member checks to ensure the data adhere to the participants' intended meanings, and the storage of data in locked file cabinets and password-protected devices accessible only to the researcher (Ravitch & Carl, 2016).

After receipt of the completed consent forms and confirmation of eligibility to participate, participants were contacted to explain what would be expected of them and to establish a comfortable working relationship. An in-person or Zoom interview was then scheduled at the participant's convenience. Debriefing procedures consisted of personal communication with each participant discussing treatment of interview data and requests for follow-up communication as needed; also, participants received transcripts and a summary of their responses to examine for accuracy (Rubin & Rubin, 2012). Finally, all participants knew what to expect both during and after their participation, in terms of follow-up and further communication via email prior to their interview (Ravitch & Carl, 2016).

Role of Researcher

My role in this study was that of both a former instructor of biology at a community college and a 4-year university in the Mid-Atlantic United States, and as a Walden University doctoral student in the Doctor of Education program specializing in Curriculum, Instruction, and Assessment at the Richard W. Riley College of Education and Leadership. My role as researcher was to explore the perceptions of instructors, occupying similar roles to mine, about the FOI of metacognitive instruction at this community college as a part of a strategic plan. Though I was undertaking this study with participants who teach in the community college where I taught in the recent past. I did not want participants in my study to feel obligated to participate due to a prior relationship with me, nor did I want any prior relationship with participants to bias my data or my ability to ask potentially difficult questions (NIH Office of Extramural Research, 2008; Ravitch & Carl, 2016). I stated in recruitment materials that participation was entirely voluntary, and participants could withdraw at any time with no penalty. However, I knew approximately half of the science department, and ended up interviewing participants with whom I had at least a social relationship in the science department. I made efforts, however, to initially contact people whom I did not already know, as people I know may not have felt comfortable being entirely honest about their work, even if I was no longer a colleague.

Researcher Bias and Ethical Issues

These roles and relationships may have affected data collection, in both positive and negative ways. In my former position as a molecular biologist, I became very comfortable with asking questions to which the answer was not necessarily what I hypothesized it would be. I anticipated this familiarity to work in my favor during this study. As a fellow science instructor, I may have comprehended participants’ frame of mind more easily, as I understood the need to cover science content as well as help students learn general competencies such as cooperation, communication, self-regulated learning, metacognition, critical thinking, and problem solving. As such, participants hopefully felt comfortable speaking with me, which may have provided an authentic foundation for building rapport and they may have viewed me as a peer (Ravitch & Carl, 2016; Yin, 2015). However, it may have been detrimental if they felt I was judging them; I needed to ensure participants feel respected. Because of my experiences in classrooms similar to this study's participants', I may have made the mistake of assuming my pedagogical blind spots were also theirs.

Procedures to reduce bias and call my attention to any that remained included maintaining a field journal to ensure reflection. Ravitch and Carl (2016) emphasized the importance for a researcher to iteratively reflect on their relationship to the study's topic and the research design to sustain focus on participants' experiences and perceptions, rather than the researcher's. Yin (2015) also emphasized the importance of avoiding bias to the full extent possible, but also remaining cognizant of any biases that will remain, as true neutrality is near impossible to achieve.

Data Analysis

After each interview, these data from both recordings and my field notes taken during interviews were transcribed verbatim by me and organized for analysis so that identifying information was removed, as pseudonyms were used for participants (P1, P2, etc.). The transcripts included speech patterns such as pauses and "um"s to ensure that participants' meanings were recorded as clearly as possible (Ravitch & Carl, 2016). Analyses followed the guidelines of Ravitch and Carl (2016) and include the following steps:

Coding Procedures and Processes

Digital transcripts and an interview summary were sent to participants as an initial member check after their interview to ensure the transcripts accurately represented their perceptions and allow them to add any information they would like (Ravitch & Carl, 2016; Rubin & Rubin, 2012). I began analysis by undertaking multiple cycles of coding of all the data, beginning with a priori coding followed by open and axial coding, using the terms and phrasing of the participants as initial codes to ensure that their perceptions remain the focus of the analysis (Saldaña, 2016). Formative analysis began after the first interview, and all interviews were analyzed in a recursive manner after each interview. During coding, a codebook was created on Excel, containing codes, their definitions, descriptions of what makes each code distinct from one another, and examples of each code from the data; this codebook was updated in an iterative manner (Ravitch & Carl, 2016; Saldaña, 2016). All interviews were analyzed during the creation of the codebook to ensure codes and themes were supported by interview data (Ravitch & Carl, 2016). Each interview was also analyzed to refine follow-up questions in later interviews to elicit rich information that could answer my research questions (Ravitch & Carl, 2016).

A Priori Coding

I began the coding process using a priori coding based on this study's framework and the following terms: (a) structural-procedural critical components (SPCC); (b) structural-educative critical components (SECC); (c) instructional-pedagogical critical components (IPCC); (d) instructional-student engagement critical components (ISCC);

and (e) overall perceptions of the QEP (OP). Table 1 includes examples of each code, participant, and excerpts from the data source.

Table 1

A Priori Codes (framework Model) with Examples

A priori code	Participant	Excerpt
SPCC	P3	I think that has to do with the design of the VALUE rubric. In a way that it was phrased to where some aspects of it fit, and then others we kind of feel like, I personally feel like I'm forcing a grading of that with some of these things.
SECC	P10	[Department co-chair] held a meeting and he's like, um, "This is it. Let's go." I mean, it was, it was, there was no training.
IPCC	P5	but you didn't want to grade students with the rubric, so that had a double grade, right? And so that is like, I don't know, for every teacher, that's, like, almost insurmountable, like, remembering to do that, like, go back in and actually put in what (air quotes) score they would have gotten on the rubric. Um, you know, because we were expecting them to be like ones and twos. But you mark them ones and twos and they're going to feel very bad about themselves, but that's what we were expecting. So it's kind of this, you mark it one way in the class and then you mark it a different way for the official recording
ISCC	P2	so I just wanted to see that they were, um, taking the feedback that I was giving them, um, and incorporating it to improve their, their thinking skills moving forward in the course.
OP	P4	I think it had a lot of struggles. So, yeah. So it, so it didn't, ah, it didn't change anything for me.

Open Coding

Through the a priori coding process, I created many codes by applying open, in vivo coding. I also returned to the transcripts and recordings from each interview to ensure I had not missed any repetitions. I searched these data for similarities and labeled clusters of words with a term that gave meaning to the cluster. For example, I labeled one cluster as *planning comments* because all the codes were participants' perceptions of the QEP planning process. I labeled another cluster as *rapid rollout* because participants shared their perceptions of the initial implementation of the QEP. Another cluster was labeled as *assignment scoring* because all the codes referred to how each participant scored their students' work according to a common rubric. Open coding resulted in a total of 467 codes. Table 2 contains examples of open codes and participant excerpts from the data source.

Table 2

Open Codes by Source with Examples

Open code cluster	Participant	Excerpt
Planning comments	P5	I do feel like we, we, you know, did the best job that we could in trying to plan it, but it did feel like this should have been something you should start, you know, five years prior to the next one, like planning, you know. Um, so it felt, it did feel kind of rushed, um, uh, planning.
Rapid rollout	P3	I think as this thing started to roll out really fast, we had to meet certain timelines, but we didn't have quite the support within the college to roll this out well.
Assignment scoring	P11	I actually graded them very easy because I wanted them to do it and not get concerned about it.

Axial Coding

During the last coding stage—axial coding, I searched the open codes and corresponding excerpts from the interviews to identify the relationships among the open codes. I grouped similar open code clusters and assigned a name to each category. For example, I grouped “untrained instructors,” “nonspecific training,” and “inadequate training” to form the category *ineffective or absent training*, I also grouped “planning comments” and “rapid rollout” to form the category *rapid rollout.* The category *assignment implementation* was created when I grouped the clusters “structure and frequency” and “assignment guidance.” Table 3 contains four examples of the axial codes from the 17 categories.

Table 3

Axial Codes and Participant Excerpts

Axial codes	Participant	Excerpt
Incompatible rubric	P4	I honestly think the biggest problem was the rubric. It just didn’t fit because it was so PBL specific.
Data usage	P2	Then we stopped uploading them. Yeah. So I was like, if we’re not uploading the scores anymore and I’m not getting yelled at for not uploading the scores, why am I still doing this~ And that’s when I started, I was like, alright, I’m just going to make it optional.
Ineffective or absent training	P3	It didn’t go over how to score this stuff with the VALUE rubric.
Assignment-rubric alignment	P6	I gave the assignment to the students as a pass fail assignment. They got full credit if they completed the assignment. I then evaluated the assignment according to the rubric for submission to the QEP statistics. Thus the students never saw the rubric.

Thematic Analysis

To create themes, I resumed searching among the categories and raw data for additional patterns. These patterns were the key concepts I used to explain the analyzed data. Three themes emerged from my search for patterns across categories:

Theme 1: Although they worked to elicit metacognition from students, instructors reported little improvement in student metacognition.

Theme 2: Instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics.

Theme 3: Although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing**.**

Evidence of Quality

Great importance was placed on ensuring that the research findings accurately represented the perceptions of the science instructors regarding the FOI of metacognition at this community college. Qualitative research tends to be very context-specific, so evidence of quality does not involve complete objectivity or generalizability (Ravitch & Carl, 2016). Rather, evidence of quality in a qualitative study involves accounting for the variations inherent in qualitative data and analysis, as well as accounting for the complexities of using the researcher, who has their own inherent biases and perceptions, as the data collection and analysis instrument.

Trustworthiness

Trustworthiness is a critical factor for ensuring the quality of a study; it indicates the extent to which a study's reader can have confidence in the study's findings (Lincoln & Guba, 1985). To achieve trustworthiness, I ensured credibility, transferability, dependability, and confirmability were present in this study. To this end, I used the following methods: an audit trail consisting of my research notebook; member checks involving sharing emerging patterns and findings with participants to ensure that the findings accurately reflected the participants' perceptions on the subject under study (Creswell, 2014; Stewart & Hitchcock, 2016); thick data description; and researcher reflexivity via a reflective field journal. Collectively, each method contributed evidence as to the overall quality of the study and findings.

Credibility

Credibility is whether the research instrument and data lead to the findings (Ravitch & Carl, 2016). Further, participants in a credible study should agree with the findings and interpretations as accurate to their experiences (Lincoln & Guba, 1985). Qualitative data tends to be influenced by the researcher's filtering and interpreting information during data collection (Stewart & Hitchcock, 2016); by using member checks in which participants checked the content of the interviews that were sent to them immediately post-transcription via the email used to contact them initially, they could confirm that my interpretations were accurate to their intended meaning and could provide additional thoughts regarding my interpretations (Ravitch & Carl, 2016). For any discrepancy between their intended meaning and the transcript, appropriate edits were made to the transcript.

Transferability

For my study to be trustworthy, I also needed to ensure that the study was transferable. For a qualitative study, transferability does not involve the findings being generalizable to other contexts, but rather that the findings should be applicable to broader and similar contexts while still being very rich in a context-specific manner (Lincoln & Guba, 1985; Ravitch & Carl, 2016), Thick data descriptions can provide deep information about participants' thoughts and perceptions. Creswell (2014) stated that thick descriptions can increase the validity of a study's findings by providing richer, more realistic information which enables the reader to understand the participants' context. Ravitch and Carl (2016) noted that thick description involves clearly describing the study's contextual factors as well as the participants and their experience thoroughly enough to allow the reader to place the findings in its appropriate context. To ensure thick data description, I recorded the interview, if permitted by the participant, and organized the interview questions to encourage the participant to answer thoughtfully and in depth with examples (Rubin & Rubin, 2012); I also took extensive notes so that participants' meanings could be fully understood in context (Ravitch & Carl, 2016). Also, analytic coding methods were primarily in vivo to ensure that meaning was not lost to researcher interpretation; participants' own words and phrases were adhered to in order to maintain depth of description (Saldaña, 2016).

Dependability

Dependability is the stability of the data and findings, in terms of a logical rationale for how the data are collected and how the data are linked to the findings and interpretations within a changing context (Lincoln & Guba, 1985; Ravitch & Carl, 2016). Researcher reflexivity via a reflective journal helped ensure the accuracy of researcher interpretations and reduced researcher bias. After the coding of each interview, both the codes and the reflective journal were examined to ensure the codes and patterns I found matched with what the participant said. By these methods, the data could be dependably linked to the findings and interpretations.

Confirmability

Confirmability builds on the idea that qualitative researchers do not seek complete objectivity but rather to acknowledge and reduce how a researcher's biases may influence their interpretations of data, with the goal that findings are confirmable (Ravitch & Carl, 2016). To ensure confirmability in this study, member checks were employed to ensure that participants felt their contributed data aligned with my findings. Also, the influence of researcher filtering of information which comes with collecting qualitative data was considered by the keeping of a reflective field journal to enable researcher reflexivity (Stewart & Hitchcock, 2016). Researcher interpretations of data will certainly be informed by their own history and culture (Creswell, 2014), and ensuring that the influence was noted and acknowledged helped potentially reduce its effect and helped increase the confirmability of the findings.

Discrepant Cases

All data, including discrepant cases, were included in the data set, and analyzed. Including discrepant cases also aided in credibility; as people are not homogenous, their perceptions were not homogenous, either. Ravitch and Carl (2016) recommended asking how discrepant cases can challenge and deepen the study's findings; Creswell (2014) stated that inclusion of these cases makes findings more nuanced and realistic. By including all the cases, rather than just the ones that seem to follow one interpretation of a theme, other interpretations could be considered, increasing the overall credibility of the findings (Yin, 2015). Further, Ravitch and Carl (2016) noted that examining discrepant cases can also aid in finding different interpretations of evidence that account for the variation seen in discrepant cases, leading to more nuanced understanding of participants' perceptions.

Data Analysis Results

The purpose of this basic qualitative study was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. The findings of this study may help bridge the gap to some extent between what is intended in the strategic plan and what is implemented. As a result of gaining more information about the FOI of its strategic plan, the college may better make informed decisions regarding adjustments to its strategic plan.

Themes

As I analyzed the findings from the data, three themes emerged that address the RQ:

- **Theme 1:** Although they worked to elicit metacognition from students, instructors reported little improvement in student metacognition**.**
- **Theme 2:** Instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics.
- **Theme 3:** Although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing.

In the following discussion, I explain the development of each theme from the data source, and its relevance to the problem through the lens of the conceptual framework. Finally, I detail how the theme statements for the findings inform the RQ in this study. The themes informed the RQ in this study and were developed by analyzing the a priori and open codes from the participant data set. Figure 2 includes the alignment of the codes with the resulting themes and framework elements.

Figure 2

Coding and Thematic Analysis Matrix

RQ1: Coding & Thematic Analysis Matrix

	A Priori Codes / Framework Informed Themes			
	FoI Critical Components			
	Structural		Instructional	
	Procedural	Educative	Pedagogical	Student Engagement
Excerpt *n*	94	91	89	127
Participant *n*	10	11	11	10

THEME 1→	*Although they worked to elicit metacognition from students, instructors reported little improvement in student metacognition.* **(SPCC, IPCC)**
THEME 2→	*Instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics.* **(SPCC, SECC, ISECC)**
THEME 3→	*Although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing.* **(SPCC, IPCC, ISECC)**

	Participant *n* = 10*	Open Codes *n = 467*	Axial Codes *n* = 17	**SPCC**	**SECC**	**IPCC**	**ISECC**
1.	5	11	Data usage	1		1	
2.	7	11	Student tracking	1		1	
3.	8	16	Student comfort	1		1	
4.	8	30	Elicit metacognition	1		1	
5.	9	32	Rapid rollout	2	2		2
6.	10	64	Ineffective or absent training	2	2		2
7.	4	7	Comfort with familiarity	2	2		2
8.	5	20	Necessary knowledge	2	2		2
9.	10	39	Scoring	2	2		2
10.	6	26	Consistency and flaws	3		3	3
11.	10	25	Incompatible rubric	3		3	3
12.	10	25	Assignment rubric alignment	3		3	3
13.	11*	53	Assignment implementation	3		3	3
14.	8	25	Adapting assignments	3		3	3
15.	5	17	Feedback use	3		3	3
16.	7	16	Overall QEP Benefits	3		3	3
17.	7	50	Overall Poor FOI of QEP	3		3	3

*Participants (*n* = 10); 1 transcript was coded into two files (*n* = 11)

In this section, I explain each theme in detail, how it evolved from the participant data set, and how the theme informs the RQ.

Theme 1: Little Improvement in Metacognition.

Based on the data analysis, instructors saw little improvement in metacognition in their students, although they overall worked to elicit more metacognition from students. This concept includes the methods instructors used to encourage students to be more metacognitive in their completion of the required assignments, as well as to improve students' ability to articulate their metacognitive thought processes. It also includes instructors' perceptions of whether these efforts improved student metacognition to any significant degree as a result of the assignments required by the QEP. All 10 participants commented on metacognition in their students, their efforts to elicit metacognition, or both. Of note is that three participants pointed out that science and lab classes by their very nature require metacognition and reflection, so students already have a baseline of metacognitive skills; participants spoke specifically about improvements to students' skills as a result of the assignments involved with the QEP. Four axial codes informed this theme—unclear and inconsistent *data usage* by the college to assess student metacognition across the college; methods of *student tracking* by individual instructors within and across semesters; *student comfort* with the required assignments; and instructors' efforts to *elicit metacognition* in the students.

Data Usage. Of the 10 participants, five provided remarks with 11 open codes which informed this axial code. Four participants stated that they never saw any departmental or school data in terms of changes in students problem solving or metacognitive skills; two of these participants further said they doubted if the data were being used. P5 stated, “I guess the only thing is I would have liked to see some departmental data, right? ... (chuckle) If you’re emphasizing the importance of metacognition… to know how you’re doing is important, and that’s not something that’s actually been done.” P8 also stated that “There was no follow up to the assignments,” and P3 agreed with, “I know somewhere in [community college] they have pulling all this data down, but we don’t ever see the, the print out summary of what all that looks like.” Overall, instructors just stated that there was no information about student performance improvement or decline available to them.

Compounding the problem with data availability, three participants also cited their own inconsistent or absent data collection, with no negative feedback from the school. P3 declared, “I did not do the rubrics. I admit it. (laughing) And that goes for the entire, I don’t know, four years. I didn’t do it.”, and “nobody pestered me, ever. I mean, I was a complete dropout and nobody did anything (chuckling).” P3 stated, “Then we stopped uploading [the scores]. Yeah. So I was like, if we’re not uploading the scores anymore and I’m not getting yelled at for not uploading the scores, why am I still doing this?” and P5 admitted, “At one point, I realized I didn’t actually include that assignment for that semester.” As a result of inconsistent data collection and usage, as well as no data results being available to instructors, the instructors were unable to determine if students were improving problem solving and metacognition skills across the science department.

Based upon the participants’ experiences, the axial code, *data usage*, captured the essential elements in addressing the challenge of determining if the science department’s students' metacognition had overall improved. Instructors then worked with more anecdotal data to adjust their methods of eliciting metacognition from students, as will be discussed in the axial code *student tracking.*

Student Tracking. Instructors primarily relied on informally collected data to determine if their implementation of the strategic plan was having an effect on student metacognition and problem solving. Of the 10 participants, seven provided remarks with 11 open codes which informed this axial code. Only one participant, P3, formally tracked student performance from one semester to the next via an Excel spreadsheet. Although six other participants stated that they did not track student performance, with P8 even stating "I wasn't responsible for tracking it", three of those participants made statements indicating informal monitoring of students' skills outside of the required PBL assignment. For example, P7 stated, "I would say, informally, you just kind of see it over the course of the semester" and "because I only scored the rubric once, I didn't really use that as an indicator for … progression ... But looking at their other project works, …I can get a sense of it with that, … but not necessarily with the PBL." P11 stated that they could informally track performance "because I kept giving them less…support with each one, and they kept coming up with…the still good answers and so I think they were…getting-. At least most of them, some of them never did, but most of them did."

Based upon the participants' experiences, the axial code, *student tracking*, captured the elements in tracking whether instructors were tracking student metacognitive performance within semesters or between semesters. Only one participant tracked in any formal capacity, and that participant was also the only one to track between semesters. All other tracking, if done at all, was informal.

Student Comfort. The more relevant and familiar the assignment seemed to the students, the more participants perceived students to be comfortable and willing to exert metacognitive effort on assignments. This axial code was informed by eight participants with 16 open codes. Six participants discussed students becoming familiar with the format and objectives of the PBL assignments. For example, P3 stated, “I think by having that and the student seeing these in multiple classes, the students seem to be more used to these assignments as well,” and P2 noted, “all of my learning outcomes that I, I actually deem (chuckles) important for the course, they’ll see them a minimum of six times throughout the semester, so they’re just growing, um, on, on those objectives.” P7 referred to the benefit of doing the assignment multiple times when they stated, “I had kind of an informal PBL that they did as a group and it ran them through the same types of questions .... And then when they did the individual one, like, these questions weren’t out of left field.”

Overall, however, instructors reported that student enjoyment of the required assignments was mixed. No participant reported only positive or negative feedback from students. P8 said, “The first one was usually well received, but the topic-specific ones were not.” P12 stated,

> They enjoyed them. I mean, they’re, they’re extra activ-, they’re activities. So they’re, you know, they’re not super excited about doing more, about doing work.

> But, you know, they as far as, uh, compared to, uh, other activities and stuff, they, they enjoyed them and they thought they were useful for it.

P3 linked student enjoyment to familiarity as they said, “In terms of the end of the semester, um, students have said…at first they kind of struggled with the PBLs. But then once they did one, they were actually kind of fun, um, especially the ones in micro.” P10 linked comfort and willingness to exert effort to relevance to the students as they stated, “I think there are several instances where I introduce things, um, that, once you start talking about [the students], they’re interested, right? I mean, like, once this pertains to them.”

The benefit of increased familiarity and student comfort in terms of higher student effort was mentioned by two participants when comparing students’ performance on the first assignment to the second assignment. For example, P3 stated,

> they are getting better at, instead of just giving me one solution, that’s very vague, many of the students are getting better at being more robust in explaining why they came up with this thing, how they would go about it, doing it.

However, two other participants noted that many students had prior experience with similar assignments, so they were already familiar. P12 noted, “PBLs in general, students… generally have a lot of practice with them. They… do PBL kind of activities a lot of times in middle schools, … they’ve really seen them a lot of times, um, and have an idea,” while P11 stated that, “The only ones who didn’t mind were ones that did them all through high school and they would crank those things out in 15 minutes and be done.”

Both participants stated students with prior experience tended to perform consistently well on all iterations of the PBL assignments.

Based on the participants' experiences, the axial code, *student comfort*, captured the essential elements in addressing how participants perceived students' familiarity with and willingness to exert effort on required PBL assignments to the quality of their performance with problem solving and metacognitive skills.

Elicit Metacognition. Participants generally worked to help students become more metacognitive and better articulate their thought processes. Of the 10 participants, eight provided remarks with 30 open codes that informed this axial code. Four participants described using lab analyses to encourage metacognition, although P8, for example, noted, "But often they didn't 'analyze' so much as 'justify' their responses." P5 agreed, saying,

> Just anecdotally, most people are just going to say, "Yeah, I thought I was doing it right the first time." Um, so, but I do have some students who say, "Yeah, I should have done it a little bit different." So that kind of feels like a win that anyone is choosing, (laughing) choosing that as an option. Um, but no, I don't think the majority of students do.

Two other participants reported using discussion boards to elicit metacognition, both commenting on utilizing social metacognition to increase each students' metacognitive skills. P7 stated, "they have to help each other. So there, there's a bit more reflection of what was difficult and why was it difficult or what came kind of easy and, and why did I find that easy." P4 had students post reflections on challenging homework problems, describing the following:

> why they found it difficult,…what did they do to try to figure it out,…how did they know if they were on the right track or not, and…what did they do then? …. They just do that for a couple of problems…, and then I grade them on the quality of that response, not whether they got the problem right.

Despite efforts by most participants, four stated explicitly that they did not see any increase in student metacognition. P10 stated, "I didn't see this big light bulb go off afterward." P7 noted, "I mean, I think they got better at…filling out the QEP … And I'm sure it helped them, but I don't know that, you know, it was a big aha moment for any of them really." P5 said of the QEP, "I don't think it's good at actually teaching, you know, metacognition." On the other hand, P4 noted that "I had the same approach before the QEP, like and, like, the, the same approach that I used during the QEP I did before. So, including the metacognition part." As they already made a point to encourage metacognition in their students, saying, "metacognition itself, … it's kind of a…, not a, not necessarily a precise thing to pin down and actually measure, but there are some ways to at least get students thinking about how they're thinking," they were not likely to see any particular difference in student metacognition specifically as a result of the QEP.

Interestingly, two participants stated that metacognition was not a large objective in their classes. P6 stated "so I feel like science, we teach science for content? ... And the emphasis was entirely about content and, you know, that was always my emphasis is that is on the content and not having them analyze how they learn," and P8 noted, "But metacognition is not the focus; it’s a secondary objective in my classes.” Even P5, who did encourage metacognition in class, noted that,

> I mean, that would almost be like something ... not separate? but kind of as like a whole other thing, like teaching them to really (gesturing towards self) think about what they’re thinking, so. I mean, I think it is a fine job for what it does because we weren’t really ... focused necessarily on teaching that specific aspect.

So, to the science faculty, whether metacognition even belongs in the science curriculum is not universally agreed upon.

Summary. Interview responses confirmed that the science instructors generally worked to elicit metacognition from students, often using labs and discussion boards as vehicles for the required PBL assignments to promote reflection of thought processes. However, few reported any actual increase in metacognition as a result of the PBL assignments required by the QEP, although tracking student metacognition was mostly an informal endeavor when done at all. Also, the lack of departmental data made it difficult to determine if there were any evidence beyond anecdotal that the QEP was affecting student metacognition.

Thematic Alignment to RQ 1: This theme informs the research question by providing participants’ perceptions of the fidelity of implementation of the strategic plan specifically in regards to metacognitive instruction. The theme takes into consideration the assessment of whether metacognitive instruction was effective via information regarding the college’s data usage, which falls under the structural-procedural critical component of the FOI framework. It is further informed by instructors’ individual student tracking, which falls under the instructional-pedagogical critical component of the FOI framework, as well as students comfort with the assignments and instructors' efforts to elicit metacognition, both of which fall under the instructional-student engagement critical component of the FOI framework.

Theme 2: Desire for mandatory, science content-specific training

Instructors indicated that required training for designing the PBL assignments and scoring them according to the VALUE rubric would be valuable, particularly science-specific training. This training would enable consistent implementation and assessment of student learning across the science department. All 10 participants commented on training for the QEP. Five axial codes informed this theme—*rapid rollout* of the QEP; *ineffective or absent training* that instructors had received; instructors' *comfort with familiarity* with teaching materials, varying reports of *necessary knowledge* for QEP implementation, and *scoring* the assignments in a consistent manner.

Rapid Rollout. Of the 10 participants, nine provided remarks with 32 open codes that informed this axial code. Two participants described that the science department was chosen as one of the departments to pilot the QEP. P12 noted "we were used as a little bit as a pilot. We, we often are for science, um, because we're more organized than most (laughing) and PBLs fit in pretty well with science." Four participants noted that members of the department, or at one point, the entire department, were involved in choosing the QEP's focus and organizing its implementation. According to P5,

> Faculty did choose it, um, at a faculty meeting (horizontal circular gesture with right hand). We went around with Post-it notes and we, one of the last, like, the

> year prior to what we decided, like we, we chose that, that this is what we wanted to focus on.

However, P6 disagreed that faculty had input. They recalled, “I was never involved in the department discussions about how it would be implemented…If I remember correctly, the department chair and maybe some, some of the other faculty were involved in those discussions. And if I remember correctly, they just gave it to us and we just implemented it.” Even with faculty having input early on, when the QEP was initially implemented, the instructors reported perceiving the process as being very rapid, and feeling unsupported in the initial implementation process. P3 stated, “I think as this thing started to roll out really fast, we had to meet certain timelines, but we didn’t have quite the support within the college to roll this out well.” P10 discussed the span of time between the QEP being presented to the faculty and the date of its initial implementation with, “But that first time out was like…(looks up) I’ve already written my syllabus. I’ve already planned my semester and you’re throwing this at me today, right (laughing) It’s like, um, school starts Monday.” Of the nine instructors who described the initial implementation, eight stated that they did not feel ready to implement the QEP in their classes.

Instructors were directed to create PBL assignments per the QEP parameters after being given an example as a guide. P3 stated, “pretty much from there it was, ‘Oh, hey start developing these for your own classes’.” Four participants noted, however, that the science faculty tended to share assignments among themselves, so not everyone was designing their own assignments. P12 described the benefit to sharing assignments because, “it takes a lot to create a PBL. PBLs are challenging to create, but if you provide a PBL…that fits in that does, it does well,… it is not challenging to pull off as a teacher.” Most of the participants who described the sharing saw it as a benefit, but P6 saw it more as a limitation, as they viewed the available assignments as ones that were required to be used rather than being a potential guide for designing other assignments. Also, P11 appeared to be unaware of the pool of available assignments, as they said, “It would have been better if there were two or three or four that we chose from, … rather than coming…up…with them ourselves, just because if you’re going to have data on something…, that just makes sense to me.” Overall, despite members of the department trying to make implementation a little easier by sharing assignments, not everyone benefited from the sharing.

Based upon the participants’ experiences, the axial code, *rapid rollout*, captured participants’ feelings of being initially rushed into implementation and feeling unprepared, even despite having available a pool of usable assignments.

Ineffective or Absent Training. Training in creating PBLs and using the VALUE rubric to score student work was not always available. When available, training tended to be non-science specific or inadequate to ensuring instructors were prepared for the QEP implementation. All 10 participants provided remarks comprising 64 open codes to inform this axial code. Six participants reported not attending any training on the QEP. P2 stated, “at the time, my full-time job, um, I was like probably 30 or 40% travel and it just was like not conducive to, to go to any of the trainings.” Three participants describe attending training that covered active science learning methods, but these trainings were not targeted towards implementation of the QEP and its parameters. Only one participant, P3, reported getting any science-specific QEP training early in the implementation process, and that training was not provided by the college. P3 went on to report regarding training by the college,

> That's where it took probably about another two years, three years before we had a few more professional development sessions where other people across the college had their types of problem based learning assignments that they shared, um, in, in these professional development days.

However, P3 stated that this training did not cover how to score assignments with the VALUE rubric, in agreement with three other participants. P10 recalled that initially, " At that time, in that meeting, I don't know that we had a rubric. Uh, if I'm not mistaken, the rubric came later." P6 recalled practicing scoring with the rubric during a training, but stated, "of course, in a perfect world, everyone would rank at the same…. But…that takes some serious practice and I don't think we've reached that level of practice." Overall, participants did not report robust, science-specific training for implementing the QEP, and seven participants reported feeling unprepared to implement the plan in the first semester.

Three participants referred to utilizing expertise they already had, although one of them also reported feeling unprepared for implementation. P2 and P4 both utilized Process Oriented Guided Inquiry Learning (POGIL) rather than PBLs in class. P4 stated, "I don't know if you've heard of the POGIL project ... I've been involved with them for years…I haven't done as much lately, but when I was at [university], I worked with them a lot, and I facilitated workshops." P11 noted about methods they included in their implementation, "When I was in vet school, we did something called SOAP, soaping problems, which was similar… But this was much broader than soaping. The soaping …was just diagnosing. So Subjective, Objective, Assessment, and Plan." In contrast to the participants who used non-PBL methodologies, P10 researched PBLs specifically on their own, stating,

> I really did a lot of research online, not a lot, but I mean I looked at different places. How do they, uh, how did they implement PBL? What are some examples, PBL examples, um, you know that other schools have done and I'll tell you it's, there's not a lot of science being done.

So, instructors did seek out training on their own and utilized active learning knowledge they already had.

Comfort with Familiarity. Instructors felt more confident with implementation when working with methodologies or materials they already knew. For example, P2 and P4 already were well versed with POGIL methodologies, and both used POGIL exercises rather than PBLs to fulfil the QEP requirements. P4 noted, "basically I just did the same thing I have always done. You know, all through the QEP period, which is… having them either… work in their groups or, or, ah, work on the discussion board throughout the semester." P7 modified familiar materials, stating, "it was a lab that I had already been doing, so I just kind of modified it so that it would fit with the rubric, and I would be able to score it…So…I was comfortable doing the lab." As a result of staying with the familiar, they were the only participants who reported feeling prepared for the initial implementation of the QEP.

Based on participants' experiences, the axial code, *inadequate or absent training*, captured participants' feelings of being unprepared to implement the QEP, although those participants who utilized familiar methods or materials tended to feel more comfortable with implementation than the others.

Necessary Knowledge. Participants were asked what particular knowledge was necessary for successful implementation of the QEP. Of the 10 participants, five made remarks with 20 open codes to inform this axial code. Four participants referred to the necessity of open ended questions. P2 stated, "I think you need to know that pedagogically, that there's not one right answer, right? Like you need to know that students can come at it from many diff-, different directions." Meanwhile, two participants referred to the importance of aligning the assignment with the progress of the course curriculum, so that students could put the assignment in context. P3 stated, "I think by pairing that up properly, at least the students have some comfort in the area that when you give them the scenario or problem, then they feel semiequipped to tackle the problem." Adequate time for planning and knowledge about modeling and scaffolding learning for students were mentioned by one participant each. Finally, P8 stated that only general pedagogical skills were needed for successful implementation. They declared, "The pedagogical knowledge? Only what I had in terms of teaching in general—there was nothing specific to implementation of the PBLs." Interestingly, none of the participants mentioned metacognition when asked about necessary knowledge, although three participants discussed metacognition explicitly when describing their implementation of the QEP.

Based upon participants' experiences, the axial code, *necessary knowledge,* captured what instructors perceived that they needed for successful implementation of the QEP. Of the five topics listed, interestingly, three were listed by only one participant, while one topic was listed by four of the five participants. Most of the participants agreed that successful implementation required awareness that the open ended questions could elicit a variety of answers and approaches.

Scoring. Each instructor was responsible for scoring their own students' performance on the PBL assignments, but as training was inadequate, there was variation in how instructors approached scoring. All 10 participants made remarks of 39 open codes informing this axial code. Six participants described the rubric criteria as open to interpretation, with P11 referring to the criteria as "wishy-washy" and P7 and P8 both calling the criteria "subjective." Two participants stated that they doubted instructors scored student work in a manner that was consistent with the other instructors. One of the rubric criteria asked students to identify approaches to solving a problem, while the next criterion asks for solutions to the problem. Three participants stated that they themselves did not know the difference between the two criteria, while a third stated that they did not believe that students knew the difference. When those who did differentiate were asked how they approached the two questions, three participants stated that the difference between them was that the solutions question asked for more detail about the answer to the approaches question. For example, P7 described their scoring method as, "I would…

be looking for how many of those things did they list and that … goes with 2 [approaches] and then what's the depth of the answer they're giving me for each one, that is number 3 [solutions]." Three other participants stated that the approaches question asks students what they would do, while the solutions question asks how those stated approaches address the question. P3 explained, "So if they say like, 'we're gonna stop transmission', that's the solution. But if they tell me the steps for how they would go about stopping transmission, that's where those approaches are coming in." P4 also perceived an issue with using the rubric in lower level chemistry classes where students are learning very structured procedures, stating "if I gave problems that had multiple approaches and multiple solutions in general chemistry, I would have 0% participation. I mean they, they honestly it would (mimes head exploding) it's too much." In short, there is inconsistency in how the instructors understand the rubric criteria, an issue that may have its roots in the lack of training in using the rubric.

Another source of inconsistency which could also connect with rubric training is how instructors weigh student responses. Community college students were expected to achieve scores of one or two on a four-point scale, with a score of four being equivalent to what is expected of a senior at a four-year university. Five participants stated that student responses that did not meet the benchmark of two were mainly responses that failed to completely answer the question that was posed. For example, P5 stated,

> So you need to actually propose multiple solutions and then tell me, um, I think I had like pros and cons, too. Like tell me the pros and the cons for each and then actually at least attempt to hit on those topics, like obviously they're not always

> going to be, you know (air quotes) quote unquote good at doing that and that's fine. Um, but just an attempt made at doing that would get them a 2.

Two participants also described what sort of student response would surpass the expected benchmark. P3 described the difference between meeting the benchmark and exceeding the benchmark with,

> when my students just say, "we'll just clean the daycare and close it," versus "OK, well, if we close the daycare to try to send all the kids home and kind of prevent, um, transmission. From there, we also need to clean all the toys, make sure there's a thorough, uh, bleach solution used. Um, any kids with certain XYZ symptoms will be sent home and they're quarantined for X amount of time."

However, two other participants stated that as long as an attempt at a complete answer was made, full credit was given. So, there is some variation in how the scaling of student scores was approached by different instructors. Based on the participants' reported experiences, the axial code, *scoring*, captured the variation in how different instructors interpreted the different criteria and weighting of the rubric, leading to variation and inconsistency in how students work was assessed.

Summary. Interview responses confirmed instructors did not feel adequately trained to create PBLs or to score them according to the VALUE rubric, which may have led to variation in how instructors approached assessing student work. Mandatory, science-specific training offered prior to implementation of the QEP would have been valued by instructors, leading to increased confidence in designing PBLs and in scoring them in a consistent manner with the VALUE rubric.

Thematic Alignment to RQ 1: This theme informs the research question by examining instructors' perceptions of their ability to initially implement the strategic plan as intended by designing and scoring assignments to assess students' metacognitive and problem solving skills. The theme specifically was informed by the effect of the rapid rollout of the plan, which falls under the strategic-procedural critical components of the FOI framework. It was also informed by ineffective or absent training, instructors' comfort with familiar materials and methodologies, and perceived necessary knowledge for implementation, all of which fall under structural-educative critical components of the FOI framework. Finally, this theme was informed by variations in instructors' varied approaches to scoring student responses on the QEP assignments, which falls under the instructional-student engagement critical components of the FOI framework.

Theme 3: Lack of Direction in Implementing

Instructors valued the goals of the QEP, and used their personal judgement and experience to use and modify materials and assignments to benefit student learning, often illustrated by the variation of implementation between instructors. However, according to the data analysis, instructors felt a lack of direction and support in implementation of the QEP. All 10 participants commented on their experience with implementing and adapting assignments in the classroom. Eight axial codes informed this theme— *consistency and flaws* in the implementation, an *incompatible rubric* that did not fit the plan's goals, *assignment-rubric alignment* to ensure student learning, *assignment implementation*: both the format of assignments and guidance given to students, *adapting assignments* for increased learning, perceived *feedback use* by students, *benefits* of the QEP, and *poor FOI of the QEP*.

Consistency and Flaws. Of 10 participants, six provided remarks, totaling 26 open codes, which informed this axial code. Three participants referred to flaws in terms of inconsistency in how different instructors scored assignments, and two referred to whether the data were useful due to this inconsistency. However, participants still worked to ensure they provided their best efforts. For example, P10 stated, "If I'm gonna introduce something in the classroom, eh, I don't want it to be trash, right? I mean, even though I don't think that data has value, I have to present something that meets a standard…otherwise I don't feel good about it." One participant also cited the format of the assignment delivery as a potential source of inconsistency. They said, "If your PBL is written to be an individually done assignment, but you're giving it to groups, I think that definitely makes it messy." They further stated,

> if in one class, that same PBL is being used for group work, but a different class, it's being used for individual students, um, that obviously is going to adjust scoring when it comes back to the rubric and then causes, you know, we kind of talked about the infidelity in how this rubric is actually being scored across classes.

Consistency, or lack thereof, has a large effect on the data that were collected.

Three participants described improvements in the available PBLs, although two of these participants stated their quality is still flawed. For example, P3 stated, "we have them made, but in my opinion, I don't feel that they're the most robust, best things we could produce." P5 stated, "

> I felt good with what I was doing in my face to face class. I was very much at a loss for how to do it online and make it meaningful so, I- that is why it took me so long to actually get it in my classes and then I still didn't love it. I still have a few questions that are kind of related.

So, despite 5 years of iterations of these assignments, instructors still perceived issues with smooth design and implementation. Based upon the participants' experiences, the axial code, *consistency and flaws*, captured the essential elements in addressing the challenge of ensuring that the QEP is operating as intended with instructors implementing it consistently between and within their classes.

Incompatible Rubric. The QEP required the use of the Problem Solving VALUE rubric to assess student work, but the rubric was not entirely compatible with the class structures and materials in use. All 10 participants provided remarks, totaling 25 open codes, to inform this axial code. Five participants referred to the rubric just being a poor fit for the desired outcomes, and four participants cited the reasoning as it being designed for use by all departments of the college. P8 stated, "The questions were designed to be used for all disciplines (History, English, Math, Bio, etc.), meaning the questions were so vague as to be useless." P4 noted that meetings often "devolved into a (circular motions with hands) discussion about why…the rubric doesn't fit well with … the various activities (laughing) and so… they really did try. I just think it worked better with certain … subjects than others." Two participants stated that the rubric was straightforward and fine for its intended purpose, but both participants also stated that a more science-specific rubric would have been superior, and one stated that in adapting assignments to fit the rubric, they felt they were "shoehorning something in, um, because it's very difficult, looking at the rubric." With the imperfect fit, one participant referring to it as "clunky", seven participants reported feeling as though they were forcing the rubric to work in their classes. P3 stated, "In a way that it was phrased to where some aspects of it fit, and then others we kind of feel like, I personally feel like I'm forcing a grading of that with some of these things." P4 also stated, "I asked specifically if that POGIL would fit and they said yes, but the rubric didn't fit." Overall, participants perceived the rubric to be partially or entirely incompatible with their established teaching methods and materials.

Five participants stated that the wording the rubric used was confusing, including one of the participants who previously stated that the rubric was straightforward. P2 stated, "The way that it was worded, um, it talked about like ethical, cultural, logical, whatever solutions. That was really confusing for my students," and P11 agreed with, "I think the steps were hard, at least how I understood it, were very hard for the students to interpret what we wanted in each step." Added to this confusion is the aforementioned issue with instructors stating they did not know what the difference was between the criteria asking for approaches and solutions. The confusing wording of the rubric contributes to participants perceiving it as incompatible with their classes and assignment methods.

Based upon the participants' experiences, the axial code, *incompatible rubric,* captured the essential elements in addressing that the rubric is designed to fit so many different disciplines as to be incompatible for the sciences. Further, the phrasing of the rubric was perceived to be confusing to both students and instructors.

Assignment Rubric Alignment. The PBL assignments created by science instructors were designed to be scored according to a common VALUE rubric, so the questions on the assignments were aligned to the criteria of the rubric. However, instructors tended to independently score assignments for classes and data collection with different levels of alignment. All 10 participants made remarks, totaling 25 open codes, to inform this axial code. Eight participants reported that they "double scored" the assignment, assigning one score to contribute to the student's grade for the class and assigning a separate score per the rubric for the QEP. P5 explained the rationale as,

> because we were expecting them to be like ones and twos. But you mark them ones and twos and they're going to feel very bad about themselves, but that's what we were expecting. So it's kind of this, you mark it one way in the class and then you mark it a different way for the official recording.

P7 agreed.

> I felt like a student could give really great answers, but was gonna score low on the rubric the way it was set up. Um, so I didn't, I didn't want the A student going, "why did I get a two out of five?" and (raises both hands) freaking out about that. But I also wanted the scores on the rubric to be consistent for what the rubric was saying, so I always kept those two scores separate from each other.

Of these eight participants who provided two grades of the assignments, four stated that they never let the students see the rubric, while the other four provided the grade for just the class assignment, generally graded only for completeness rather than accuracy and depth, and gave students access to the rubric. Only one participant, P11, described the class grades in terms of the rubric weighting. They stated, “And then I said, if you want to see where I got your numbers, look at the rubric, which is, you know, cause I did go 1234, 01234, as far as grading them, um, each step.” However, most instructors refrained from adhering to the rubric weighting for the reason cited by P5 and P7. Based upon the participants’ experiences, the axial code, *assignment rubric alignment,* captured the essential elements in addressing the challenge of scoring the QEP assignments per the rubric criteria and weighting without alarming students with low assignment scores.

Assignment Implementation. All 10 participants provided remarks, totaling 53 open codes, which informed this axial code. Instructors varied in the formats they chose for their QEP assignments. Three instructors formatted their QEP assignment as a worksheet with a scenario and six questions that align to the criteria of the rubric. Another instructor ultimately chose a similar format, but on the final exam rather than a worksheet. They stated,

> When COVID hit, the labs all had to get a lot more straightforward and so giving them something where they were going to get lost in the weeds and, “I don’t know how many solutions I’m supposed to propose.” I was like, this is dumb. We’re not doing this. So, that’s when the PBL moved to the final exam.

Two participants reported that they did the assignment as a lab exercise. Four other participants did the assignments as discussions, either online or in person. One instructor reported sometimes doing the assignments as labs and sometimes as worksheets. Two participants had students work in groups on assignments early in the semester, then work individually on the last assignment of the semester, which was the iteration of the assignment on which the QEP data was collected. So, the format in which the assignments were implemented encompassed the spectrum between, and sometimes within, classes taught by various instructors.

Frequency of PBL assignments to fulfil the QEP requirements also varied among instructors. Six instructors reported doing PBL assignments three times, with earlier assignments serving as practice for the final assignment. P12 stated,

> I think everybody … had to do…three of them … throughout the semester …. they had some practice doing them, um, practice looking at the patterns, and … how to answer those types of questions and stuff, and … then the last one was the one that was actually utilized for the…QEP data.

Two instructors reported doing only one of the PBL assignments per semester, although a third included the assignment on the final exam with informal exposure to the PBL-type questions on prior assignments and tests. The remaining instructor did not specify how often students did the assignments, but noted that they were a normal part of the regular discussion board.

The guidance given to students on completing the assignments also varied. Only three participants actually discussed this topic, but their approaches were distinctly different from one another Whereas P2 offered no initial guidance to students, preferring to see where students' baseline of capabilities lay, P12 showed students what was expected by modeling. P12 stated, "I would literally model how I would answer it and like, what I would be thinking and why, you know, what the question is actually asking, so what the rubric actually wants." Two instructors used students as peer guides for work. P4 described the benefit of having students help guide each other by noting, "it actually got to where they were helping each other learn how to solve the problems, which is actually what I want because students speak student language and, um, and that's better for them than, um, than professor language." P2, despite giving no guidance for the first assignment, used student work to guide later assignments. They described, "I also would …reach out to students who did a…really excellent job and ask if they would be…willing to, um, annotate theirs, and then to, like, provide a video to the class on, like, what their thinking approach was." After some time, P2 started sharing student work from one semester to the next, stating, "I would have… a really good one from a previous class and I would just ask that student, '…Do you mind if I use your think aloud with… my next semesters class, … to let them know your…process?'" Just among the three instructors who discussed the topic, the guidance given to students varied highly. Based upon the participants' experiences, the axial code, *assignment implementation*, captured the essential elements in addressing the variation present in how, as well as how often, different instructors implemented the QEP assignments.

Adapting Assignments. Over the 5 years of the QEP, the assignments were modified to better enable achievement of desired student learning goals. Of the 10 participants, eight provided remarks, totaling 25 open codes, that informed this axial code. Four participants adapted assignments over time to clarify wording. For example, P5 noted, "I had to adapt a lot, um, the rubric to make it fit, which to the, you know, so the students would understand what I was asking." Two participants adapted assignments they found to be compatible with the rubric or with a delivery format, like a discussion board. For example, P3 explained,

> You know, in ours, our VALUE rubric it says, "can they identify the problem, uh, or can they form a problem statement?" Again, this was another thing that was not actually in Cornell University's assignments. They never said, "OK, what's the problem here?", ah, to see: can the students pick out, um, reading comprehension, what the problem is? So that was, that was another thing that had to be put in there.

Two other participants stated that the scenarios in their assignments were initially too broad, so they made their assignments "more specific and more narrative" as P10 described their adaptations. Two participants reported that they did not adapt anything, and one of them explained, "there was no flexibility in the questions that were used." Of the eight instructors who adapted assignments, all reported using student performance to at least partially guide the modifications to better achieve the goal of improved student problem solving and metacognition. Based upon the participants' experiences, the axial code, *adapting assignments*, captured the essential elements of what instructors perceived to be the necessary adaptations to assignments that would enable achieving the goal of improved student learning.

Feedback Use. Instructors provided feedback to students on each assignment with the expectation that students would use that feedback to guide later assignment completion in addition to assignment instructions provided by their instructor. Of the 10 participants, five provided remarks, totaling 17 open codes, which informed this axial code. All five participants stated that students did not have the opportunity to resubmit assignments; it was expected that feedback would be just applied to the next assignment. Feedback was often online, extensive, and timely. For example, P2 stated,

> I definitely see them applying that to the next PBL assignment, so it's really important with that first PBL that I grade them quickly, so that way I can leave those comments in the, um, I have them do it through, um, Google assignments so I can leave all sorts of comment boxes, lots of highlighting.

Two instructors reported giving collective feedback to the entire class after the first assignment. For example, P2 stated that after the first assignment, " I did my follow up like just in time teaching afterwards .,,'Alright, y'all. Like, we're unpacking what this is about…This is part of our… accreditation process and we want to make sure that we are following the guidelines'." However, not every instructor saw evidence in later student performance of the students' using the feedback. P8 stated, "I gave feedback on each student/group response (which was painful and a ridiculous amount of work) but a lot of students disregard that type of feedback." Most participants who discussed student use of feedback did report seeing student providing more complete answers over time, though.

Based upon the participants' experiences, the axial code, *feedback use*, captured the essential elements in instructors' using feedback on one assignment to guide student performance on later assignments. Aside from two instructors who gave collective feedback for the first assignment to the entire class, the methods of providing feedback and expectations about its use were consistent among the instructors.

Benefits. Despite problems that instructors perceived with the implementation of the QEP, instructors felt that its goals were valuable and that its implementation improved over time. Of 10 participants, seven provided remarks, totaling 16 open codes, which informed this axial code. All seven participants reported that the goals and intent of the QEP, increasing student problem solving and metacognitive skills, had merit. For example, P4 stated, “Teaching them how to think about the problems that they’re given, …that’s the mindset, and honestly that’s, … for in chemistry as a discipline, that’s actually not a leap at all…In other words, we’re already inclined in that direction.” In addition to finding the overall goal beneficial, P2 also described an extra benefit with “I think it’s valuable for people who might not have, for instructors who might not have a strong understanding of how people learn. It’s probably really useful for them to do something like this.” Two instructors viewed the improved quality of PBL assignments over time and sharing assignments among instructors as benefits. P12 stated, “As for sciences, we had it organized pretty well… and everybody … did a good job of sharing ideas, …. it’s hard to come up with them a lot of times … that part can be the tough part.” Primarily, however, the consensus of instructors’ perceptions of beneficial components of the QEP was limited to the goals. Based upon the participants’ experiences, the axial code, *benefits*, captured the essential elements in addressing which aspects of the QEP were perceived by participants in a positive light.

Poor FOI of the QEP. Despite thinking highly of the QEP’s goals, instructors perceived the implementation of the QEP in an overall negative light. Of the 10 participants, seven made remarks, totaling 50 open codes, which informed this axial code.

Six participants stated that they perceived a disconnect between what was intended and how it was implemented. For example, P6 stated, “It gets, lots of things get lost in the translation. Between a good plan and how we implement it.” The implementation method was seen as a weak point, with five participants referring to wishing for a better delivery method. P8 summed their perception up with, “The application was terrible.” Two participants expressed concern that the collected data would not be useful due to instructors assigning different problems with different formats and assessing them different ways. P10 stated,” I think we recognized it for ... its lack of value. As scientists, you have hard data, right? You look at data and it’s not… subjective … Whereas what we’re having here, … it was all over the place.” The disconnect between the plan and the implementation, the quality of the implementation, and doubts about the utility of the collected data contributed to negative perceptions by participants.

Adding another problem, three participants also expressed concern with faculty buy-in of the QEP and their capacity to add this activity to their workloads. P5 noted, “As [fellow QEP committee member] and I were the face of the QEP, we definitely trauma bonded over how much everyone hated it, but (throws hands in air) there was nothing we could do at that point.(chuckling).” P5 later stated,

> when you were asking them to make this change, kind of a significant change to an assignment that they’re doing their class, it’s, it’s just this barrier where you’re like I I can’t (strained chuckling) I don’t want to. I can’t do this. This isn’t something I can do on the fly like, you know.

In addition to the perceived problems with the implementation of the QEP, five participants described the challenge of implementing it on top of multiple other initiatives that the college was implementing at the same time. For example, P5 stated, “With that, [study site] took on … a whole bunch more initiatives … It just felt like, I can’t focus on all of these things; I’m going to have to pick. And it just wasn’t a priority.” Overall, participants expressed difficulty with implementation outside of the parameters of the QEP itself, as they were perceived to be unwilling or unavailable to fully implement the QEP as intended. Based upon the participants’ experiences, the axial code, *poor FOI of the QEP*, captured the essential elements in participants’ negative views of the overall implementation of the QEP.

Summary. Interview responses confirm that instructors used their own judgement and student performance to use and modify materials and assignments to benefit students, but that they felt a lack of direction and support in implementation. Although participants expressed positive perceptions of the goals of the QEP, they perceived the overall implementation negatively.

Thematic Alignment to RQ 1: This theme informs the research question by addressing how instructors use their personal judgement to use and modify materials and assignments to implement the QEP in a manner that they perceive will achieve the worthy goal of better student metacognition and problem solving, despite perceiving that the QEP’s intended design is flawed. This theme was informed by perceived problems with consistency and flaws in the design and use of the PBL assignments and their scoring, and an incompatible rubric in use, both of which fall under the structural-procedural critical components of the FOI framework. It was also informed by assignment-rubric alignment in classroom use and assignment implementation methodologies, both of which fall under the instructional-pedagogical critical components of the FOI framework. This theme was also informed by instructors' adapting assignments to improve student outcomes and expected student use of feedback, both of which fall under instructional-student engagement critical components of the FOI framework. Finally, this theme was informed by participants' perceptions of both beneficial goals and flawed execution of the overall QEP's implementation.

Project Deliverable as an Outcome of Results

I studied the data from participants' interviews, as well as my own reflective journal. Three themes emerged to answer the research question:

- Theme 1: Although they worked to elicit metacognition from students, instructors reported little improvement in student metacognition**.**
- Theme 2: Instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics.
- Theme 3: Although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing.

The intended project deliverable is a white paper on implementing a strategic plan according to Senge et al. (2012) five disciplines learning organization approach.

Summary

In this section, I described this basic qualitative study using interviews to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. I used purposeful sampling to identify 10 participants from the college's science faculty. I conducted semistructured interviews by using the Zoom teleconference tool. I analyzed transcribed interview data using a priori, open, axial, and thematic coding. I found three themes in the data. In Section 3, I detailed the intended project deliverable of a white paper on implementing an effective strategic plan using Senge et al. (2012) five disciplines learning organization approach.

Section 3: The Project

Introduction

The project developed for this research study was a white paper, specifically a position paper, providing recommendations for implementing future strategic plans at the study site (see Appendix A). Senge et al. (2012) stated that learning organizations can be improved by making sure that stakeholders in the organization, such as administrators, faculty, and members of the outside community, can think and act together. The purpose of this basic qualitative study was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. The study resulted in three overarching themes.

The first theme indicated that although instructors reported working to elicit metacognition from students, they reported little improvement in student metacognition. The second theme was that instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics. Finally, the third theme was that although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing. This study's findings can be used to guide the implementation of future strategic plans, whether for the same goal of improved critical thinking and problem solving in students or in the pursuit of new objectives. The purpose of this white paper was to ensure that these future strategic plans will align the positions of all stakeholders in pursuing the objectives of the plans and provide guidance for effective, high-fidelity implementation of said plans.

Project Goals

Based upon the thematic analysis and findings of my research, this project has three specific goals. The overarching goal of this project is to ensure that the study site's next strategic plan is effective in achieving its objectives, with the full investment of the administration and faculty in the plan's success. However, each of the themes that emerged from my research led to a specific, actionable goal that makes reaching the overall goal possible.

The first specific goal of improving student metacognition is a goal that remains unfulfilled but still desired. To achieve this goal, instructors must increase their own grasp of instructing metacognition. They will be encouraged to both engage in personal mastery of their efficacy to teach metacognition, both from their own learning and from team learning via professional development from one another. Several study participants reported prior interest in and study of metacognition, so there are already people who can help begin the process.

The second goal is to create mandatory professional development opportunities to train the faculty in using the VALUE rubric and constructing science assignments designed to align with the VALUE rubric. Although participants reported varying approaches to PBL assignment design and scoring, McConnell and Rhodes (2017) stated that teachers using VALUE rubrics to assess student work have high inter-rater reliability when those teachers have undergone training. Several participants stated concerns regarding how useful data collected over the strategic plan could be when some instructors assessed groups, while others assessed individuals and instructors reported varied interpretations of rubric criteria. With training, instructors can be confident that everyone is measuring the same criteria and collecting meaningful data through their individual PBL assignments.

The third goal is to ensure that even after the strategic plan is initially implemented, ongoing support is provided to instructors. Departments should regularly meet to discuss the implementation, address emerging concerns, and check any collected data to determine if the plan produces desired learning outcomes. A systems thinking perspective should be adopted to consider factors external to the strategic plan that may influence or be influenced by the plan’s design or implementation. A large focus for this goal is that ongoing communication and support can enable the plan to be adjusted as needed, or to ensure that anyone who would benefit from additional training can access it.

The deliverable white paper is intended for use by the study site’s administration and its Center for Teaching and Learning in designing and implementing future strategic plans. In the white paper, I describe the format of the strategic plan that was the subject of this study, namely the designing and scoring of assignments with a common rubric, done by individual faculty members in varied departments. I also describe components of the existing strategic plan that were effective, such as surveying the faculty and administration to identify the problem the plan should address. I also describe the problematic components of the plan, such as a lack of professional development to ensure all faculty were implementing the plan consistently. Evidence from both this qualitative study and the literature are included to support recommendations for designing and implementing an effective strategic plan.

After summarizing the current plan and the results of this study, I then make recommendations for creating future strategic plans. I describe how to improve stakeholder buy-in at both the administrative and faculty level. Usunier and Squires (2019) stated that academic deans are ultimately the ones who design the educational initiatives, lead the faculty in the professional development processes, and keep the focus on the overarching goals of the plans. As such, the position paper includes recommendations of how the administration can use learning to be effective in leading and empowering the faculty to implement a strategic plan with high fidelity and high success. Recommendations are also made for designing professional development opportunities for faculty, so that a shared vision of the strategic plan's goals and methodologies is possible, and faculty can perceive themselves as not only invested in the plan, but also capable of implementing it.

Rationale

Addressing the themes that emerged from the research via a white paper is an appropriate approach. A white paper is defined as a research-based document that presents a description of a topic or problem that provides the reader with a sufficient understanding of an issue to enable them to make a decision (UMass Lowell, 2023). Graham (2024) listed proposing solutions to an ongoing problem as a common use for a white paper. White papers have been used for making recommendations to address challenges in enabling leadership to increase employee motivation in organizations; these recommendations could also be useful to the study site of this study (Abraham et al., 2023). More relevantly, educational organizations also often use white papers to make recommendations to address identified problems (Bamford et al., 2022; Baylor University, n.d.; Olson et al., 2023; Robinson & Candal, 2023). Indeed, Bamford et al. (2022) and Baylor University resorted to white papers to make recommendations for strategic plans to address identified problems; here, I recommend doing the same to address the themes revealed by the study.

The goals outlined in the white paper can be addressed by creating recommendations aligned with Senge et al.'s five disciplines. The way to address this problem needs to have a broader focus than just offering better professional development or more effective leadership activity. However, the white paper's recommendations include both of these actions. Alignment and effort from multiple levels of people implementing the plan are needed to apply leverage to produce large results from a relatively small effort (Senge et al., 2012). Effective communication between administration and faculty, specific and mandatory training, and ongoing monitoring of the progress of the strategic plan via regular communication among implementers are key to the plan's success. These recommendations are described in the white paper to ensure that all of them can be smoothly implemented, addressing the themes found in this qualitative study.

The first specific goal outlined in this white paper is improving student metacognition. To achieve this goal, instructors must increase their own grasp of instructing metacognition. By improving communication and training, faculty and administration's assumptions and mental models regarding the strategic plan can be made explicit and discussed. As the study revealed inconsistency in instructors' perceptions of whether metacognition instruction should even be the responsibility of the science faculty, effective dialogue to reveal mental models and promote a shared vision ensures that implementers are in alignment as to what their role is in promoting metacognition in students. Implementers can both perceive a personal mastery and engage in team learning of how to best implement metacognitive instruction and can be invested in the strategic plan's success in bridging the gap between where student metacognition currently is and where the college wants it to be. Better team learning via effective dialogue and training can also ensure that all implementing faculty understand how to elicit metacognition in students and recognize and measure success in that endeavor, linking the first goal to the second goal of the white paper.

The second goal is to create mandatory professional development opportunities to train the faculty in using the VALUE rubric and constructing science assignments designed to align with the VALUE rubric. Again, improved communication and training, both initial and ongoing, will increase implementers' personal mastery of how to implement the plan but will also ensure that a shared vision and team learning factor into the implementation. In other words, implementers will be in alignment about their understanding of what implementing the plan entails and what its success looks like. It is also crucial that all implementers perceive that they have ownership of the plan, rather than some perceiving that the strategic plan is something that was assigned to them by leadership for no clearly defined purpose. Effective training, which is specific to how the plan will be implemented in the science classroom, will be effective in guiding faculty in their design of assignments and use of the rubric in a manner that is consistent among the implementing faculty. Alignment in what types of assignments are being assigned and how the rubric is being interpreted will ensure that all faculty are measuring students' metacognition performance in a consistent manner, resulting in data that are comparable from class to class and from year to year. The results of the strategic plan's data then become more meaningful and useful to determine the plan's success or need for modification. To arrive at the ability to collect these useful data, however, it is crucial that everyone is trained via professional developments that are directly useful (i.e., mandatory and science-specific).

The third goal is to ensure that even after the strategic plan is initially implemented, ongoing support is provided to instructors to ensure that emerging concerns are being addressed and that the implementation of the strategic plan results in desired learning outcomes. Senge et al.'s (2012) systems thinking perspective is the major component. Improved communication and training provide a strong start, but ongoing communication among departments and with administration is crucial for ensuring that the strategic plan produces desired learning outcomes in context rather than serving as something extraneous to the curriculum. Systems thinking and ongoing communication will ensure that factors that influence the strategic plan are taken into account and that instructors' concerns are heard and addressed. Ongoing, robust communication and support will also make it possible to make small, effective alterations to the plan as needed to ultimately achieve the goals of the plan. Ensuring that instructors are implementing the plan in the same manner should happen on a regular, ongoing basis, and further training should be available as needed to ensure faculty are confident in their capacity to implement the plan as designed. Evaluation data collected by survey, document analysis, and other flexible methods that provide rapid feedback should be used to inform and guide the ongoing support of implementers in an iterative process (Chen, 2015; Sweet, 2024).

The key to the strategic plan's success, as laid out in this white paper, is that it requires investment from all implementers. Neither the administration nor the faculty can implement effective improvements in a strategic plan without the other because both parties are components of a system, affecting and being affected by one another in a causal loop (Senge, 2012). The whole system must be involved in improving the existing strategic plan implementation, and research-based recommendations can be provided in a white paper to ensure that the improvements are effective in addressing the problems revealed by the three themes of this qualitative study.

Review of the Literature

Genre Related to Project

A white paper is a research-based document that is frequently used to provide a recommended solution to an identified problem (Graham, 2024). The white paper provides a description of the problem experienced by the organization, and then several actionable recommendations that the organization can implement (Graham, 2024). Key to a white paper being effective is that it be written in a manner tailored to its audience; information should be directly relevant to the organization and the specific reader (Graham, 2024; Sweet, 2024). In the case of this white paper, the primary desired audience is the administration and the staff of the Center for Teaching and Learning, as they will likely be taking leadership roles in designing and managing future strategic plans.

One format of a white paper includes numbered lists of problems and solutions. Graham (2024) recommended numbered lists of up to nine items with a preference for odd numbers, stating that even numbers of items seem too “rounded off” to the reader and that lists in the high teens seems like excessive work for the reader (Graham, 2024, paragraph 6). Abraham et al. (2023) and Robinson and Candal (2023) made three recommendations to address the problems identified by their white papers on increasing a leadership pipeline in business and a STEM teacher shortage, respectively. Bamford et al. (2022) followed a similar formula by made five recommendations on creating a new strategic plan for a school system. In contrast, Olson et al. (2023) made 17 recommendations to address problems with the Every Student Succeeds Act (ESSA) not meeting learning objectives in private and religious schools, including recommendations for Congressional actions. For this white paper, there are three recommendations to address the lingering problems in the existing strategic plan as revealed by three themes of the qualitative study.

The findings of the study indicated that the faculty agreed that the strategic plan was a worthwhile endeavor, but that the implementation of the plan was flawed. A white paper can be used to make recommendations to both leadership and implementers on how to implement a strategic plan so that its objectives can be reached. In short, a white paper can be used to apply lessons learned from this study to improve both faculty implementation and student learning results from the existing strategic plan. White papers can be used to make recommendations to businesses, such as Abraham et al.'s (2023) paper, or to schools and school systems, such as Robinson and Candal's (2023) or Olson et al.'s (2023) papers. Relevant to the white paper informed by this study, both the Southern Association of Independent Schools and Baylor University provided examples online of using a white paper to delineate the parameters of a strategic plan for a school (Bamford et al., 2022; Baylor University, n.d.), in parallel to this white paper's intent. Mofolo and Novulkela (2024), in a study of a performance management system's support of a strategic plan, also described how the strategic plans of South Africa's higher education institutions, including the latest one for 2020-2030, are based on recommendations from a white paper published in 1997. A white paper is a viable option for the project deliverable to address the problems that appeared in the three themes of this study.

In this white paper, my recommendations for the design and implementation of a strategic plan are guided by Senge et al.'s (2012) five disciplines learning organization perspective. The findings of the study were the following three themes. Theme 1 was that although they worked to elicit metacognition from students, instructors reported little improvement in student metacognition. Theme 2 was that instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics. Theme 3 was that although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing.

The results indicated that no component of the FOI framework was fulfilled, resulting in an ineffective strategic plan which did not provide the desired outcomes.

Addressing Lingering Issues with the Existing Strategic Plan

Inherent in the themes, faculty reported perceiving they had no input for the design of the implementation of the strategic plan, unable to leverage the knowledge of relevant pedagogy they could have brought to the plan, as well as perceiving themselves as underprepared for the implementation, and that there was no feedback from leaders about the plan's outcomes. Addressing the overall problem requires a broad approach that took into consideration the roles of the administration and the faculty, as well as the perceptions of the faculty regarding the study's awkward design and practice. To address all of the problems in this system of design and implementation, a white paper providing recommendations for creating and implementing future strategic plans, according to methods that considered the entire system of the college and the personal and collective capacity of the people, was the appropriate choice.

Benefit of Using the Five Disciplines for Implementing a Strategic Plan

Schneper (2020) noted that liberal arts colleges can benefit from applying the five disciplines with modifications to suit the unique needs of the college, although Kuźmicz (2015) and Springmier et al. (2024) noted that it was important to monitor the implementation disciplines via systems thinking for emergent problems. Springmier et al. (2024) went into further detail by describing the importance of accounting for the possibility that while an action might have a desired effect in one area, while simultaneously having a potentially undesirable effect in another area. However, Senge pointed out, with von Anelm in 2019 and again in 2020, that emergent outcomes can also be beneficial, albeit unpredictable from the perspective of the component parts of the change, such as collective intelligence greater than the sum of the group members' individual intelligence. As long ago as 2011, Khasawneh stated that university faculty had improved teaching efficacy after attending professional development focused on the five disciplines, while more recently, Williamson et al. (2024) noted that six universities had organizational learning improvements after implementing a professional competency framework modeled on the five disciplines. At the administrative level, Usunier and Squires (2019) noted the role of the academic dean in ensuring that five discipline learning organization initiatives are well designed and well implemented.

How the Search Was Conducted

I utilized the Walden University Library to locate peer-reviewed journal articles for this literature review. The search was conducted until data saturation was reached, and included sources from the following databases: EBSCO, ERIC, Academic Source Complete, Emerald Insight, Taylor & Francis Online, Education Source, and Directory of Open Access Journals. I also used Google Scholar and ResearchGate. The search terms used included the following, both used alone and in combinations: *five disciplines, Senge, learning organizations, schools that learn, education, systems thinking, learning universities, strategic plan*, mental models, team learning, personal mastery, white paper,* and *position paper* .

Five Disciplines Learning Organizations

I applied Senge et al.'s (2012) disciplines learning organization perspective which includes five parts: personal mastery, shared vision, mental models, team learning, and systems thinking. According to Senge, individuals implementing a strategic plan take into consideration the interdependent components of the plan and how they may change and effect one another; as a result, those individuals can effectively create leverage to create productive, lasting improvements to the strategic plan (Senge et al., 2012). The five disciplines learning organizations perspective is intended to enable educators to learn and grow as well as create teaching tools and methods that address the varied components of the educational system (Senge et al., 2012). The five disciplines involved in the perspective are: (a) personal mastery, or the practices that support people in simultaneously maintaining both their goals and an awareness of current reality; (b) shared vision, or the uniting of people around a common goal; (c) mental models, or awareness of assumptions and personal perceptions; (d) team learning, or group interaction that creates results greater than the capacity of individual members; and (e) systems thinking, or the understanding of how individual components of a system influence one another (Senge et al., 2012). Leveraging all five disciplines enables a learning organization to take small actions but reap large benefits.

Leveraging Personal Mastery

Senge et al. (2012) defined personal mastery as maintaining personal goals while also maintaining perspective of current reality. Ensuring that personal mastery is being leveraged requires a great deal of reflection and communication (Senge et al., 2020;

Springmier et al., 2024). Personal mastery factors into all three of the specific goals listed in the white paper. In terms of the first goal, instructors must seek personal mastery to understand what metacognition instruction and learning are and how to teach them. It is crucial that instructors feel a personal sense of investment in this endeavor. Reese (2020) stated that personal mastery is the most cited of the five disciplines, but is sometimes neglected because of insufficient reflection; it is important for each person to want to accomplish something that matters to them, but they must face their mental models and commit to the long, difficult process of connecting their goal with current reality. Robinson (2020) also noted that disproportionate personal mastery, to the exclusion of shared mental models or systems thinking can result in an unbalanced and dysfunctional organization, so instructors should engage in pursuing personal mastery, but also keep in perspective that they are not working alone.

In terms of the second goal, the personal mastery of the strategic plan's implementers will ensure that mandatory, science-specific professional development is effective, as the faculty will feel a personal investment in learning the development objectives. However, it is important to make sure the professional development, though mandatory, is not perceived as an imposition. An example is when school administrators require professional learning, particularly on teachers' own time or on subjects viewed as not personally relevant; as a result, teachers become resistant to the training (Ng, 2020; Sanchez et al., 2022). Cultivating a sense of personal mastery and investment among the faculty regarding the professional development will beget more buy-in and can help the development be more effective in achieving the goals of training the faculty in metacognition and in the strategic plan itself, the design and scoring of the PBL assignments via the VALUE rubric.

For the third goal, effective ongoing support, to be effective, the faculty needs to be involved in regular discussion and they should be personally invested in the outcomes of the discussion. Ideally, all communication, whether formal or informal, should happen among various teams who incorporate members from all stakeholder groups, and from all levels of authority; communication should also take into consideration external components, such as the social or cultural context, that influence and are influenced by the learning organization (Da'as & Ali, 2021; Rad & Bocoş, 2024; Roegman et al., 2021; Schneper, 2020; Senge, 2020; Senge & von Ameln, 2019; Usunier & Squires, 2019). Senge (2020) emphasized the importance of a commitment to practicing the five disciplines to make them self-sustaining; Reese (2020) stated that action is crucial to learning, and must be followed by reflection on whether the action produced the desired results. Ng (2020) and Springmier et al. (2024) referred to the use of regular meetings to revisit them and reinforce making the behaviors of a learning organization habitual, while Hutasuhut et al. (2021) and Ng (2020) described the need to integrate the five disciplines into daily work. Also, goals and progress towards them must constantly be evaluated to ensure that they remain appropriately prioritized, a method Matsumoto (2019) linked to Senge's double loop learning (Regenold & Murphy, 2020; Schneper, 2020, Springmier et al., 2024). Further, time must be allowed for changes to be implemented, sometimes in gradual stages, to allow for, the creation of shared vision, personal mastery, learning, and adjustment of beliefs (Reese, 2020; Schneper, 2020; Senge et al., 2020; Springmier et al., 2024). Key to keeping the ongoing support in action and making it effective is ensuring that each implementing faculty member has personal mastery of the strategic plan and feels invested in its success on an ongoing basis.

Leveraging Mental Models

Senge et al. (2012) defined mental models as the assumptions, both conscious and implicit, that influence the other disciplines of personal mastery, shared vision, team learning, and systems thinking. Mental models factor into all three of the specific goals listed in the white paper, but primarily for goals one and two. Each study participant has their own perceptions of metacognitive learning and their responsibility towards teaching it; some study participants had a mental model that it was not included in their role as a science instructor to teach metacognition. It is absolutely crucial to make explicit mental models and personal goals in a non-judgmental way, so that a shared vision as to what metacognition instruction and the strategic plan entail is even possible (Ng, 2020; Senge et al., 2020; Simanjuntak et al., 2023; Springmier et al., 2024). Ground rules regarding honest communication, recognition of others' contributions, respect and trust, and allowances for mistakes without judgement are necessary (Ng, 2020; Senge, 2020; Springmier et al., 2024). Also, Senge (2020) and Rebelo et al. (2020) stated that one needs to be in a state of relaxation, rather than defensiveness, to be able to innovate, such as with designing effective, science-specific PBL assignments. Senge et al. (2020) noted that generally, people focus on the system components they see most clearly, which can lead to arguments with others who have their own perspective on the system, and Ng (2020) stated that learning disabilities inherent in some mental models, such as blaming others when things go wrong, can destroy learning organizations, so respectful communication ensures that everyone's perspective is heard. In the case of the white paper's goals, making mental models explicit can ensure that all stakeholders are in alignment as to what metacognition instruction is, what implementing the strategic plan should look like, and what each individual's responsibility to the strategic plan's success is. In particular, making mental models explicit can be very useful for training, so that any assumptions instructors may have regarding what the assignments are supposed to be and what their objectives are may be recognized and put into alignment with one another, resulting in a shared vision of the strategic plan.

Leveraging Shared Vision

Senge et al. (2012) defined shared vision as bringing all stakeholders' priorities and goals into alignment with one another. Shared vision factors into all three of the specific goals listed in the white paper, but primarily for goals one and two. It is vital that everyone involved in the strategic plan is working in alignment towards the same goals and utilizing the same methods. Stakeholders should share a common idea of what metacognitive instruction is and how to elicit it from students, as well as what the PBL assignments should entail and how they should be scored. Effective professional development will contribute to that shared vision and ongoing support and ample communication will ensure that the vision remains consistent, rather than fracturing into multiple visions over time. The emergence of a shared vision co-created by all participants begets buy-in and enthusiasm from stakeholders (Matsumoto, 2019; Ng, 2020; Rad & Bocoş, 2024; Roegman et al., 2021; Springmier et al., 2024).

Leveraging Team Learning

The remaining two disciplines, team learning and systems thinking, are influenced by the prior three disciplines. Senge et al. (2012) defined team learning as practices intended to make team members think and act in alignment, although not thinking alike. Creating team learning enables team members to create a collective intelligence that is greater than that of the individual members. This process is done via dialogue, to ensure each individual is heard, and discussion, to determine the best actions for the organization; both forms of communication, without members becoming defensive, are needed for productive team learning (Rebelo et al., 2019). In this white paper, team learning factors into the first goal in terms of ensuring that everyone can learn what metacognitive learning is, what it entails, and how to elicit it from students. Some study participants reported they had familiarity with metacognition and can be a source of knowledge to other faculty members; people can learn with each other and from each other. Matsumoto (2019) and Springmier et al. (2024) described the benefits of collaboration in which each member acts as teacher and student to the other members, although Matsumoto mentioned that Japan has moved away from this level of collaboration in recent years and they recommended shifting back towards this team learning approach.

Team learning can serve the second and third goals by ensuring that people are learning with and from each other in the professional development opportunities in how to design and score the PBL assignments according to the VALUE rubric as well. The third goal, the ongoing support communications, can be met by checking on the progress of team learning and shared vision, and reinforce both as faculty and administration provide feedback to one another during the progress of the strategic plan's implementation. Feedback can be used to increase what is known about the ongoing implementation and make appropriate adjustments to the process, including supplementing any training as needed.

Ensuring that team learning is effective for everyone requires a certain level of caution, though. Jackson (2021) worried that, even more important than how learning happens, is what exactly is learned, whether it is beneficial or detrimental. Jackson further warned of superficial use of the disciplines or the possibility of groupthink appearing during dialogue and discussion. Further, it is generally assumed that team members hold equal power and decision-making power, which may not be the case at all (Springmier et al., 2024). A facilitator may be beneficial in ensuring that everyone is treated equitably (Rebelo et al., 2020). Senge (2020) stated that leaders must create a safe space for this collective team learning to happen. Changing a system requires often changing deeply ingrained thinking, habits, and mental models, and accounting for the shared vision and personal mastery goals of all of the people, although it does not require people to think unanimously (Matsumoto, 2019; Reese, 2020; Roegman et al., 2021). Often a system changes though the action of a few influential people, a critical mass which becomes larger over time as people join the vision (Reese, 2020). Indeed, Hassan et al. (2022) stated that the involved people are a major component leading to systems thinking's success. For this white paper's success, the existing faculty who understand metacognition can be the beginning of the critical mass that starts the team learning towards the shared vision.

Leveraging Systems Thinking

Systems thinking was defined as the ability to see a system as interconnected components that influence and are influenced by one another; systems must be viewed as a whole (Senge et al., 2012). Lasting change requires not only time, but a long-term view of the system. Short term fixes can always be done and can boost measured variables for a short period of time, but as cause and effect are often separated by time, higher leverage changes require a long-term view and foresight (Reese, 2020; Sanchez et al., 2022; Simanjuntak et al., 2023). Senge et al. (2020) cited the frequency with which organizations implement short-term improvements that eventually make the contributing problem worse. Also, creating a learning organization requires more than sharing best practices; it requires using feedback to improve the system based on positive and negative outcomes (Blonder & Rosenfeld, 2019; Reese, 2020; Roegman et al., 2021). This white paper focuses systems thinking primarily in the ongoing support of the third goal. By communicating on a regular basis among varied parties involved in the strategic plan, the efficacy of the plan can be frequently examined along with influence on the plan by other factors and the plan's influence on external factors. Further, systems thinking principles causes decision makers to slow down during planning and consider larger implications of each action and its effect on the system (Regenold & Murphy, 2020). Senge et al. (2020) and Simanjuntak et al. (2023) emphasized how it is crucial for systems thinkers to be open to engaging in iterative cycles of action, feedback, reflection, and dialogue to make effective, but ever evolving plans to use the five disciplines to eliminate the gap between theory and practice, a gap noticed by Davis and Davis (2021) as well. No component of the five disciplines works alone; all interconnect to create change for an organization, shrinking the gap between what is intended and what is. Using feedback via communication among stakeholders and collected data, changes can be made to improve the design of the strategic plan, fidelity of implementation of the plan, and its progress towards achieving its learning goals.

Role of Leaders in Creating Change Via the Five Disciplines

An effective plan for improvement requires a leader who can elicit buy-in and enthusiasm from stakeholders. . Support from upper administration for school leaders has been noted by some researchers (Davis & Davis, 2021; Smith et al., 2020), and listed as a missing or needed but unexamined commodity by others (Kools et al., 2020; Sanchez et al., 2022). Although Reese (2020) described that major changes can begin with a critical mass of people who are not in leadership positions, an effective leader can facilitate an effective change remaining in effect by communicating with implementers and using feedback to inform decisions. Further, Abraham et al. (2023) recommended making leadership development opportunities available to all; doing so can make team learning and personal mastery of the strategic plan more effective as the initial critical mass of people creating change can lead others with a shared vision. As Ng (2020) noted, a leader can not force employees to engage in personal growth; they can only create a climate conducive to it and be a role model in their own growth. Indeed, Jackson (2021) noted problems with compulsory professional development, in that participants could not choose to do or not do the learning. Ng (2020) added that the resulting learning is passive and disengaged. Particularly because the second goal of the white paper, to delineate effective, science-specific professional development training in designing and scoring the PBL assignments, also described this training as mandatory, the role of leadership becomes key in preventing the issues Ng and Jackson described. The administration has an important role in ensuring that faculty view the training as a need rather than an unnecessary burden inflicted upon them (Ng, 2020; Sanchez et al., 2022). Usunier and Squires (2019) stated that because it is very easy for university deans to have hostile relationships with faculty, it is important for the deans to be familiar with the university's culture and to be sensitive to stakeholders' positive and negative influences, both from within the system and from without, in agreement with Senge et al. (2020). The recommendations detailed in the white paper list being sensitive to faculty's mental models and working to bring everyone together into alignment in terms of what implementers' responsibilities are, what knowledge of metacognition, assignment design, and rubric use is needed. An effective leader can work to ensure all implementers feel a sense of personal mastery, shared vision, and team learning, in short, a sense of personal investment in the strategic plan. Susanto (2021) stated that change from the five disciplines often starts with the organization's leader, in agreement with Reese (2020) and Sanchez et al. (2022), who added that the leader needs to keep in mind that the process of feedback and reflection never ends, and that results often take an investment of time to manifest. Ng(2020) emphasized the importance and benefit of administrators keeping communication with teachers open, enabling them to leverage their knowledge to benefit student learning, and ensuring they are informed of why a change is beneficial to the university. For example, a leader can communicate why science faculty should also be ensuring students learn metacognition in science class, not just in a study skills class. Using the five disciplines and a great deal of communication, an effective leader can make sure implementers are invested in the success of the strategic plan and the three goals listed in this white paper.).

Efficacy of Five Disciplines

Although several researchers noted a lack of empirical research on creating a learning organization via the five disciplines, studies have been done regarding whether the five disciplines improve learning in various businesses, libraries, and schools (Noreen & Shahbaz, 2021; Rebelo et al., 2020; Hatshuhut et al., 2021; Smith et al., 2021; Springmier et al., 2024). Rebelo et al. (2020) stated that any organization that can learn via the five disciplines can be effective, although Bui (2020) argued that implementing the disciplines in young people in schools is more effective than in adults in the workplace. For example, Regenold and Murphy (2020) determined that using a framework of systems thinking to create a strategic plan for a business, including the design of professional development resulted in team members who valued reflection and communication for workforce development. Hutasuhut et al. (2021) used the five disciplines in a motorcycle factory and determined that employees had a clear shared vision and a self-directed approach to their learning, they felt supported by their peers and leadership, and were comfortable facing and refining their mental models. Both Matsumoto (2020) and Springmier et al. (2024) stated that school libraries improved in performance, in coordinating library use with teachers and in effectively auditing collections, respectively, by using the five disciplines to become more of a learning organization. In a university setting, faculty reported that they mastered content more effectively through professional development that challenged their mental models and emphasized systems thinking, resulting in a perception of a moderate to high grasp of all five disciplines (Khasawneh, 2011). Smith et al. (2020) stated that using the five disciplines improved communication and shared vision among school principals and upper administration. Still, Kuźmicz (2015) and Williamson et al. (2024) both cited the need of systematic benchmarking at a university to ensure that appropriate actual progress was being made towards using the five disciplines to become an effective learning organization.

In contrast, however, Hansen et al. (2020) questioned whether the five disciplines could enable an organization to become a learning organization, and whether it was worth the collective effort required to undertake the process. Of note, though, is that several studies used questionnaires or rubrics to assess the beginning capacities of the organizations and their people, so these researchers could show improvements where they existed (Pascu et al., 2023; Rad & Bocoş, 2024; Regenold & Murphy, 2020). In partial agreement with Hansen et al. (2020), Goh (2020) and Pascu et al. (2023) believed that although some organizations refer to themselves as learning organizations, they did not know how to begin building learning capacity or they applied only the principles that were more easily applied. Indeed, Hansen et al. stated that applying only some of the disciplines while ignoring others would be rational, but Kholdenjani and Mehraban

(2020) reported that inconsistent application of the disciplines can lead to dissatisfaction and disruption for hospital employees, while Sanchez et al. (2022) stated that high school principals who did not apply the disciplines to an equal extent found themselves less effective than they desired to meet their personal and school goals. Overall, all five disciplines are needed, as they are all interconnected.

Project Description

The project is a white paper describing the methods for designing and implementing a strategic plan with high fidelity according to Senge et al.'s (2012) five disciplines learning organization perspective. The methods ensure that stakeholders' are in alignment and have a shared vision for what the strategic plan is intended to accomplish and how it will accomplish it. They also account, via systems thinking, for how each component of the system, whether people, time, or resources, influences all of the other components. The paper is written so it can be applied by the study site in its design of future strategic plans and their implementation with high fidelity according to Century et al.'s (2010) FOI framework.

Needed Resources and Existing Supports

This white paper itself does not need resources. However, creating a strategic plan according to the recommendations outlined in the paper requires several resources. The largest resource needed is time, as a large amount of dialogue is needed to ensure that all faculty and administrators can share their perspectives and assumptions, as well as co-create the strategic plan. Senge et al. (2012) recommended the use of an outside facilitator to ensure that the dialogue remains focused and working towards consensus.

Repeated meetings among faculty, administrators, and groups comprised of individuals from both groups are needed.

Once the strategic plan is designed, training the faculty is then necessary. A professional development opportunity is a needed resource. Most participants in this study reported having little to no training for the existing strategic plan, and some of them reported availability for training as a barrier, so a mandatory, online, self-paced set of three one-hour modules would be desirable so that everyone can equally access needed training. One module should be discipline-specific, and its design should include the involvement of members of that department.

The largest existing support is the presence of the Center for Teaching and Learning, which was in charge of implementing the existing strategic plan. Though it has a very small staff, it provides many resources for effective instruction, including professional developments on many subjects, including the strategic plans. Its staff, working with the Technical Services department, has previously created online, self-paced professional development modules, so they may be the primary designer of this professional development.

Potential Barriers and Solutions

A potential barrier to the needed dialogues to create a strategic plan may be people being unwilling or unavailable to participate in meetings to engage in needed dialogue. Usunier and Squires (2019) note that the relationship between academic deans and faculty can easily become hostile, but they emphasize the importance in the dean’s making sure the faculty are understood and heard. To ensure that meetings for dialogue are attended, they should be scheduled on the college's mandatory instructor work days, held every semester.

Another barrier may be faculty members being unwilling to participate in professional development. Reasoning given by this study's participants varied from availability to relevance to the subject taught by the instructor. However, without training, the participants were not consistent with one another in assignment design and scoring. By making professional development mandatory, it can be ensured that everyone has been trained. By making it online, it can be ensured that everyone can access it in a timely manner. Finally, by making a module discipline-specific, it can be ensured that how the strategic plan is implemented in each discipline is included, so the training is relevant to each instructor.

Timetable for Implementation

Dialogues to decide what a new strategic plan should address will occur monthly over a semester. Following the choice of a problem to address, a committee will spend a year on a literature review which includes how other learning organizations have addressed similar problems. Monthly during this process, departments will meet to discuss the progress of the strategic plan design and to provide input and new perspectives. During the last two months of this process, the professional development modules will be created. During the spring and summer semesters, all existing faculty will be trained, with new members being trained as they join the faculty. The first classes to pilot the strategic plan will implement it in the fall semester. At the end of the fall semester, department meetings will be held to discuss the results, which will then be brought to the administration. The CTL will make adjustments as needed to the plan per the faculty's feedback, and in the spring, a full rollout of the strategic plan will occur. The entire process will occur over the course of two years.

Roles and Responsibilities

The main role is as a participant in the dialogues, and that role is held by faculty members and administrative staff alike. Each individual has a responsibility to ensure that they contributed their voice to this process, to avoid the perception of this plan's being created without them, and forced upon them. Senge et al. (2012), and Usunier and Squires (2019), however, described an extra responsibility of administration, in that as leaders of the college, that they keep communication channels open for input and feedback from other stakeholders, so as to avoid inadvertently adopting a strategic plan in which no one else is particularly invested.

The other role held by the faculty is that of implementing the strategic plan in the classroom and collecting data. Connected to that role, the faculty also will be providing feedback on how implementation is going in terms of the instructional critical components of the FOI framework. It is the faculty that are experiencing both what they are doing in the classroom related to the strategic plan and, more importantly, what behaviors their students are displaying in response to the plan. Further, faculty are responsible for scoring their own students' work and the work of another faculty member's students' work, to ensure consistency in how the rubric is applied.

Finally, a committee of faculty and administrators have the role of analyzing documents from randomly selected faculty to ensure that the assignments given are consistent between instructors and over time. This task will be carried out once a semester, and the members of the committee will rotate.

Project Evaluation Plan

Initial implementation of the strategic plan will require training of the faculty to ensure the structural-procedural and structural-educative components of the FOI framework are addressed. However, ensuring that the plan is being implemented with high fidelity and is delivering the desired outcomes will require ongoing monitoring and evaluation. Evaluation of a new strategic plan is formative, to enable adjustments to the plan as needed, although Massey Combs et al. (2022) noted that modifications to an initiative can contribute to reduced FOI, so adjustments should be applied judiciously. Based on Chen's (2015) research, I suggest a formative conclusive/constructive evaluation process to provide information about the merits, strengths, and weaknesses of the plan's implementation with the goal of improving the plan. The conclusive aspects of the evaluation determine whether the implementation is a success or a failure, while the constructive aspects of the evaluation provide information for plan improvement, including information on specific areas of the plan. A formative plan will ensure that the goal of the white paper, to ensure that the strategic plan is effective in addressing the lingering problems revealed by this qualitative study, is achievable rather than only noticed after the completion of the plan. I further suggest an internal evaluation for both the cost savings and to ensure the evaluator's intimate familiarity with the strategic plan. Also, an internal evaluation will ensure that feedback can be implemented quickly to modify and improve the strategic plan as needed.

The overall goals sought by evaluation of the white paper are evidence of high fidelity of implementation of the strategic plan, faculty confidently designing and scoring PBL assignments with the VALUE rubric in alignment with one another, and increased metacognition and problem solving in students. If the recommendations listed in the white paper are effective, the aforementioned goals should serve as evidence of that efficacy and therefore should be the metrics that are measured. The data collected by the evaluation methods can then be used towards the white paper's third recommendation regarding ongoing communication, support, direction, and appropriate adjustment regarding the strategic plan. Although there are three goals to the evaluation, the methods of evaluation are the same for each of the goals.

To assess fidelity of implementation, all four critical components should be examined. Although Lakin and Rambo-Hernandez (2019) listed both classroom observation and document analysis as important sources of evidence of FOI, the small staff size of the Center for Teaching and Learning makes direct evaluation of classrooms unfeasible(personal communication, Aug. 2021). However, document analysis of randomly selected instructors' assessments on an annual basis by a small committee of administrators and faculty is feasible. This analysis would ensure that the assessments are in alignment with the strategic plan's structure and are designed to elicit the desired teaching outcomes, giving a measure of both the structural-procedural and the instructional-pedagogical components of the FOI framework. Further, two instructors should assess randomly selected students' work once a semester to ensure that the rubric is being applied in a consistent manner. This assessment should occur after all instructors have undergone training in the assessment methods and it will also give a measure of the instructional-student engagement component of the framework. McConnell and Rhodes (2017) stated that teachers using VALUE rubrics to assess student work have high inter-rater reliability when those teachers have undergone training. The desired outcome is consistent evidence from the collected rubric data that students' learning is improving from semester to semester, indicating that the strategic plan is effective in achieving its goal.

Faculty confidence in implementing the strategic plan and their alignment in designing and scoring the PBL assignments are also goals needing evaluation. Their confidence can be assessed by surveys and gathering data during meetings during implementation in an informal focus group setting (Chen, 2015). In addition, surveys of the Center for Teaching and Learning staff and the faculty can gather information on the perceptions of the plan's implementation and success, as well as how well the desired audience of the white paper, all of the implementers, comprehend the recommendations and to what extent they are pleased with the effect of the recommendations(Sweet, 2024). To determine the alignment of the design and scoring of the PBL assignments, data from the document analysis used to assess FOI can also be used here.

Finally, to determine whether the recommendations in the white paper are leading to desired learning outcomes, the PBL score data collected by all of the faculty can be compiled and compared to the desired benchmarks over time. If these data are indicative that students are not increasing in their metacognitive and problem solving skills, data-driven adjustments can be made to the strategic plan in the regular, ongoing meetings during the implementation period. Survey data from the CTL staff and faculty can be used to triangulate the collected PBL data to determine if the recommendations set forth in the white paper are leading to the desired learning outcomes.

Key Stakeholders

The key stakeholders who benefit from an effective strategic plan implemented with high fidelity include the college administration, the faculty, and the students. The administration would, after engaging in dialogue with faculty and the state's higher education system, choose and ultimately be the deciding factor for the implementation of the strategic plan. The faculty would do the actual implementation of the plan in the classroom, collect data on a regular basis to determine whether the plan is working as intended, and make necessary adjustments after engaging in dialogue with the administration. Pascu et al. (2023) stated that the goals of a higher education institution are to increase prestige, and attract top teachers and resources, via high student scores on exams and high rates of graduates who find jobs after graduation. Ultimately, though, the students would be the stakeholders who would most benefit from an effectively implemented strategic plan, as their learning would be improved, and they would be the ones to earn the scores and jobs mentioned by Pascu et al.

Project Implications

The largest implication of this project is its potential for positive social change via bridging the gap between what is intended in a strategic plan and what is actually implemented. The intention of the existing strategic plan was to increase students' metacognition and problem solving skills by instructors designing PBL assignments and scoring them according to a common VALUE rubric. The executed implementation of the strategic plan with poor fidelity resulted in stakeholders who did not perceive the desired gains in metacognition and critical thinking, inconsistent design of PBL assignments and interpretation of the rubric, and a perceived lack of support in implementation.

White Paper Recommendations and Themes of the Study

The white paper makes recommendations that address remaining gaps between intention and execution of the strategic plan that were revealed by this qualitative study. The first theme of the study was that although instructors worked to elicit metacognition from students, interviewed faculty reported little improvement in student metacognition. In addition, some faculty reported that they perceived metacognition to be a topic that belonged in a study skills class, not a science topic. To address this theme, the white paper recommends better training and communication to ensure faculty feel personal mastery of metacognitive instruction, comprehend how to elicit metacognition in students, as well as how to recognize and measure it.

The second theme of the study was that instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics. Most instructors reported either having no training in the strategic plan or having training that was relevant to other disciplines but of limited use in the sciences. The white paper recommends this mandatory, science-specific training in how to design and score these PBL assignments for science classes. This training will, in turn, ensure that all instructors are in alignment in their activities regarding the strategic plan and are collecting consistent, comparable data that can be used to guide the continuing implementation of the strategic plan.

Finally, the third theme of the study was that although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing. Some instructors reported that they collected data and sent it to the school but had no idea whether it was being used or if the strategic plan was effective. Overall, the perception of the plan’s implementation was negative despite the positive perception of its goals. This white paper recommends ongoing communication, guided by evaluation data, between implementers and administration to ensure that the strategic plan is leading to the desired learning outcomes in students and that instructors are aware of the plan’s effect. Also, this ongoing communication ensures that faculty are implementing the plan with high fidelity and confidence and that any problems and concerns they may have are being heard and addressed. These three recommendations of the white paper directly address the three ongoing problems of the strategic plan.

Implications of Using the Five Disciplines to Guide the White Paper

By basing the recommendations in this study’s white paper on Senge et al.’s (2012) five disciplines learning organization perspective, future strategic plans can ensure that all stakeholders have a shared vision for the plan, mental models that contribute to that vision, team learning, individual learning which results in personal mastery, and systems thinking that makes sure all of the strategic plan’s components work together. The college can then monitor this strategic plan according to Century et al.’s (2010) FOI framework and evaluation recommendations of Chen (2015) and make informed decisions about any changes the plan may need.

By providing a white paper that sets out the guidelines of creating and monitoring a strategic plan according to the five disciplines learning organization perspective, I can help administrators to communicate effectively with faculty, and allow the faculty to perceive that they are heard. Further, the administration can be confident that the faculty have had input on the goals and implementation methods of the strategic plan, and as a result, will be more invested in the plan than if they were to perceive that the plan was forced upon them by their superiors (Senge et al., 2012). An effectively implemented strategic plan in which all stakeholders are heard can make adjustments more readily and achieve the desired goals more often than an ineffectively implemented strategic plan.

Benefits to Faculty and Students

Faculty can benefit by having their personal mental models and perspectives considered in the design of future strategic plans and can feel supported by administrators. They further can benefit by engaging in team learning, in which individuals can learn to be effective together, although not by thinking alike. Team learning involves continuous conversation, so that everyone’s experiences and expectations are considered in the plan’s design. Working together, faculty can ensure that everyone is empowered to implement the plan with confidence and in a manner that is consistent between instructors.

Finally, students benefit from the improved learning that an effective, and effectively implemented, strategic plan for their education can create. Butler et al. (2017)

stated that critical thinking skills are a predictor of life decisions and that individuals with higher critical thinking skills report fewer negative life events, so an effectively implemented strategic plan designed to improve critical thinking and metacognition could potentially influence future decisions and outcomes. However, examining that influence is outside the scope of this study. Overall, students' goal in attending college is learning, and improved learning is a benefit to those students.

Section 4: Reflections and Conclusions

Project Strengths and Limitations

The project deliverable offers some strengths, but it also has several weaknesses. Strengths were aspects that enabled the project to address the entirety of the problem that was the subject of the study. Limitations were aspects of the study that could be a barrier to addressing the study's problem or parts of the study that limited the depth of information collected in the study.

Strengths

In this basic qualitative study, I addressed the research question:

RQ1: How do community college science instructors perceive the fidelity of implementationFOI of metacognition instruction according to the intended outcomes of the study site's strategic plan?

Century et al.'s (2010) Fidelity of Implementation (FOI) framework guided this study. In the study's findings, it was determined that none of the critical components of the framework were applied consistently among all of the science faculty. There were a variety of approaches to creating the assignments, scoring the assignments, and tracking the data. Faculty perceived that student metacognition did not improve, that mandatory, science-specific training would be useful and that although they used their best pedagogical judgment, there was a lack of guidance in the implementation of the strategic plan.

A strength of the study was the basic qualitative approach. Participants could provide their own perceptions of their experiences with the QEP. The semistructured interview format enabled consistency of what was asked of each participant, but also enabled the opportunity to go more in-depth about individual's experiences and thoughts. Coding was done in vivo to ensure that the data adhered as closely as possible to participants' perceptions of their implementation of the QEP, and of the QEP itself.

A key strength of the project deliverable is that using Senge et al.'s (2012) Five Disciplines to guide the creation of future strategic plans will enable a greater level of implementation with fidelity and enthusiasm among stakeholders. Maintaining open communication among all stakeholders would enable people to feel heard and respected (Springmier et al., 2024). This communication would enable team learning in which team members learn together, so everyone implementing the plan understands the structural critical components of the plan. Because everyone could contribute to the plan and engage in personal mastery, as well as in reflection on their own and one another's mental models, each stakeholder could feel personal ownership of the strategic plan. Ng (2020) stated that an effective leader is aware that change and adherence to a plan cannot be forced on people; rather, a leader helps people feel comfortable and welcome to implement improvements. The largest strength is the focus on communication and reflection; a large flaw in the existing strategic plan was that communication did not enable faculty to feel trained, guided, and prepared to implement the plan, and no information was sent back to the faculty to enable them to determine whether the plan was working to improve student learning outcomes.

Limitations

A weakness of the study is that I interviewed 10 science instructors at the community college, a sample that was smaller than my originally intended sample size of 12-15 instructors. Although my sample comprised approximately 25% of the science department at the study site, most of the interview participants were full-time biology instructors with at least 5 years of teaching experience. Two participants were adjuncts, and two were chemistry instructors. It is possible that valuable perceptions among the people implementing the QEP in the science department were not included in the collected data. However, the overall consistency of the participants' interview data is indicative that saturation may have been reached despite the relatively low variability in participants' demographics

A key weakness of the project deliverable of the project deliverable is that even with the best intentions, the stakeholders may not implement a strategic plan according to the Five Disciplines as Senge et al. (2012) intended. For example, Jackson (2021) warned against allowing shared vision to become groupthink. Sanchez et al. (2022) noted that leaders often implement short term solutions to fix problems, although they do not take a systems thinking view of how a solution may also make a problem worse in other areas that had not been considered (Springmier et al., 2024). Robinson (2020) noted that a focus on personal mastery without consideration of the other disciplines results in ineffective changes and the potential for hubris in leaders. Also, Ng (2020) stated that learning disabilities inherent in some mental models, such as blaming others when things go wrong, can destroy learning organizations when not reflected upon. Although Hansen et al. (2020) stated that Senge probably would not mind if only some of the disciplines were implemented, Kholdenjani and Mehraban (2020) and Sanchez et al. (2022) reported that inconsistent application of the disciplines resulted in dissatisfaction and lower self-efficacy among stakeholders. Committed application of all five disciplines is needed for a plan to be effective.

An important weakness to consider is that the plan assumes that stakeholders are willing to engage in dialogue and learning on a regular basis, and that effectively implementing the Five Disciplines requires a great deal of dialogue to enable shared vision and team learning. Several study participants noted that the strategic plan’s requirements were already a burden on top of their other duties, so it must be acknowledged that requesting stakeholders to meet monthly or undergo mandatory professional development may be unwelcome to the stakeholders (Ng, 2020; Sanchez et al., 2022). Researchers noted that support from administration does make a difference in participant buy-in of a plan, both in noting the positive effects of its presence in some studies (Davis & Davis, 2021; Smith et al., 2020) and in noting the need for it in other studies (Kools et al., 2020; Sanchez et al., 2022).

Recommendations for Alternative Approaches

I considered two alternative approaches to a project deliverable for this study. Both addressed part of the problem posed by this study. However, neither approach addressed all aspects of the themes revealed by the study. Because of its ability to address all three themes of the study, a position paper providing recommendations for future strategic plans was chosen as the project deliverable.

Professional Development

A major consideration was that one theme from this study was that instructors perceived that mandatory, science-specific professional development would be valuable. As such, an alternative approach to the project deliverable could have been a professional development workshop. Ensuring that faculty were adequately trained to design and score the PBL assignments according to the VALUE rubric is important to ensure that the collected data are useful to the school. McConnell and Rhodes (2017) stated that with training, high levels of consistency in how the rubric is interpreted among various instructors. However, a professional development workshop would not address all three themes that this study yielded. In particular, professional development could train people on metacognition and critical thinking, as well as the logistical components of creating and scoring assignments, but it would not necessarily engender enthusiasm for the strategic plan among the faculty (Ng, 2020); additionally, it would not provide ongoing guidance and feedback to enable adjustments to the plan. As such, professional development is needed, but alone, it is not sufficient.

Program Evaluation

Another approach would be to design a program evaluation. This approach would allow the college to determine whether the strategic plan was effective, to what extent it was effective, and what components of the plan were effective. Approaches to a program evaluation include class observations and document analysis (Chen, 2015), both of which also are components to ensuring a high fidelity of implementation of a plan (Century et al., 2010; Lakin & Rambo-Hernandez, 2019). However, during the data collection of this study, it became clear that the strategic plan was not implemented consistently among the participants, as instructors reported feeling a lack of guidance. Also, instructors reported seeing little improvement in student metacognition. A program evaluation, like professional development, is needed during the process of implementation; however, before a program evaluation can be useful, a strategic plan that can elicit engagement and enthusiasm among stakeholders must be created.

Scholarship, Project Development and Evaluation, and Leadership and Change

Growth as a Scholar

I began this process with the goal of becoming a more effective college science instructor. Conveying information was the easy part, but helping students to learn it was a challenge. After 6 years of teaching with two biology degrees, it became clear that it was overdue for me to learn how to guide student learning. Thus began my journey with Walden University. My classroom experience was unusual compared to the rest of my cohort of K -12 teachers; my students varied widely in age, life experiences, and expectations of the classes. However, I learned to respect the knowledge with which students arrived in class regardless of their prior experiences and how to correct misconceptions about the subject. I learned to give them ownership of their learning, and I learned to use data to drive instruction and assessment. Most interestingly, as part of this project study, I have learned in detail how cognition and metacognition work and have been able to help students study more effectively for subjects other than my own. My academic journey was extremely long, involving multiple family deaths and births, two brain cancer diagnoses and a recovery in the family, and more missed time with family and friends than I want to acknowledge. I learned exactly the extent to which I refuse to give up on a goal; for example, it required just over a year to recruit 10 participants for interviews. I also learned how to find deeper meaning in what people say to me through learning to code and conduct thematic analysis of interview transcripts. I found it rewarding to discover that the available research literature could provide an answer to how to address the problems in the college's strategic plan that were uncovered by my study. Unfortunately, I also learned during this study's literature reviews that I am prone to following topics that are only tangentially relevant to the study. It was necessary to exert extra effort towards focusing only on the relevant topics. However, all of the work has allowed me to create positive social change for the community college. By using my work, the college can create an effective strategic plan with high fidelity of implementation and high levels of faculty buy-in and enthusiasm. This plan may enable the achievement of learning goals for the students and will certainly provide data that allow for adjustment and improvement to ensure that progress continues towards said goals.

Growth as a Practitioner

Colleges use strategic plans to improve the quality of student learning. This project led me to consider what components are required to create a strategic plan that faculty can implement in the classroom with consistency between instructors in terms of what they are measuring in student learning and how they are going about measuring it. It is not enough to design the assignments of the plan and which classes will implement the plan first; faculty must be provided with the knowledge they will need to implement the strategic with fidelity. It needs to be defined what the plan should look like in the classroom, and what achieving student learning objectives should look like. Collecting usable data requires that instructors are providing students with similar assignments and scoring those assignments in similar ways. In the existing strategic plan, all instructors appear to be giving the same assignment and grading it with the same rubric. However, some instructors used worksheets as the PBL assignment while others used multi-section virtual lab exercises as their assignment. Despite using the same rubric, these instructors were measuring different levels of problem solving skills. It is very difficult to find meaning in data when instructors are implementing the assignments in significantly different ways. Because of this inconsistency in implementation, as well as participants' perceptions of being untrained and unguided in implementation, it is clear to me as a practitioner that ensuring everyone is informed, heard, respected, and engaged in the strategic plan are all necessary for a strategic plan to have any likelihood at succeeding in achieving its goals.

Growth as a Project Developer

I learned that creating a strategic plan requires a great deal of preparatory work to ensure that it can be implemented with any significant level of fidelity. The QEP that was the subject of this study had its topic chosen by the faculty, then it was designed by a committee and given to the faculty, without detailed training, three days before the start of the semester in which it was to be implemented. Some faculty reported feeling as though the QEP was inflicted upon them by the administration. Others reported a distinct disconnect between defining the goals of the QEP, on which everyone had input and on which all participants said something favorable, and the actual form of the QEP, which was done entirely by a committee without input from outside stakeholders. I learned that people need to feel heard, and feel they were part of creating a plan for them to feel invested in implementing the plan (Fullan, 2011; Senge et al., 2012; Ng, 2020). Also, people need to understand what the plan will require of them before it is implemented, with enough time before implementation to ensure everyone is trained and ready to implement. I based the steps of creating a strategic plan on the available research literature to create a plan that will achieve the intended goals.

Reflection on Importance of the Work

The purpose of this basic qualitative study was to investigate the fidelity of implementation of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. In this investigation, I discovered that the science faculty did not perceive that implementation occurred with high fidelity. They reported that student metacognition did not improve, that they would have valued mandatory, science-specific professional development, and that they felt a lack of guidance in their implementation. By identifying where the faculty felt the fidelity was lacking in this strategic plan, future strategic plans can be deliberately designed to ensure implementers feel consistently supported and adequately trained. Also, ensuring that the implementers feel informed, heard, and respected during the plan’s design and implementation can help their engagement and personal investment in the plan’s success. As a result of careful planning and implementation, and consistent open communication among stakeholders, adjustments can be made to the plan as needed, and the likelihood of its success can be higher.

Implications, Applications, and Directions for Future Research

The largest implication in terms of potential positive social change is that a strategic plan that is implemented with high fidelity is likely to meet with success in achieving its goals. High fidelity of implementation enables stakeholders to determine whether the strategic plan is working, what parts of the plan are working, and whether adjustments should be made to enable that success. In the case of the existing strategic plan that was the topic of this study, high fidelity of implementation would enable the college to make data-driven decisions about the progress of the strategic plan. Having the ability to make informed decisions may lead to achieving the desired learning goals of students' increased metacognition and problem-solving skills. Ultimately, the college seeks to send graduates into the workforce with skills that enable them to enter productive careers. To ensure that such a positive outcome is even possible, the college needs a strategic plan implemented with high fidelity which can provide data that enable the college to make informed decisions about its progress.

Recommendations for Practice and Research

Recommendations for practice consist of creating a well discussed strategic plan according to the Five Disciplines of Senge et al. (2012). Limitations of the current plan were that faculty conducting the implementation did not perceive that they had effective training or guidance, that iterative, systems thinking-oriented reflection did not occur, and that many faculty did not feel a sense of ownership for the plan. A resulting lack of high fidelity of implementation manifested as different types of assignments and interpretations of rubric criteria by different instructors, and different levels of buy-in among instructors. A high quality, mandatory professional development must be created to enable faculty to gain the pedagogical and logistical knowledge they need to implement the strategic plan with high fidelity. This professional development should be online, so that adjunct instructors can easily access it regardless of their teaching schedule, and at least one module should be discipline specific, so that instructors can experience how the strategic plan works in the sciences, for example.

A recommendation for future research is to follow up on a new strategic plan implemented by the college according to the recommendations detailed in the project deliverable. A program evaluation would be valuable as both data on how the strategic plan is progressing and what adjustments should be made, if any, as well as on how a college strategic plan designed according to the Five Disciplines affects learning outcomes for students.

Conclusion

This basic qualitative study investigated the fidelity of implementation of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. The results yielded themes that indicated a low fidelity of implementation of the strategic plan. Participants reported that they thought highly of the goals of the plan, but felt the implementation was poor. They felt inadequately trained and unsupported. Participants reported seeing little improvement in students’ metacognition, so the strategic plan did not achieve its intended goal. By using Senge et al.'s (2012) Five Disciplines to guide the creation of future strategic plans, each stakeholder can participate in a shared vision that allows for reflection of their mental models and allows for their personal mastery towards their goals as well as team learning with their colleagues. Possibly most important to the disciplines is systems thinking, where the entire system is considered as a single whole, in which all components interact to become more than the sum of their parts. By engaging in systems thinking in creating a strategic plan, a college account for all of the parts of the college that influence and are influenced by the strategic plan. Once the system is seen clearly, the college can take small actions that have large positive effects. A successful plan to achieve increased student learning results, and all stakeholders can know that they ensured that goal was reached.

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Appendix A: The Project

Introduction

A community college in the Mid-Atlantic region of the United States created a strategic plan to increase graduating students’ skills needed in the workforce, such as critical thinking and problem solving. The college created a Quality Enhancement Plan (QEP), enacted from Fall 2018 until Spring 2023, to increase critical thinking and soft skills by focusing on improving students’ problem-solving skills (QEP, 2017; College website, 2022). Ennis (1985) and Halpern (1998) tied critical thinking to metacognition and student metacognition was listed as key to the goals of the QEP (2017). This 5-year plan was implemented by incorporating problem-based learning (PBL) in many classes, with PBL assignments scored according to a common Valid Assessment of Learning in Undergraduate Education (VALUE) rubric designed by the American Association of American Colleges and Universities (2009). However, faculty’s metacognitive instruction, PBL assignments, and the use of the VALUE rubric had not been monitored for fidelity to the QEP. Through a basic qualitative study, I investigated the fidelity of implementation (FOI) of metacognitive instruction as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. Based on the findings of this study, I am making recommendations for more effective strategic plan implementation in the future.

Background of Existing Quality Enhancement Plan

Data collected prior to implementation of the Quality Enhancement Plan indicated that the college’s students struggled with problem solving, scoring at or below the national average in most aspects of problem solving; this data provided the focus for the strategic plan (QEP, 2017). The QEP (2017) also " suggested that a focus on metacognition and self-regulation would benefit [the College's] students" (p. 9). According to Saiful et al. (2020), McNamara et al. (2019), and Siegesmund (2016), a university may consider a methodology such as PBL to increase critical thinking and metacognition among students. Although faculty were offered professional development in both PBL and VALUE rubric assessment since the launch of QEP, as of November 2020, only 25% of adjunct faculty completed the training, while 97% of the full-time faculty were trained. However, 74% of the faculty were part-time instructors (College website, 2020; 2022). Additionally, the college did not offer professional development opportunities on critical thinking and metacognition themselves (College website, 2022). At the college, data during implementation of the QEP consisted of scores on PBL exercises designed and scored by individual instructors; however, according to the individual implementing the QEP, there was a gap in practice in ongoing monitoring of the faculty's FOI of the strategic plan to implement metacognition instruction (personal communication, Aug. 2021), as there were many instructors across multiple campuses to be monitored, and few people tasked to undertake examination of PBL assignments or observe classes. This gap in practice made it difficult to determine if student outcomes were correlated with the QEP, as negative or ambiguous outcomes may have been due to causes such as implementation of the plan with low fidelity or even high fidelity implementation of a plan that was ill-suited to this college.

There was some evidence that may have indicated that the plan was not working as intended. Data sets regarding whether the QEP was increasing students' critical thinking yielded conflicting results. A survey of graduating students in Spring of 2021, who were among the first to encounter implementation of the QEP throughout their time at the college, yielded data that indicated that students still ranked as weak to moderate in overall critical thinking and components of problem-solving skills (California Critical Thinking Skills Test, 2021). In contrast to these data, the CTL director reported in the November 2020 Strategic Plan update that approximately one-third to one-half of students from 2018-2020 scored equivalent to third- and fourth-year college students on the PBLs from the strategic plan. For a community college, scores should be equivalent to first- and second-year students at a 4-year university (McConnell & Rhodes, 2017). Without monitoring the FOI of the QEP, it was difficult to know what to conclude from the conflicting data.

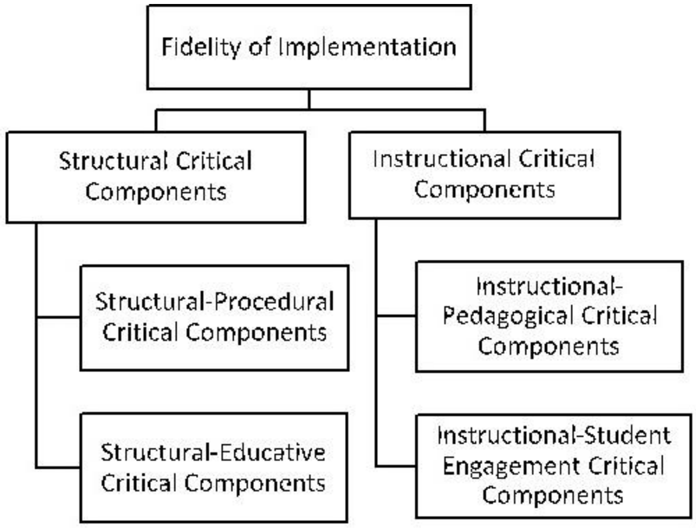
Findings of Santillo Study on FOI of Existing QEP

The purpose of this basic qualitative study was to investigate the FOI of metacognitive instruction to a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States. Century et al.'s (2010) fidelity of implementation (FOI) framework outlined the focus of this study and guided the research question of how community college science instructors perceive the FOI of metacognitive instruction according to the intended outcomes of the study site's strategic plan. To answer this research question, the main data collection method was semistructured interviews with 12-15 members of the study site's science department faculty. Interview questions focused on implementation of the four critical components of the FOI framework.

The critical components of the FOI framework fall into the two broad organizational categories of structural or instructional critical components (Century et al., 2010). Structural critical components are broken down into structural-procedural critical components, which are the elements of a program that dictate what is to be done in an intervention, and structural-educative critical components, which refer to the expertise implementers need to conduct an intervention as designed. Instructional critical components are subcategorized into instructional-pedagogical critical components, which consist of the actions and interactions the program's implementers, in this case, the instructors, should engage in during an intervention, and instructional-student engagement critical components, which consist of the actions and interactions expected of the program's recipients, in this case, the students (Century et al., 2010). Figure 1 illustrates the relationships among the critical components. Each component plays a role in ensuring a high FOI. Engaged students and committed instructors can positively influence FOI of a program, according to (Mataniari et al., 2020; McKeown et al., 2019). In a well-designed and well-monitored program, not only can it be determined whether the program working as designed, but it can be determined exactly which components and in what combinations are leading to the desired learning outcomes (Century et al., 2010; Lakin & Rambo-Hernandez, 2019; Smith & Finney, 2020). Further, it can be determined which, if any, critical components should be adapted and how the desired outcomes could be affected as a result (Lakin & Rambo-Hernandez, 2019).

Figure A3

O*rganizational Chart of the Critical Components of the FOI* framework



The basic qualitative study informing this position paper yielded three major themes.

- Theme 1: Although they worked to elicit metacognition from students, instructors reported little improvement in student metacognition**.**
- Theme 2: Instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics.
- Theme 3: Although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing.

Theme 1 was that although they worked to elicit metacognition from students, instructors reported little improvement in student metacognition. Flavell (1979) defined metacognition as awareness and control of cognition, or mental processes or, in short, thinking about thinking. Study participants indicated that they worked to help students reflect on their thinking, although some participants felt that metacognition should be a separate study skills class, rather than a topic included in science classes. Theme 1 aligned with available research literature which indicated that college students arriving in introductory science classes do not have strong metacognitive skills in place, often because they did not need the skills in high school (Bernacki et al., 2020; Dye & Stanton, 2017; McGuire, 2018; Ridlo & Lutfiya, 2017; Stanton et al., 2015, 2019; Zhao et al., 2014). Hattie (2015) stated that university students have varying metacognitive skills and need to be explicitly taught to fill in the gaps, an idea with which Dye and Stanton (2017), Halmo et al. (2024), McDowell (2019), Shukla and Dungungnoen (2016), Stanton et al. (2019), and Stanton et al. (2021) agreed. In addition, Ijirana et al. (2022) stated that explicit instruction in metacognition increases overall critical thinking in college students. Interestingly, instructors' grasp of metacognition was not found to be much better, although it is an admittedly understudied topic (Bas and Sagirli (2017), Lavi et al., 2019; McDowell (2019), Zohar & Barzilai, 2013). Rivero and Lewis (2018) reported that many secondary science instructors reported using metacognition less than they should, due to not hearing about metacognition after their schooling, misconceptions, or not knowing how to incorporate metacognitive practices or needing more experience in doing so, while Dennis and Somerville (2023) stated that most higher education instructors do not have an understanding of metacognition and generally do not explicitly teach it.

Theme 2 was that instructors indicated that mandatory, science content-specific training would be valuable for implementation and assessment of student learning with VALUE Rubrics. Participants interpreted components of the rubric differently from one another, and reported that they felt the rubric to be a poor fit for achieving its objectives. Further, most training was focused on other disciplines and was of limited usefulness to science instructors. Theme 2 aligned with research literature indicating that professional development improved fidelity of implementation of a strategic plan (Garwood & Harris, 2020). Massey Combs et al. (2021) stated that online training was effective at improving FOI, while Sogunro (2017) concluded that higher education institutions should make professional development required for all faculty. Indeed, after use of the VALUE rubrics for 2 years, McConnell and Rhodes (2017) stated that after training, instructors could produce reliable results using the rubrics with high FOI to assess student work and show improvements in student outcomes. However, Efu (2020) and Daniel and Lemons (2018) noted that instructors tend to show low participation in professional development due to time away from teaching duties, lack of planning time, the professional development process, and the need for repeated trainings. Jankowski et al. (2018) recommended that professional development more clearly align with assessment efforts, to ensure that collected data be sufficient and accurate regarding student learning outcomes, and therefore useful to the college.

Theme 3 was that although instructors valued the QEP goals and used personal judgment to use materials and assignments that benefitted students, they indicated a lack of direction in implementing. Most participants stated that the objectives were a worthy goal for science students, but that the guidance they received was inadequate for designing the assignments and that they did not know if the data was even being used by the college. Theme 3 aligned with research which indicated that there were variables outside of the critical components of the framework which affected program implementation and outcomes. These variables included lack of time, lack of program specifications, lack of support, large numbers of students for each instructor, lack of materials and facilities, lack of knowledge and familiarity, and attitudes and beliefs about the interventions (Century et al., 2010; Effendi-Hasibuan & Mukminin, 2019), although Massey Combs et al. (2022) stated that while curriculum modifications, lack of time, and student behavior were barriers to high FOI, class size, and access to materials were far less inhibiting of fidelity. A well-designed program may address these variables to ensure a high FOI.

Suggested Procedure for Implementing a Strategic Plan

In response to the three themes revealed by the qualitative study, the overarching goal of this white paper is to ensure that the study site’s next strategic plan is effective in achieving its objectives, with the full investment of the administration and faculty in the plan’s success. However, each of the themes that emerged from my research led to a specific, actionable goal which makes reaching the overall goal possible.

1. The first specific goal of improving student metacognition is a goal that remains unfulfilled but still desired. To achieve this goal, instructors must increase their own grasp of instructing metacognition. They will be encouraged to both engage in personal mastery of their efficacy to teach

metacognition, both from their own learning and from team learning via professional development from one another. Several study participants reported prior interest in and study of metacognition, so there are already people who can help begin the process.

2. The second goal is to create mandatory professional development opportunities to train the faculty in using the VALUE rubric and constructing science assignments designed to align with the VALUE rubric. Although participants reported varying approaches to PBL assignment design and scoring, McConnell and Rhodes (2017) stated that teachers using VALUE rubrics to assess student work have high inter-rater reliability when those teachers have undergone training. Several participants stated concerns regarding how useful data collected over the strategic plan could be when some instructors assessed groups while others assessed individuals and instructors reported varied interpretations of rubric criteria. With training, instructors can be confident that everyone is measuring the same criteria and collecting meaningful data through their individual PBL assignments.
3. The third goal is to ensure that even after the strategic plan is initially implemented, ongoing support is provided to instructors. Departments should regularly meet to discuss the implementation, address emerging concerns, and check any collected data to determine if the plan produces desired learning outcomes. A systems thinking perspective should be adopted to consider factors external to the strategic plan which may influence or be influenced by

the plan's design or implementation. A large focus for this goal is that ongoing communication and support can enable the plan to be adjusted as needed, or to ensure that anyone who would benefit from additional training can access it.

To create a new strategic plan with a high fidelity of implementation and high level of faculty commitment, following the recommendations laid out by Peter Senge et al.'s (2012) five disciplines is suggested. The five disciplines involved in the approach are: (a) personal mastery, or the practices which support people in simultaneously maintaining both their goals and an awareness of current reality; (b) shared vision, or the uniting of people around a common goal; (c) mental models, or awareness of assumptions and personal perceptions; (d) team learning, or group interaction that creates results greater than the capacity of individual members; and (e) systems thinking, or the understanding of how individual components of a system influence one another (Senge et al., 2012). Leveraging all five disciplines enables a learning organization to take small actions but reap large benefits. Evaluation data collected by survey, document analysis, and other flexible methods that provide rapid feedback should be used to inform and guide the ongoing support of implementers in an iterative process (Chen, 2015; Sweet, 2024).

Personal mastery enables people to be aware of differences between what their goals are and what current reality is. Reese (2020) stated that it is important for each person to want to accomplish something that personally matters to them, but they must reflect on their mental models and commit to bringing reality closer to their goals.

Ensuring that student metacognition improves requires that faculty understand what metacognition is and how to elicit it in students. If all faculty felt a personal investment in bridging the gap between students' current metacognition and their desired level of metacognition, it becomes more likely that the gap will actually be closed. Further, if faculty felt a personal investment in understanding and becoming adept at designing PBL assignments and scoring them with the VALUE rubric, training to do so would be more effective than if instructors felt that such information is not relevant to them (Ng, 2020).

Mental models can stand in the way of bridging the gap between goals and reality, and it is crucial that communication remain honest, with assumptions made explicit, respectful of others' contributions, and nonjudgmental with allowances for mistakes (Ng, 2020; Senge, 2020; Springmier et al., 2024). At the current moment, faculty understanding of metacognition and their responsibility to teach it is not consistent; some study participants reported that metacognition instruction does not belong in science class. Making mental models explicit, regarding metacognition as well as the PBL assignments and VALUE rubric, via open communication enables stakeholders to achieve a shared vision in which people's goals, while not identical, are in alignment; people who have a personal stake in the vision tend to be enthusiastic and committed to ensuring the vision and goals happen (Matsumoto, 2019; Ng, 2020; Rad & Bocoş,2024; Roegman et al., 2021; Springmier et al., 2024).

Enthusiasm and open communication enable stakeholders to learn together and from one another, creating a collective intelligence that is greater than the sum of individuals' intelligence. As a group, more can be accomplished as stakeholders become simultaneous educators and students of one another (Springmier et al, 2024). This phenomenon can factor in both teaching and learning about metacognitive instruction and the logistics of designing PBL assignments and scoring them with the VALUE rubric, as well as using instructors' experiences implementing the strategic plan to inform the continuing process of implementation. Finally, taking into consideration a systems thinking perspective, the larger effects of small changes can be assessed and further positive changes can be made (Senge et al., 2012). The progress and efficacy of the strategic plan can be tracked and evaluated on a regular basis

Key to the success of the strategic plan is that decisions must be data-driven. Implementation data should be collected via survey from the Center for Teaching and Learning and randomly selected faculty to ensure that implementation matches the initial design of the strategic plan. Document analysis should be done once a semester on between five and 10 PBL assignments to ensure that all are measuring students' metacognition and problem solving via the same metrics. Once per semester, two to three randomly selected classes' assignments should be graded by two instructors to ensure that all are using the rubric consistently. PBL scores should also be considered at the monthly dialogue meetings to determine if students' learning is, in fact, improving as desired.

Points to Keep in Mind

- *Open communication is key*. This communication, whether formal or informal, should happen among various teams who incorporate members from all stakeholder groups, and from all levels of authority; it should also consider components, such as the social or cultural context, which influence and are influenced by the learning organization (Da'as & Ali, 2021; Rad & Bocoş, 2024; Roegman et al., 2021; Schneper, 2020; Senge, 2020; Senge & von Ameln, 2019; Usunier & Squires, 2019). It is absolutely crucial to make explicit mental models and personal goals in a non-judgmental way, so that shared vision is possible (Ng, 2020; Senge, Hamilton, & Kania, 2020; Simanjuntak, Heriyanto, & Hasibuan, 2023; Springmier et al., 2024). Because it is generally assumed that team members hold equal decision-making power, which may not be the case, a facilitator may be beneficial (Rebelo, Lourenço, & Dimas, 2020; Springmier et al., 2024).

- *Reflection and practice is needed to determine if actions are producing the desired results and to make these actions a habit* (Reese, 2020). Ng (2020) and Springmier et al. (2024) referred to the use of regular meetings to revisit goals and reinforce making the behaviors of a learning organization habitual, while Hutasuhut et al. (2021) and Ng (2020) described the need to integrate the five disciplines into daily work. Also, goals and progress towards them must constantly be evaluated to ensure that they remain appropriately prioritized, a method Matsumoto (2019) linked to Senge's double loop learning (Regenold & Murphy, 2020; Schneper, 2020, Springmier et al., 2024).
- *Time must be allowed for implementation.* Further, time must be allowed for changes to be implemented, sometimes in gradual stages, to allow for, the creation of shared vision, learning, and adjustment of beliefs (Reese, 2020;

Schneper, 2020; Senge, et al., 2020; Springmier et al., 2024). The emergence of a shared vision and systems thinking co-created by all participants begets buy-in and enthusiasm from stakeholders (Hassan et al., 2022; Matsumoto, 2019; Ng, 2020; Rad & Bocoş,2024; Roegman et al., 2021; Springmier et al., 2024). Fullan (2011) also noted that people that do not feel ownership of a plan will not be committed to implementing the plan, so allowing for time and open communication can ensure successful implementation as people will be more enthusiastic.

- *No single discipline works alone; all are interconnected.* Lasting change requires not only time, but a long-term view of the system. Short term fixes can improve measured variables for a short period of time, but higher leverage changes that solve problems effectively require a longer-term view (Reese, 2020; Sanchez et al., 2022; Senge et al., 2020; Simanjuntak et al., 2023). Also, creating an effective learning organization requires iteratively using action, feedback, reflection, and dialogue to improve the system (Blonder & Rosenfeld, 2019; Reese, 2020; Roegman et al., 2021). No component of the five disciplines works alone; all interconnect to create change for an organization, shrinking the gap between what is intended and what is resulting.

Timeline and Sequence of Events for Strategic Plan Design and Implementation

Recommendations for the sequence of events are illustrated in Table A1. The entire process should take two years and one semester, beginning in a Fall semester, with input from both administration and faculty on what goals a new strategic plan should achieve. Initial meetings should be monthly, among stakeholders from both faculty and administration, and with people from all levels of authority (Schneper, 2020; Senge, 2020; Senge & von Ameln, 2019; Usunier & Squires, 2019). Discussions should be open and should focus on identifying topics for strategic plans. After choosing a strategic plan topic, research should be done by a committee with regular monthly communications with stakeholders to keep them informed. Research should include explorations of how other learning institutions successfully addressed similar problems.

Planning, research, and creation of the program should take a year, with training of all available faculty taking another two semesters to ensure that all current faculty are trained at the beginning of Fall semester. A mandatory, self-paced, online professional development should be used to train the faculty, with one of the training modules being tailored to instructors' specific disciplines. Each module should focus on one aspect of the strategic plan, with interactive practice that enables instructors to experience the strategic plan in action as intended. Topics should include metacognition, PBL design, and use of the VALUE rubric. Piloting, debriefing, and adjustments should occur over one further semester, with full rollout scheduled for the Spring semester beginning Year 3 after the selection of the strategic plan objectives. At the end of the first semester of piloting, surveys should be sent to implementing faculty and the staff of the Center for Teaching and Learning to gather data on their experience of implementation in the classroom, and adjustments to the plan and training should be made.

During the entirety of the strategic plan's implementation, monthly meetings should occur within departments to discuss the plan's design and progress and to determine whether any changes should be made. Surveys like those sent after the pilot semester should be sent to a randomized group of 10-12 faculty each semester to assess their experience with the plan, and these data should be used along with PBL scores to inform the meetings. Further, five to 10 randomly selected PBL assignments should be examined by committee of two to three faculty members at the end of each semester to ensure all assignments are measuring student metacognition and problem solving via the same methods and metrics, and two to three classes' assignments should be rescored by another faculty member to ensure that instructors are utilizing the VALUE rubric consistently. All collected data should be considered during the regular department meetings. Reports should then be passed along to administration and adjustments made to the strategic plan as needed. The key to success is to ensure that communication is open and honest, as well as continual.

Table A1

Proposed Timeline for Strategic Plan Design and Implementation

Activity	Time Table
Dialogues among faculty and administration to select a strategic plan	Monthly over the course of a Fall semester in Year 1
Literature review by a committee, to include how other learning organizations have addressed similar problems	12 months, with monthly meetings among departments to discuss the progress of the plan, provide new input, and new perspectives
Creation of online professional development modules	Last two months of literature review process in Fall Semester of Year 2
Professional development training of all existing faculty. New faculty will train as they join the faculty	Spring and Summer semesters of Year 2
Implementation of strategic plan in piloting classes. Participating faculty surveyed at end of semester.	Fall semester of Year 3
Department meetings for debrief of pilot semester. Results sent to the administration.	End of Fall semester of Year 3
Adjustments made to the plan per faculty feedback	Break between Fall and Spring semesters of Year 3
Full rollout of plan in all intended classes 10-12 faculty surveyed at end of each semester to monitor progress	Spring Semester of Year 3
Meeting among faculty and administration to ensure strategic plan goals are being met and to make adjustments as needed. 10-12 faculty surveyed at end of each semester to monitor progress and inform meeting.	The end of each semester for the duration of the strategic plan

Conclusion

The QEP was viewed by study participants as a worthy effort, but poorly implemented. To ensure effective implementation of future strategic plans with high fidelity, it is suggested to use Senge et al.'s (2012) Five Disciplines as a guideline towards three specific, actionable goals. The goals are improving student metacognition by ensuring faculty understand it and how to elicit it, creating effective, mandatory, science-specific professional development in designing and scoring the PBL assignments with the VALUE rubric, and providing faculty with ongoing support and guidance throughout the implementation of the strategic plan. The five disciplines ensure that communication is open between administration and faculty in terms of what the plan intends to do, what is expected of participants, and what everyone thinks of the plan's design and its implementation as it proceeds. They ensure that everyone feels heard and guided, shares in the vision and collective learning, and has a personal stake in the success of the strategic plan. Finally, approaching a strategic plan from a systems thinking perspective enables all components that influence and are in turn influenced by the strategic plan to be reflected upon and taken into account. A more effective approach to strategic plan implementation will ensure that the plan can be implemented with high fidelity, and the college can make informed decisions about any adjustments that may need to be made to the plan to achieve the ultimate objective of improving learning outcomes for the college's students.

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Appendix B: Faculty Interview Protocol Form

Date of Interview: ____

Participant (Title and Name): ____

Post Interview Comments and Leads:

____

Introductory Protocol:

Nature of study explained: _____

Confidentiality explained: _____

Recording authorized: ________

Introduction:

You have volunteered to be interviewed today. You have been invited to participate because you teach community college science classes and have experience implementing the strategic plan. My research focuses on investigating the fidelity of implementation of metacognitive instruction in a strategic plan as perceived by the science faculty at a community college in the Mid-Atlantic region of the United States.

Participant Background:

How long have you been teaching_____________________________

Are you FT or PT or Dual enrollment?____________________________

What science classes do you teach___________________________________

Educational background (Ed. and/or Bio degree) (how did you come to teaching?)

____

Interview Questions:

1. Tell me about your experience with the Quality Enhancement Plan, in as much detail as possible. In answering this question, you can focus on its components, its implementation in your classroom, or anything else that stands out to you the most when you think about the QEP.

   (Possible follow ups)

   a. How many semesters have you done the QEP PBLs?

   b. How often in a semester do you do a QEP PBL?

   c. *(If response leads here)* You say your experience was good/bad. What things influenced that?

2. How would you describe any training you have done for the QEP? Include both training offered by the college and any that you have sought out independently

   (Possible follow ups)

   a. What are the criteria for successful achievement of the learning objectives? (Were they clearly identified?)

   b. How were the design of the PBLs and the use of the VALUE rubric explained?

   c. How prepared did you feel before the first time you implemented the QEP? How does that compare to now?

   d. *(possible prompt)* Could you expand on that?

3. What special pedagogical knowledge do you perceive as being essential to successfully implementing the QEP?

(Possible follow up)

How much of that knowledge did you have in place before any training or research you did for implementing the QEP?

4. Please describe a given PBL assignment that you use in your science class for the QEP.

(Possible follow ups)

a. How do you explain the VALUE rubric's criteria to students in terms of exactly what the assignment is asking of them?
b. How do you use item 2 on the VALUE rubric, the item regarding multiple approaches to solve the identified problem, to score student responses to the PBL assignments?
c. How does that compare with how you use item 3, the item regarding multiple solutions?
d. What tools or methods do you use to track students' progress?
e. How do you go about giving students opportunities to use feedback to improve?

5. What are examples of student responses that hit the expected benchmark of 2, what merits excellent marks of 3 or 4, and what misses the benchmark on Item 5 on the rubric, the item about analyzing their chosen solution?

a. (Possible follow up) What sort feedback do you get from students on the PBL assignments? Please share an example?

6. How do you go about adapting assessments to better meet the criteria listed in the VALUE rubric?

  a. *(Follow up):* What information/data do you use to guide changes made to the assessments?

7. Circling back to pedagogical knowledge: The QEP involves the implementation of metacognitive instruction to increase problem-solving skills in students. How does metacognitive instruction appear in your implementation of the QEP?

  a. *(Follow up)* What are examples of ways you have observed your students use metacognition in your science class? What type of learning activity or experience was it?

8. How do you feel the overall implementation of the QEP is going in terms of its objectives of increasing metacognition and problem solving in students?

9. Before we conclude this interview, Is there anything about your experience with the Quality Enhancement Plan that we have not had a chance to discuss?

   Possible follow up prompts that I will keep visible as I interview participants:

   a. Could you give me an example?
   b. Tell me more about...
   c. What did you mean by….?
   d. What do you think about….?