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ABSTRACT

        This study identified four different categories of
intellectual outcomes reported by long-term research collaborators, adding
insight to different approaches collaborators use to construct theory.
Members of 19 collaborative pairs were interviewed. Each pair included at
least one member with the rank of associate or full professor at a research
university. Thirteen pairs earned doctorates in the same academic discipline;
six pairs earned doctorates in different disciplines. The four categories of
responses that emerged were: (1) efficiencies of practice; (2) nuance in
thinking; (3) coming up with the big picture; and (4) challenging the gospel.
For 7 of the 19 pairs, efficiency gained through combined efforts was the
outcome most frequently mentioned. Members of five pairs described advances
in thinking, or sharpening thinking through collaboration as the primary
outcome of collaboration. Almost all participants pointed to the impact of
collaboration on the quality of the work produced. Findings suggest a number
of ways to operationalize the outcomes of a body of work that could provide a
framework to assess quality of a publication or body of work in terms of its
contribution to knowledge. (SLD)

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Outcomes of Long-Term Research Collaboration

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ABSTRACT

This paper identifies four different categories of intellectual outcomes reported

by long-term research collaborators and adds insight to different approaches

collaborators employ to construct theory.

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Outcomes of Long-Term Research Collaboration

Elizabeth: It almost sounds like…not piggy backing. You know when

children jump over each other's backs and then the idea moves forward.

Carol: Leapfrog.

Elizabeth: That's exactly the word I was looking for.

Carol: Yeah. Yeah. Yeah. That is exactly right. Like no one is ahead. It's

just that the conversation keeps moving. When we trade [manuscripts],

it's not like the absence of trust. It's not the presence of correction.

Elizabeth: So this is how knowledge moves forward, in small increments?

Carol: Increments and them sometimes, big fat radical leaps.

Whether it be through the informal process of interaction or the more
formal process of coauthorship, the assumption of a link between collaboration
and faculty productivity is implicit in the value of collegiality, one of the
principle norms of science. Perhaps because of the effectiveness of teamwork in
the for-profit-sector, funding agencies like the National Science Foundation
(NSF) have followed suit by inserting a stipulation for cross-disciplinary

collaboration in many of its funding proposals. The leapfrog metaphor used by the prolific author quoted above illustrates how collaboration can move thinking forward both incrementally and in "big fat radical leaps" with the draft of a manuscript as the medium of exchange.

While the implicit assumption is that there is a positive relationship, the empirical literature has failed to conclusively demonstrate a link between collaboration and innovation (Austin, 2001). Despite an increase in the amount of collaboration among faculty in most academic fields, the literature is inconclusive about the relationship between collaboration and scholarly productivity, as measured either by quantity or quality. At least one author, Vera John-Steiner, has gone so far as to say that "transformative change *requires* joint efforts" [italics added](2000, p. 203). Most authors are more guarded in their support of the contribution of collaboration to quality. Smart and Bayer (1986) found, for example, that while acceptance rates in journals were higher for co- and multiple-authored manuscripts than single-authored ones, there was little evidence to support the idea that quality was better, as judged by the long-standing measure of impact or recognition, citations. Prolific researchers collaborate more than other researchers, but it is not clear whether collaboration leads to increased productivity or whether academics who are collaborative by nature are more productive (Austin & Baldwin, 1991).

Outcomes of collaborative efforts by academics have generally been conceptualized as the factors that contribute to the success or effectiveness of the

team (Lattuca, 2001). Intellectual outcomes of interdisciplinary scholarship have been left, according to Lisa Lattuca, "virtually unexamined" (p. 50). Assessing the intellectual outcomes of research is one way to explore the relationship between collaboration, quality, and innovation.

The purpose of this inquiry is to identify different types of intellectual outcomes identified by long-term research collaborators. Intellectual outcomes refer to the perceived contribution of a joint publication and/or project to scientific knowledge. I interpreted any statement that reflected a judgment about the recognition, quality, impact, or receptivity of colleagues to a jointly authored publication as a reflection of an intellectual outcome. These also included statements about the impact of the collaboration on research output. These outcomes do not refer to other types of personal or professional outcomes of collaboration or to statements about the outcomes of research collaboration in general.

Review of Relevant Literature

Innovative work in the academic arena would be expected to be marked by theory development or the re-conceptualization of paradigms that have become entrenched in an academic field. Ann Austin and Roger Baldwin (1991), authors of what is probably the most comprehensive contemporary book about faculty collaboration, cast theory building as an activity undertaken by a solitary scholars in an immature or emerging field where consensus has yet to coalesce about the central theoretical and methodological paradigms in the field. Research

collaboration most often characterizes the work of faculty in mature, high-consensus fields, such as physics and chemistry, where there is agreement about the central paradigms and where it takes the form of theory testing (Austin & Baldwin). The ability to establish a clear division of labor with little negotiation and ease of communication facilitated by shared language and agreement about core concepts are reasons why research collaboration is a more common practice in high-consensus than in low-consensus fields. Austin and Baldwin's conclusions would lead to the expectation that theory development would rarely be identified as an outcome of research collaboration.

Lisa Lattuca, another author who used empirical methods to explore the topic of collaboration among faculty, identified both professional and intellectual outcomes her faculty informants attributed to interdisciplinary research and teaching. Lattuca used an individualistic perspective and framed these outcomes in terms of professional development and achievement. Professional outcomes included tangible rewards such as advancement in rank, conference presentations, and publications. Intellectual stimulation, learning, and a new perspective on a disciplinary problem were intellectual outcomes. Lattuca found that while most of her informants tried to balance disciplinary and interdisciplinary "ways of knowing," they remained grounded in their academic disciplines. "Radical epistemological change is not common," she noted (p. 211).

As faculty have been found to be quite accurate in self-reports of their total number of publications (Creswell, 1985), I would also expect them to be

attuned to the reception their work is receiving from colleagues. At research universities where research productivity is a central criteria for advancement, faculty members are likely to be aware of who is reading their work, using it as a text for instruction, or as a spring board for their own work. Insight about the reception of their work comes from such sources as formal feedback from reviewers of manuscript submitted to peer reviewed journals, the comments of discussants at conferences, published reviews of books, and other sources such as informal inquiries from graduate students and colleagues. Prolific senior scholars, such as those who are the informants for this paper, are often in frequent communication with a national and international network of colleagues who share similar interests. They are particularly likely to be able to gauge the impact of their work to the field.

Lattuca (2001) catalogued a number of different ways that her informants felt that their interdisciplinary teaching and research advanced their own career. This is not the approach I take in this paper. Instead, I examine how participants framed the contribution of their work to knowledge. A disadvantage of this approach is that it does not assess the full range of different types of scholarship, including scholarship that impacts practice. The advantage of this approach is that it parallels the academic reward structure for faculty at research universities where advancement is ultimately tied to recognition. An additional advantage is that if offers a framework to assess the quality of faculty publications. This is the

dimension of faculty research and publication productivity that has remained

notoriously difficult to assess.

Method

Sample

The interview sample contains members of 19 collaborative pairs where I

interviewed one or both members of a pair or team (N=31). Each pair includes at

least one member who holds the ranks of associate or full professor at a research

university and has published a career total of a minimum of 21 refereed journal

articles and/or book chapters. Most of the participants have published

considerably more than this.

Participants include 13 pairs who earned doctorates in the same academic

discipline (archeology, anthropology, biochemistry, communications, economics,

geology, microbiology, physics, psychology [2 pairs], sociology [2 pairs], special

education) and 6 pairs who earned doctorates in different academic disciplines

(political science-economics, educational policy-psychology, education-

psychology [2 pairs], anthropology-English, English-history). Members of two

additional teams are excluded from this analysis because the teams' primary

mission was not to produce scholarship, but to impact practice.

Unlike the hierarchical, junior-senior/mentor-apprentice configuration

that seems ubiquitous in the literature dealing with collaboration, members of

most of the pairs could be described as career-equal or career symmetrical (13 of

19 pairs). In other words, the majority of participants did not describe significant

difference in career age or stage or characterize the relationship as one involving

a mentoring or a hierarchical relationship. Participants are identified by

pseudonyms.

Data Collection

Multiple sources of data were collected for each of the collaborative pairs.

These include: (a) a one-on-one interview with one or both members of the pair,

(b) a copy of their vita which I used to assess publication levels, and (b)

document analysis of selected coauthored publications when they could inform

the interview and/or analysis.

The interview. After collecting background material, including a copy of a

curriculum vita and a signed informed consent form, I used a semi-structured

protocol as a guide for the interview. The protocol contained questions relating

to the dynamics and outcomes of a specific collaborative relationship. I tried to

create a climate for a rather free-flowing conversation, so I did not necessarily

ask the interview questions in the exact same order or way but at a time where

they seemed to fit in the flow of the conversation. Interviews normally lasted

between 45 and 90 minutes. On several occasions, the interviews lasted so long

that I re-scheduled an additional time to complete them. The interviews were

tape recorded and transcribed verbatim.

The focus of this paper is responses to the first question in the protocol. I

asked participants to describe the nature of the work they had done with a

collaborator who they had already identified and what they saw as the primary

outcomes of the work they accomplished together. While I did not directly ask if the their work was theoretical, it was generally in the context of their responses to this first question in the interview that this information emerged.

Data Analysis

Data were analyzed using the constant comparative method (Strauss & Corbin, 1994). The process began with open coding, expanded to clarification of the definition of codes and elimination of codes that did not prove significant across cases, moved to axial coding that identified connections between categories, and ended with a set of theoretical propositions. Data collection, analysis, and verification occurred simultaneously, utilizing an iterative process. Given the complexity of data, interviews were read and coded many times over a number of years until I developed a satisfactory coding scheme and method of analysis.

Trustworthiness. I used a number of strategies to enhance the trustworthiness of the findings. These included (a) triangulation by using multiple sources of data, (b) thick description, and (c) member checks. Interviews with a second member of a pair afforded the opportunity to test the accuracy of my interpretations and to follow-up on responses from the initial interview that seemed unclear or contradictory.

Findings

Four categories of responses emerged from what participants identified as the primary intellectual outcomes of coauthored work. I have named these (a)

efficiencies of practice, (b) *nuances in thinking*, (c) *coming up with the big picture*, and

(d) *challenging the gospel*. I used the full context of all of the available information

I had to make a judgment about what single category each pair was most closely

aligned with.

Rather than being discrete, there is overlap among the categories,

suggesting a continuum of outcomes. The interviews were not structured in a

way for me to know if these categories capture a developmental progression.

Table 1 provides a definition for each of the four categories of intellectual

outcomes.

Insert Table 1 About Here

Table 2 provides a more detailed list of the distinguishing characteristics

of each of the categories of intellectual outcomes. These are the statements that

characterize most, if not necessarily all, of those identified in each category.

Insert Table 2 About Here

Efficiencies of Practice

With 7 of the 19 pairs of research collaborators appearing in this category,

efficiencies gained through combined efforts is the outcome most frequently

mentioned by long-term collaborators. It is also the pattern most frequently

captured in the literature, but the one least likely to be characterized as innovative. A key indicator of affiliation with this group is the statement that the collaboration provided an opportunity to conduct an inquiry that would otherwise have been difficult or impossible to accomplish without the labor, skills, and/or expertise supplied by the partner. Another key indicator of affiliation with this group is an emphasis on the enhanced level of publications made possible by the joint/team effort. Efficiency is one of the primary objectives of this kind of collaboration. It was the only category where members emphasized that the project could be completed more quickly or readily because of it was collaborative.

One of the key indicators of affiliation with this category is reflected by a statement made by a participant, Lucian, an economist well advanced in his career, who collaborated with Kevin, a political scientists who is 25 years his junior. Lucian observed, "I was able to do things that I would never have been able to write by myself." Over a period of five years, Lucian and Kevin coauthored six journal articles. Lucian bought the ability to frame the work in the existing literature to the project, while Eric brought advanced statistical skills that were not part of Kevin's training but were absolutely vital to completing the project. While Kevin evaluated the work as having greater impact in political science than economics, Lucian reflected on the impact of an article they coauthored when he said that the "signature piece of our collaboration ... has received considerable attention and a lot of interest from other scholars."

It was not uncommon for participants in all of the categories to identify one of the advantages of a collaborative effort, particularly when the collaboration involved a team, was the amount of data that resulted form their joint efforts. Lee Ann, a microbiologist, provides an example of the emphasis placed by members of the first group on how collaboration, particularly when set within the context of a larger team, can impact output and, consequently, recognition. She speculated that the size of the team and the sheer volume of work they produced allowed them to achieve a "critical mass" where they were able to gain recognition as being among the top experts in the world on a reagent or strain of bacteria.

Marvin, a biochemist in a medical school who studies one aspect of the structure of a ribosome with a male colleague at another medical school in the same state system, reiterated the same theme while explaining how the collaboration is related to innovation. Like others in this group, he said: [it was] "definitely beneficial to both of us because we have both been able to do things that the other one either couldn't do or would have a hard time doing ... you can get things done much more easily and much more quickly." Marvin described a recent break-through in the field of ribosome structure:

> I'm thinking very much in terms of the field that I have been
>
> involved in -- this ribosome structure thing. Just about a month
>
> ago, in an issue of *Science*, there is a series of three or four articles
>
> describing ribosome structure and it is based on x-ray

crystallography. If you didn't know anything about it, there is this

enormous break-through in terms of a structure of an incredibly

complex thing ... If you didn't know anything about the area, you

would think that this had just come down from the sky somehow.

Yet, if you know a little bit more about it, you know that this has

been something that has been building for about the last thirty

years through a whole combination of different kinds of methods.

You could have this structure and really not know much if you

didn't have all of this other stuff to build on. So, it really is an

accumulation that can allow all of a sudden something large and

different to happen. (Marvin, biochemist)

Without giving himself credit for what appears to be a sudden break-

through, Marvin is recasting the traditional view of innovation in science by

pointing out that the break-through is really the accumulation of the work of a

number of different scientists using different methods over a long period of time.

Nuances in Thinking

The group with the second largest number of participants, members of 5

of 19 pairs described advances in thinking or sharpening thinking about a

complex issue as the primary outcome of their collaboration. Members of this

group were much more likely than members of the first group to be involved in

work that they characterized as theoretical. The collaboration contributed to

quality by creating the context to reach a more layered understanding of a

theoretical perspective without causing them to abandon the perspective or to significantly reconsider its core constructs.

Number of publications was not an issue emphasized by members of this group. A member of a cross-sex pair of economists, Sheila, illustrated this point when she said, "You don't want to go to your grave and have your headstone say, she produced 2,000 pages. I can look back over the years that we have worked together and I can tell stories about what we have found that fill in pieces of history, pieces of economic history, that I am pleased with." Like other members of this group, the significance of the collaboration to Sheila was that it allowed her to bounce ideas of an informed outsider who had enough relevant expertise that he could make more than a cursory contribution to the intellectual content of her work.

A member of another pair in this category, Muriel, also observed how the collaboration helped to move her thinking forward. Repeating a sentiment echoed by participants in almost all the categories, she reflected that the sum is greater than the parts when she said, " it is really better than one of us could have written individually." Pragmatic and just as comfortable working alone as with a collaborator, Muriel's word reflect a careful weighing of the costs and benefits of collaboration:

> I don't do collaboration just to do it. It is too much work. It takes a
> lot of time. It can be very frustrating ... I like working by myself. I
> don't seek out collaboration unless it pushes forward what I do in

some ways ... I was trained as sort of an independent,

individualistic academic. She was less so because she was in

psychology. I don't have that kind of collaborative background. So,

the collaborations have to be something that is really valuable.

Something that really moves my thinking forward. I mean, I have

lot's and lot's to do. (Muriel, Educational Policy Studies)

While it comes at the cost of efficiency and a proclivity to work alone, Muriel

collaborates because it advances her thinking and improves the quality of her

work.

A cross-sex pair of psychologists who are also a couple, Diane and Mark,

described how collaboration contributed to the process of theory development.

Trained in the same doctoral program at the same time, Diane became a clinical

psychologist while Mark developed expertise in the psychology of personality.

Suggesting strong similarities in their worldviews and expertise, Mark said: "Our

formal training is different, but considering they are different, they are about as

close as you can get." Like the biochemist, Marvin, quoted in the previous

section, Diane described how she and Mark developed a theoretical perspective

in "bits and pieces" over time:

We have actually over the years developed a couple of basic

theoretical models that have been pretty widely picked up. I guess I

think of that as creative work or at least it comes out of the

literature. We didn't make it up whole cloth. That kind of thing,

you don't just sit down and say, okay, I am going to come up with a

theory. It develops over multiple conversations over the period of

years and also I think out of the process of writing in the first place

… There was this developmental process over a period of years.

When finally things kind of come together, you go, okay, now I

think we got it right. (Diane, psychologist)

Diane's reference to the theoretical perspective being "pretty widely picked up"

reflects an evaluation of the impact of an idea. It means that she is aware that

other scholars have adopted the perspective.

The comments of Gabrielle, a member of research team that has remained

together for almost 20 years, add further insight to the different ways

collaborators construct theory. Describing how theory development and

refinement is both a developmental and iterative process, she said

This thing is growing and changing all of the time. Every time we

do some kind of paper or take on a new project or new topic to look

at, quite often it happens that we go back and we refine or change

or modify or re-check something that was done before. (Gabrielle,

sociologist)

Gabrielle reflected an awareness of the impact of their work and how it fits

within the existing body of knowledge in her field when she said: "the things we

are doing for the most part are thing that other people haven't done before."

Coming Up With the Big Picture

Members of 3 of 19 collaborative pairs identified the ability to merge distinct areas of expertise to come up with the big picture as the primary intellectual outcome of their joint endeavors. The members of each pair were trained in the same academic discipline. A key distinction of the members of this group is that not only were all involved in theory development, but all did so by integrating independent, sometimes competing, theoretical perspectives. This suggests innovation. By contrast, members of the second group developed a more nuanced interpretation of a shared theoretical perspective over time and members of the last group often left differences in interpretation open for further discussion.

A pair of structural geologists, Susan and Leo, illustrate the intellectual challenge of reconciling competing explanations in their work that involves explaining the development of mountain chains. They have spent decades studying an area in California that is the only place in the world where the "hard" rocks that are her specialty and the "soft" rocks that are his specialty are found side-by-side. A couple, Susan and Leo, do not think alike and joke a lot about how the other's explanation is misguided. "We still haven't figured it out. It is just a very complex area," Susan observed wryly. Noting the synthetic dimension of their work together, Leo said

> Working on similar problems, we can combine our information.
>
> Instead of just having a little, small piece of the project we can have
>
> a much bigger project or paper. Merging information, you can

make a synthesis where one person has one part of the puzzle and

the other part is in another person's area. You can come up with the

big picture. (Leo, geologist)

A pair of paleo-anthropologists who study prehistoric remains, Alex and

Victor, mirrored a very similar process of creating an overarching theoretical

explanation by combining different areas of expertise. Earning doctorates from

the same department but in cohorts separated by a few years, Victor's expertise is

in fossil bones; Alex's expertise is in stone implements. After several summers of

fieldwork in a remote location in Southeast Asia, they were able to provide a

theoretical explanation for the extinction of a particular type of dinosaur. They

reached this conclusion by combining Victor's knowledge of "bones" and Alex's

knowledge of "stones" and interpreting the evidence as it appeared side-by-side

in different layers of sediment.

Challenging the Gospel

Members of 4 of 19 pairs explicitly framed key project outcomes as

challenging prevailing disciplinary paradigms. This is the type of outcome that

probably has the most affinity to what John-Steiner (2000) called innovation or

"transformative change." A distinguishing characteristic of members of this

group is that they reported experimenting with a new methodology or inquiry

paradigm during the process of collaborating. Members of this group were the

only participants to mention risk-taking and/or negative feedback from

colleagues. All of the collaborators in this group aimed to be interdisciplinary by

virtue of their ambition to reach audiences in more than one academic discipline. Members of several pairs identified with other categories may have achieved this outcome as well, but they are not classified in this group because they did not explicitly frame their work in this kind of language.

While all of the members of this group are also characterized by bringing an ambitious agenda to their work at the outset, the experience of writing and refining a manuscript caused one or both members to reconsider an intellectual or theoretical position they had previously been committed to. A specialist in Japanese history, Herb, illustrates this in the way he described his collaborative experience with a colleague, Hito, who though Japanese by birth had spent most of his career studying English literature. In the time they worked together, Herb not only moved to seeing the big picture but also to challenge the idea of organizing area studies as a separate academic discipline. He described this transformation when he said

> I think I have learned more from this particular collaboration than I
>
> have from others. I have learned about these broader, as you call
>
> them, worldviews, and the fact that these are really important in
>
> binding people together. I find that it has certainly affected my own
>
> personal work, the work that I do by myself in a way I wouldn't
>
> have anticipated ... I 've learned that I am not simply a specialist in
>
> a certain segment of Japanese history and that this stuff really has

to always be thought of in much broader terms. I have learned this

from him. (Herb, History)

When Herb talked about his own personal work, he reflected that he had made a

choice to continue working in his home discipline. His partner, Hito, however,

chose a different track. Hito has moved on to write about much broader issues,

seemingly far afield of his original area of specialization or field. Admitting the

risks and boldness of this move, Hito reported, "The more advanced you get, the

more risks you should take. Otherwise, what is the meaning of tenure anyway?"

Discussion

Whether a coauthored publication is atheoretical, refines the

understanding of an existing theory, extends the theory to a new population or

setting, or offers a theory that conceptualizes a phenomenon in a fresh or original

way are all factors that affect the judgement about the quality of work and

whether it can be considered innovative. Almost all participants pointed to the

impact of collaboration on the quality of the work produced. This near universal

sentiment was phrased in one of two ways: "I couldn't have done it alone" or

"What we produced together is better than I could have produced alone." This

reflects the idea that in successful collaborations, the sum is greater than the

parts. In these cases, the work produced collaboratively cannot be reduced to the

sum of the distinct skills and expertise of the collaborators, but to an unique co-

construction to create knowledge (John-Steiner, Weber, & Minnis, 1998).

Participants who characterized their work as theoretical can be found in all four categories of intellectual outcomes that I have identified. Differences are apparent in how members of the four different groups characterized the experience of theory development. For almost all of the members of the first group, *efficiencies of practice,* their work involved the application or extension of a theoretical framework to different populations or settings. Members of the second group, *nuances in thinking,* characterized their work as adding significant insight to a theory without challenging its central assumptions. Members of the third group, *coming up with the big picture,* generally found a way to synthesize competing explanations that derived from their different areas of expertise to come up with an original and more all-encompassing explanation of a phenomenon than had previously been available. This clearly suggests innovation. Members of the fourth group, *challenging the gospel,* took yet a fourth approach to theoretical work. Members of this group reached different conclusions about a theoretical or paradigmatic issue that they could not necessarily reconcile. In the process of confronting different interpretations, members of this group experimented with different methods, and sometimes inquiry paradigms, that were unfamiliar to them. Like this third category, this, too, suggests innovation.

A number of characteristics of members of the sample may explain why their collaborative worked involved theory development to a much greater extent than the literature prepared us to expect. The first is that with few

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exceptions, the sample contained what I have called career-equal or career-symmetrical pairs. That means that in most cases there were not significant differences between members of the pair in career age and, consequently, they had comparable skill levels. The majority of pairs consisted of senior academics that brought considerable expertise and experience to a topic, generally from distinct but complementary areas of expertise. Secondly, the longevity of the collaboration provided the context for either prolonged engagement focused on a single line of inquiry or prolonged interaction about a series of loosely related topics that, nevertheless, were united by a common thread. Finally, many of the participants in the study described the process of collaboration in ways that differ dramatically from the picture of collaboration routinely captured in the research literature. The high and on-going level of interaction and relatively fluid division of labor due to comparable skill levels described by many of the participants differ substantially from the hierarchical division of labor that is so often taken as the normative approach to collaboration. The link between dynamics of the collaborative process and different intellectual outcomes is an area I plan to pursue further.

Conclusions

Findings from this research both support and challenge a number of conclusions about the relationship between collaboration and innovation that have been presented in the literature. First, findings support the idea that collaboration is associated with both quality and innovation but extends the idea

by demonstrating that innovation can take a number of different forms and be accomplished in a number of different ways. Secondly, findings strongly dispute the idea that innovation is most likely to be the product of short-term collaboration. Third, findings suggest that theory development is not an unusual activity for long-term collaborators to undertake. Finally, while supporting the idea that distinct skills and expertise contribute to innovation, findings suggest that innovation is just as likely to characterize the work of collaborators from the same academic discipline as collaborators trained in different academic disciplines.

The findings presented here suggest a number of different ways to operationalize the outcomes of scholarly work that could provide a framework to assess quality of a publication or body of work in terms of its contribution to knowledge. While it is challenging to make the subtle distinction between how a publication advances an individual's knowledge and/or skills and how it advances knowledge in a field, the distinction is an important one. A positive experience with collaboration can advance an individual's skills and knowledge and improve the quality of their work without making any noteworthy contribution to a field. A judgment about the quality of a piece of work or how innovative it is ultimately rests on a subjective comparison to the state of knowledge in a field.

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Table 1

Categories and Definitions of Intellectual Outcomes Identified by Long-Term Research Collaborators (N=19 pairs)

Category of Outcome	Definition
Efficiencies of Practice (n=7 pairs)	Complete an investigation that otherwise would be difficult or impossible to accomplish.
Nuances in Thinking (n=5 pairs)	Advance a more nuanced interpretation of a phenomenon or theoretical position without fundamentally altering a commitment to its basic constructs.
Coming up with the Big Picture (n=3 pairs)	Integrate distinct areas of expertise, even within the same academic discipline, to create a more all-encompassing explanation of a phenomenon than had been previously available in the literature.
Challenging the Gospel (n=4 pairs)	Challenge mainstream disciplinary theories or methods.

Table 2

Distinguishing of Characteristics of Categories of Intellectual Outcomes Identified by

Long-Term Research Collaborators

Category of Outcome	Distinguishing Characteristics
Efficiencies of Practice	Time-saved from a clear division of labor
	Additional publications
	When theoretical, application of theory to a new population or setting
Nuances in Thinking	Add insight to theory without challenging its core assumptions.
Coming up with the Big Picture	Create new theory or substantially revise an existing one
	Integrate or synthesize independent and sometimes competing explanations to create theory.
Challenging the Gospel	Aim to reach audiences in more than one discipline
	Experiment with new methodologies or inquiry paradigms
	Experience adverse feedback from colleagues
	Voice sense of risk-taking or experimentation

On some occasions, leave differences of opinion or

interpretation unresolved.

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