A Qualitative Review of Early Undergraduate Research from the Perspective of Faculty Members, Academic Advisors, and Undergraduate Researchers (Students) at a Two-Year College

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The academic advantages that students gain from participating in undergraduate research have been well documented. Undergraduate research opportunities provide real-world experiences outside of a traditional lecture class, giving students a chance to improve their understanding of research methods, practice communication skills, and collaborate in a professional manner with others (Lopatto, 2010). Our findings also suggest opening a forum for increased communication between faculty members and academic advisors, which may help to identify "research ready" students sooner. Faculty members, academic advisors, and students with early undergraduate research experience also agree upon the multiple values found in an undergraduate research experience; however, groups tended to disagreed on the specific skills gained. The major challenge may be to develop a unified undergraduate research program that inspires students to achieve their personal goals and developmental skills, while also advancing the scientific and academic knowledge that can advance them into their future careers.

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There are multiple facets of the higher educational process that students must

successfully navigate in order to advance academically, professionally, and personally. Students

starting out at community colleges and two-year colleges may face the even greater challenge of

transitioning to a new college and campus with much of their academic program already

completed (Perez, 2003). While faculty members play a critical role in guiding students through

many of the challenges and transitions that might occur during a student's academic journey,

individualized mentoring through undergraduate research experiences are often not available

until the final two years of a student's academic program. This deferral occurs even though there

are a number of academic and personal benefits gained from student participation in

undergraduate research experiences (Bauer & Bennett, 2003; Knoll, 2016; Kuh, 2003; Lopatto,

2006; Lopatto, 2010).

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have been well documented. Undergraduate research opportunities provide real-world

experiences outside of a traditional lecture class, giving students a chance to improve their

understanding of research methods, practice communication skills, and collaborate in a

professional manner with others (Lopatto, 2010). There are also opportunities to apply academic

concepts outside the classroom while improving critical thinking skills (Knoll, 2016).

Undergraduate research experiences engage students at a deeper level, involving students in a

more productive way, which may result in a more successful, and often a more meaningful

academic experience (Kuh, 2003). Students who participate in undergraduate research also show

an increased interest in continuing their studies (Guterman, 2007; Lopatto, 2010), resulting in

higher retention rates (Craney, McKay, Mazzeo, Morris, Prigodich, & de Groot, 2011; Nagda,

Gregeman, Jonides, von Hippel, & Lerner, 1998) as supported by an increase in students' GPA

(Fechheimer, Webber, & Kleiber, 2011), and some increased interest in graduate studies

(Hathaway, Nagda, & Gregerman, 2002). Participation in undergraduate research also facilitates

the development of skills that are necessary to successfully transition into a professional career

(Kinkead, 2003).

The practice of developing and carrying out a research project can be a pivotal turning

point for students in influencing their choice of career (Guterman, 2007; Lopatto, 2010), personal

development, and the development of professional skills that are desired by employers (Kinkead,

2003). The majority of students report a gain in self-confidence and a sense of accomplishment,

which leads to a belief that they are able to work on their own to meet a challenge (Lopatto,

2006; Lopatto 2010). Other research suggests that students participating in undergraduate

research develop a greater capacity for time management and good organization, professional

decorum and leadership skills, and improved critical thinking and problem solving abilities

(Bauer & Bennett, 2003; Guterman, 2007; Knoll, 2016; Lopatto, 2010).

Although some researchers address the potential challenges that may be faced by students

and faculty members who engage in undergraduate research, studies rarely include the special

challenges faced at a two-year institution. Most two-year colleges lack formalized undergraduate

research programs, which may result in less understanding or consensus about what

undergraduate research involves and how it may benefit students (Perez, 2003). Additionally, the

heavily teaching-focused mission of most two-year institutions may foster a view or perception

that learning only occurs inside the classroom. Two-year colleges, particularly those with an

open access model, may serve a higher proportion of underprepared students. These students

may overlook an opportunity to engage in research believing that any additional time they have

must be spent taking core college-level classes. Moreover, participation in undergraduate

research requires a long-term commitment to a time-consuming endeavor (Knoll, 2016), and it

may not be possible given the time constraints and other obligations of students in two-year

programs. For faculty members and students who are fortunate enough to be involved in

undergraduate research projects, a lack of funding can become a persistent problem. Finally,

administrators at teaching-focused institutions cite the time-commitment that their faculty must

make as a drawback, and they may have the perception that first- and second-year students may

not be ready to engage in undergraduate research (Perez, 2003).

Due to the special challenges faced by students at two-year institutions, early

undergraduate research experiences may be exponentially important. After all, undergraduate

students gain significantly, especially minority and disadvantaged students (Knoll, 2016), both

academically and personally, from their undergraduate research experiences. These may lead to a

greater success when transitioning to a new college and campus to complete a four-year degree.

With this in mind, a group of faculty members at the University of Cincinnati Blue Ash College

(UCBA) came together to form a faculty learning community (FLC) to explore the benefits and

challenges that might occur for students who participate in undergraduate research at a two-year

institution. Our hope was to increase opportunities and resources for undergraduate research at

our college, which is an open-access college serving approximately 5,000 students ($M_{age} = 23$

years) who are enrolled in a variety of associate degrees and transitional programs, while also

offering developmental courses in math, English, and reading (University of Cincinnati Blue Ash

College [UCBA], 2015). The majority (64%) of students are fulltime students, and 58% are

female. Similar to many community colleges across the nation, 40% of UCBA enrollees are first

generation college students with 31% from ethnic minority backgrounds, with the majority

(21%) of those students African American.

As a first step to encouraging greater participation in early undergraduate research on our

campus, FLC members first sought to examine awareness of undergraduate research at UCBA

with the goal of sharing outcomes that might encourage the advancement of undergraduate

research projects. This paper is a qualitative review of the perceived benefits and challenges

regarding early undergraduate research experiences from the viewpoint of faculty members,

academic advisors, and several students who completed undergraduate research projects at

UCBA. The aim of this article is to describe and reflect on the perceptions of undergraduate

research from the three perspectives to offer ideas that might be used to advance undergraduate

research on our campus.

Methods and Measures

Group 1 – Faculty Members

The first group of participants represents a mix of faculty members who teach at four-

year and two-year public universities as well as at liberal arts colleges. Part of the faculty

member data was collected from faculty members at colleges and universities throughout the

United States (n = 8) who met to offer opinions and reflective statements during the *46th Annual*

Conference of the International Society for Exploring Teaching and Learning (ISETL) in Salt

Lake City on October 14, 2016. This group of faculty members was asked following questions:

(1) What is your definition of Undergraduate (UG) Research? (2) How might undergraduate

research benefit students early in their academic careers? (3) What is your role, college type,

major program when working with students? (4) How might faculty identify students who may

benefit from UG Research? (5) What are some potential challenges to promoting early UG

research? (6) What suggestions do you have for mitigating the potential challenges? The second

part of the faculty member group were from UCBA (n = 6). These faculty members responded to

an online survey, Survey Monkey, during the summer of 2016 to offer their viewpoints and

experiences with undergraduate research. UCBA group members were asked questions 1 – 6

(above), and were also asked: (7) Describe any resources or opportunities you are aware of that

might benefit other faculty members who are interested in becoming mentors for UG research.

(8) Describe any possible benefits experienced by faculty who serve as mentors for UG research.

Group 2 – Academic Advisors

Qualitative statements and viewpoints were collected from a group of academic advisors

(n = 11) who gathered at the *5th Annual University of Cincinnati Academic Advising Conference*

on September 21, 2016. Participants answered anonymously by writing their responses to the

questions as they were posted to a banner for discussion during a conference session regarding

undergraduate research. Academic advisors were asked for their responses to the following

questions: (1) What is your definition of Undergraduate Research? (2) How might UG Research

benefit students early in their academic careers? (3) What is your role when working with

students and on what campus? (4) How might advisors identify students who may benefit from

UG Research? (5) What are some potential challenges to promoting early undergraduate

research? (6) What suggestions do you have for mitigating the potential challenges?

Group 3 – Undergraduate Researchers (Students)

The third set of responses was gathered from two students (n = 2) who met with one of

the FLC group members to discuss the benefits and challenges of having participated in early

undergraduate research while attending UCBA. These students were asked: (1) How did you

become involved with undergraduate research? (2) What are some of the benefits of participating in undergraduate research? (3) What are some of the challenges of participating in undergraduate research? (4) Would you recommend undergraduate research, and what advice would you have for another student? (5) Did participating in early UG research help you transition to your junior and senior years at the university? (6) You mentioned Mediated Minds; could you tell me more about this undergraduate conference experience?

Results

A qualitative review of the reflective feedback was completed to explore the benefits and challenges of early undergraduate research experiences from the perspectives of faculty members, academic advisors, and students who had participated in early undergraduate research during their time at a two-year institution. In order to fully understand undergraduate research experiences from the perspective of the participant groups, we used an open coding method, which is a comparative examination founded in grounded theory design (Salkind, 2010). Following a progression of data collection, data analysis, and assessment of results allowed common themes to emerge from the data, which resulted in four identifiable findings that were most frequently communicated by all three groups; faculty members, academic advisors, and students with early undergraduate research experience (see Figure 1).
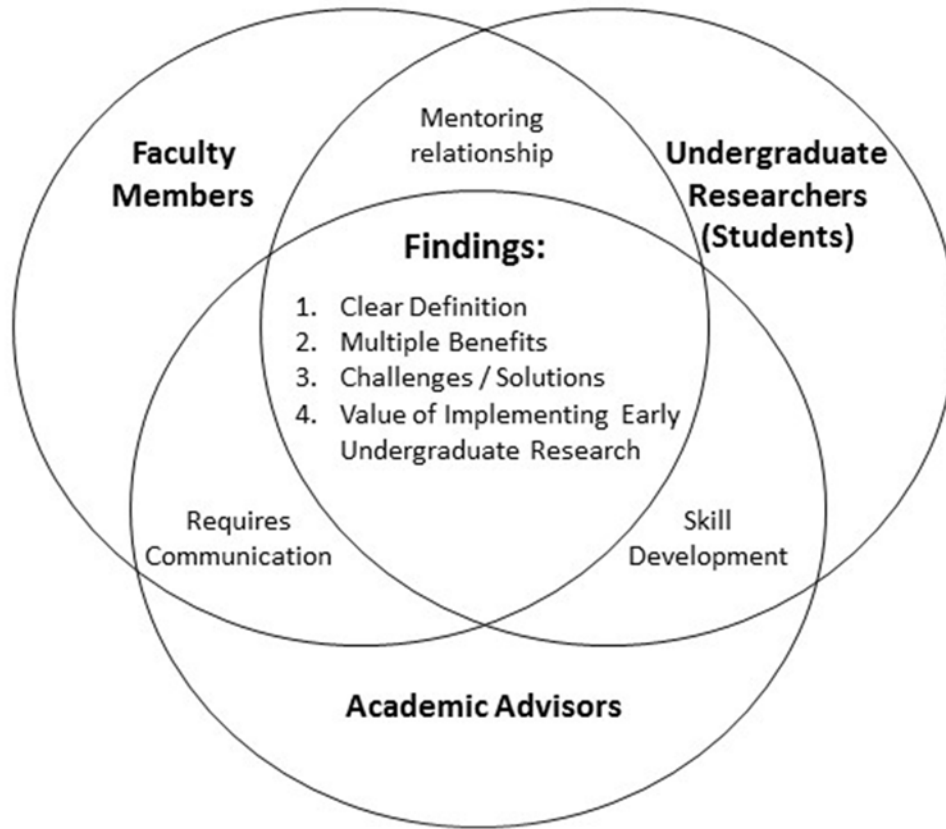
Figure 1. Early undergraduate research findings and future challenges as emerging from the perceptions of faculty members, academic advisors, and undergraduate researchers (students).

Finding 1: A Clear Definition

Faculty members, academic advisors, and students with early undergraduate research experience agreed about a broad definition of undergraduate research. Most faculty respondents indicated that undergraduate research consisted of developing a question that was explored through "writing, presentation, and [potentially] a publication." From the viewpoint of faculty members, this work would be done with a faculty member to develop a concept or hypothesis, and then students would learn to use discipline-specific research methods beyond just a literature review. Often experimental studies were mentioned, but this was not a necessary component.

One faculty member reflected on the aspect of "experiential learning" where a student would draw "conclusions and connections from experiences/knowledge outside their easy reach." Advisors thought of undergraduate research in terms of "engaging as both participants in research studies and as co-investigators." The majority of academic advisors also thought of undergraduate research as "a way for students to engage in their discipline and to connect with faculty and graduate students," and as "a way to get students to think about graduate school and furthering their education." Student responses to this question centered on specific aspects of their own projects such as "collecting data, putting together a questionnaire," but always mentioned the importance of presenting the work to a larger audience such as in a presentation or publication. Undergraduate researchers also agreed that the undergraduate research experience should be an application of what one is learning in the classroom.

Finding 2: Multiple Benefits

Faculty members, academic advisors, and students with early undergraduate research experience agreed on the many benefits of undergraduate research. Faculty respondents indicated that primary benefits to students were learning how to work independently, developing research skills, and developing a good working relationship. For example, the majority of faculty members thought that undergraduate research offered an "early investment in learning" and that "Students learn independent research skills and responsibility." The majority of faculty members also emphasized the role of subject/major, career choice and policy choices, or preparation for graduate school." Academic advisors cited the benefits of an "early introduction to an element of their career they'll be a part of later in life" and "setting themselves apart from peers" to "make connections" and "inspire them to pursue grad degree" or "future degree and life-long learning." All three groups noted the importance of building relationships with faculty members; however,

students especially emphasized the idea of having a "mentor" and the importance of a mentoring relationship. Students also emphasized the idea of learning "to become resourceful, take initiative, to think critically and be a problem solver. It also helps students to develop time management, relationship building and presentation skills" and "being able to be in front of a classroom and begin able to speak at a conference" and "being able to be confident" over the concept of learning elements of their future career.

Finding 3: Challenges and Possible Solutions

Faculty members, academic advisors, and students with early undergraduate research experience agreed about specific challenges and possible solutions to those challenges. Overall, faculty members, academic advisors, and students noted that "time" is a particular challenge. One faculty member responded, "So little time, so many undergraduates." Academic advisors agreed that the "time commitment necessary from students; [and] money" would be a barrier to students who were interested in undergraduate research. Students mentioned time as an issue, but with a different focus. Student researchers were more likely to discuss issues of time as having to do with prioritizing responsibilities and juggling their schedule. For example, one student researcher said, "you know, balancing out life and balancing out being a student and balancing out being a part of the research really took a toll on my personal time and so I had to sacrifice some of the things that were important to me and undergraduate research is what I chose."

A number of faculty members were concerned about student readiness. For example, one faculty member said students would not "know what research is – and they are overwhelmed," while others were concerned about "low student self-confidence" and "getting students to the level of competency." Academic advisors were most concerned about "connecting faculty [members] with students." This was expressed in several ways such as, "Making 1st and 2nd year

students aware of the opportunities they have on/off campus" or "Knowledge of opportunities ([we] need this)." Other concerns brought up by academic advisors were for "faculty buy-in," "explaining the benefits to students" and for "finding the right student" because it would be "Hard to judge a student's work ethic/seriousness in participating in research."

As explained previously, students were more concerned about prioritizing time and having to make choices about what was important. Other challenges brought up by student researchers had to do with the specific details of their research project. For example, one student mentioned, "the barriers people [participants] have that prevent them from participating in research studies. Sometimes is difficult to get the research participants in one place at the same time due to work schedule" and "there is also the barrier of lack of trust especially when working with vulnerable populations." Another student researcher suggested a high dropout rate as one of the biggest challenges to her undergraduate research project saying, "the amount of students [participants] we were expecting to have were not a part of the study at the end, so the results were skewed."

Finding 4: Value of Implementation

All three participant groups, with some minor variations, saw early undergraduate research experiences as valuable. For example, one faculty respondent indicated that undergraduate research is particularly beneficial for "students who mostly don't even know why they're in college or who are only interested in vocational and economic outcomes." Academic advisors agreed that undergraduate research has value as shown in Finding 2 as well as in comments such as, undergraduate research helps students by giving them "exposure to areas of research [so] that they find out what they like and/or dislike." However, academic advisors seemed less concerned with the timing of the undergraduate research experience, but were more

focused on how to identify students and how to make connections between faculty members and students who might be interested in the undergraduate research experience.

Student researchers, on the other hand, were very positive about the timing of an early undergraduate research experience. For example, one student stated, "The benefits you acquire by learning to do research during the first two years of college are extremely important throughout your scholarly years" because you build important personal skills, like time management. Another student elaborated on this idea by saying, "I was really grateful to connect with a faculty member early in my career at UCBA…because there are so many things that you learn along the way, not just about the research, but about who you are as a student…" The student expanded upon her support for early undergraduate research experiences by explaining that while upper level students are given a great number of opportunities, they also have greater challenges during their junior and senior years. The student asserted:

I think it should be the opposite. More opportunities [for early undergraduate research] because it will encourage and strengthen the skills that [students] are learning in the classroom. And, by the third and fourth years… you are already slammed with so many classes and harder classes, and classes that take up too much of your time. Whereas your first two years, you really get to be involved and you really have that time to just take it all in rather than hurrying and trying to get it out of the way.

Thus, although participant groups agreed upon many of the educational values stemming from an undergraduate research experience, there still seems to be some difference of

opinion when it comes to importance of starting the research experience early in a student's academic journey.

Discussion of Findings

The purpose of this case study was to complete a qualitative review of the perceived benefits and challenges regarding early undergraduate research experiences from the viewpoint of faculty members, academic advisors, and students who completed early undergraduate research projects at UCBA. There has been a special focus on describing each group's perceptions with the goal of improving the number of opportunities for early undergraduate research on our campus. Generally, reflective measures suggested four main findings, which were most frequently communicated by all three participant groups. Moreover, an inductive analysis of these findings revealed a logical relationship between participant groups (see Figure 1). The diagram shows four main findings with suggested interconnected relationship among the groups. We found agreement for a clear definition of what it means to conduct undergraduate research. Second, participants across all three groups identified multiple benefits for students participating in undergraduate research experiences. Third, participants had some agreement regarding the challenges faced by undergraduate researchers (students), with each group focusing on specialized concerns, from their own perspective. Finally, participants across all groups indicated that implementing undergraduate research had value, with students identifying several advantages of earlier implementation, during the first and second year of their academic journey.

Participants' clear definition of undergraduate research is in accord with the research literature, which defines undergraduate research as original thought or work, under the broad

range, including "scientific inquiry, creative activity, and scholarship" (Kinkead, 2003). Thus, undergraduate research does not require, but may follow, the scientific method. Another important aspect of undergraduate research that was found by Kinkead and also recognized by faculty members, academic advisors, and undergraduate researchers (students) in our study with was the importance of sharing the newly discovered information, either as a professional presentation or potential publication in a peer-reviewed journal.

Participants mentioned a number of benefits that grow out of the undergraduate research experience. These benefits tend to fall into two trajectories, while also splitting along group lines, perhaps due to group member's role in the undergraduate research experience. Faculty members and academic advisors appeared to emphasize the professional and academic benefits that come from engaging in one's discipline and exploring career paths, the latter of which was emphasized primarily by academic advisors. Students emphasized gains in personal development such as critical thinking, problem solving, and time management. Additionally, students emphasized developing a good working relationship with a mentor, and this is a component that has been cited as the most common area requiring improvement in a recent survey of the benefits of undergraduate research experiences (Russell, Hancock, & McCullough, 2007). The important social aspect of mentoring was not as recognized by faculty members or academic advisors in our study. While the benefits regarding the advantages of undergraduate research experiences are found throughout the research literature (Linn, Palmer, Baranger, Gerard, & Stone, 2015), much more attention has been given to the role and impact of faculty members compared to the relatively understudied role and impact of academic advisors. Our study suggests faculty members tend to focus on students learning academic subjects. At the same time, academic advisors tend to view undergraduate research as a means to a student's career choice or path,

while students tend to look at more practical matters and the importance of a mentoring relationship.

Generally, faculty members, academic advisors, and students noted time issues as the most important challenge to early undergraduate research. Although time can and always will be a challenging factor, students seemed to view time issues as more of an opportunity to build time management and personal and organizational skills, which has been found throughout the literature as one of the main benefits of an undergraduate research experience (Bauer & Bennett, 2003; Guterman, 2007; Knoll, 2016; Lopatto, 2010). Another challenge that was brought up by faculty members and academic advisors, but not students, was finding resources to support undergraduate research. Finally, a common perception by faculty members was that first- and second-year students might not yet have the work ethic and academic background necessary for conducting research. However, this seeming limitation was seen as something that faculty members could strategically work with by effectively guide students, as long as both faculty members and students had sufficient resources in terms of time and money. In the current study, students appear to welcome this guidance and even recognize the importance of the faculty-student relationship as a mentoring experience.

Finally, this study found that faculty members, academic advisors, and students with early undergraduate research experience agree on the value and appear to be open to the idea of expanding undergraduate research opportunities at our college. Early undergraduate research experiences, specifically those offered during the first two years, were seen as valuable for a number of reasons depending upon the group members' role. From the perspective of academic advisors, the early investment in learning pays off in terms of early exploration of majors, and by extension, early exploration of careers. This viewpoint is consistent with findings in the area of

benefits to students who participate in early undergraduate research. For example, early research experiences give students more time to develop and set themselves off from their peers, and more time to develop connections and a network (Craney et al., 2011; Nagda et al., 1998). Early research experiences have also been found to ameliorate some of the readiness concern raised by faculty members regarding outreach to underrepresented populations and increasing retention (O'Donnell, Botelho, Brown, González, & Head, 2015).

Limitations of this Study

This research provided the opportunity for a qualitative review of the perceptions of three very different groups – faculty members, academic advisors, and students with early undergraduate research experience. The rich detail gained from a comparative examination of the data allowed us to identify themes that can be used to guide, and to generate hypotheses for further research with a greater sample size. Findings from this study can also be used to meet the challenges of our students and facilitate enhancement of our own undergraduate research program. However, because our college an open-access institution, serving a large number of first generation college students from ethnic minority backgrounds who are enrolled in a variety of associate degrees and transitional programs, while also taking developmental courses in math, English, and reading (UCBA, 2015), our findings may not be generalizable to other academic settings.

Conclusions and Future Directions

As a first step to encouraging greater participation in early undergraduate research on our campus, we examined awareness of conducting early undergraduate research with the goal of sharing outcomes that might encourage the advancement of undergraduate research projects.

This paper serves as a qualitative review of the perceived benefits and challenges regarding early undergraduate research experiences from the viewpoint of faculty members, academic advisors, and students who completed undergraduate research projects at UCBA. We found four areas of agreement across the participant groups, which were outlined as the findings of this paper. However, we also found three areas that still need clarification across group members and, perhaps our college community, so that we might meet our goal of increasing undergraduate research opportunities at our college.

First, although all three groups noted the importance of students building relationships with faculty members, only students emphasized the special relationship between faculty members and students in terms of "mentoring." According to Kinkead (2003), the mentoring relationship is a "hallmark" of undergraduate research. Craney et al. (2011) agree with this assertion. In their research, they found the mentor-mentee relationship to be a strong predictor of learning. This relationship is so important that Kinkead suggests some faculty members may not be ready and may consider looking for training or guidance before entering into a mentoring relationship with an undergraduate researcher (student). Once faculty members have a clear understanding of this role they can move to work collaboratively with their students, promoting student achievement (Craney et al., 2011). Although faculty mentors may determine the specifics of a research project, students need to be able to take a project from beginning to the end, while learning to handle increasingly complex tasks (Kinkead, 2003), moving the faculty member into the role of mentor or co-researcher.

A second area that may need clarification or improvement and may be one of the main barriers to identifying students and connecting them with eager faculty mentors is the special challenge of developing improved communication between the participant groups. While all

participant group members displayed a keen interest in undergraduate research, it became clear from their answers that establishing a better communication network between faculty members, academic advisors, and students could bring research opportunities to the attention of students earlier in their academic careers. Academic advisors are also in an excellent position to identify students who are "research ready," but also to ensure that faculty members reach out to underrepresented student groups to offer research opportunities. Focusing on better communication between faculty members and academic advisors, with a strong outreach to students was seen by academic advisors in the current study as a good way to make everyone aware of the benefits of early undergraduate research and the opportunities on our campus.

The final area that may need clarification and enhancement is the area of skill development as it applies to goal setting for individual faculty members and student researchers. There was considerable agreement regarding the learning objectives cited by most faculty mentors – Students need to acquire an understanding of the scientific method. Yet, students did not mention this ability as the most important outcome, or skill. Instead, student participants in this study cited gains in developmental growth and other personal skills such as good time-management, strong leadership, effective problem-solving, improved critical thinking, professional competence, better ability to handle uncertainty, and improved organization. This suggests faculty members and student researchers may have incongruent objectives when collaborating on an undergraduate research project. There is evidence of this incongruence throughout the literature (Lapatto, 2003, March; Falconer & Holcomb, 2008). Still, we believe this outcome needs further exploration, especially because many of our students are first generation and diverse students who may benefit differentially (O'Donnell, et al., 2015).

Overall, the findings described in this paper emphasize the benefits and challenges regarding early undergraduate research experiences from the viewpoints of faculty members, academic advisors, and students who completed undergraduate research projects at UCBA. We found conformity across the groups regarding a broad definition of undergraduate research. Ultimately, faculty members, academic advisors, and students with early undergraduate research experience identify undergraduate research as a learning experience that may be more fully explored through a mentoring relationship between faculty members and students, which is consistent with findings by Zachary (2012). Even when the details varied, participant groups also agreed on the many benefits of the early undergraduate research experience. Faculty members, academic advisors, and students with early undergraduate research experience agreed that finding time was the most challenging aspect to the undergraduate research experience with students recognizing the need to prioritize. Our findings also suggest opening a forum for increased communication between faculty members and academic advisors, which may help to identify "research ready" students sooner. Faculty members, academic advisors, and students with early undergraduate research experience also agree the multiple values found in an undergraduate research experience; however, groups tended to disagreed on the specific skills gained. While academic advisors tend to view undergraduate research as a means to a student's career choice or path, students tend to look at matters that are more practical to the research project and the importance of a mentoring relationship. At the same time, faculty members focus on the academic performance and gains in understanding the scientific method. Thus, the major challenge may be to develop a unified undergraduate research program that inspires students to achieve their personal

goals and developmental skills, while also advancing the scientific and academic

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