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Defining and Identifying Interdisciplinary Research among Doctoral Candidates

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A Report to the National Science Foundation
Division of Science Resources Statistics

Submitted by

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Executive Summary

This report summarizes the results of a series of cognitive interviews conducted with doctoral candidates at Washington State University. These interviews served several purposes. First, we aimed to evaluate how well two versions of a questionnaire item from the Survey of Earned Doctorates, which asks for respondents' field(s) of dissertation research, serve as measures of interdisciplinary research. Additionally, we sought to understand how respondents define the concepts of interdisciplinary and multidisciplinary research, and whether they distinguish between the two. Also, we examined how respondents' conceptualizations of these terms relate to their identification as interdisciplinary or not, as well as to how they respond to the dissertation research fields questions from the Survey of Earned Doctorates.

Results show that all of the respondents had some recognition of the basic definition of interdisciplinary research, but several were unfamiliar with the term multidisciplinary. In general, the respondents viewed the two terms "interdisciplinary" and "multidisciplinary" in a similar way, but most respondents indicated that the two have somewhat distinct definitions. Also, although many respondents provided separate definitions for interdisciplinary and multidisciplinary, there was quite a bit of variation in how respondents actually defined and distinguished between the terms. This suggests that while the general concept of interdisciplinary research is widely understood, the specifics of the process and how it may differ from multidisciplinary research are not common knowledge in this population.

Furthermore, in many cases the distinctions that respondents made between the two terms did not appear to be very meaningful. For example, many respondents were inconsistent in their use of these distinctions throughout the interview, and several respondents indicated that the two terms are essentially the same or interchangeable. Some respondents did not seem to have a preconceived idea of

how the two terms differed until they were explicitly asked to define them and distinguished between them in the interview.

These results suggest that the definitions and distinctions that interdisciplinary research scholars often use for interdisciplinary, multidisciplinary, and other related forms of research are not recognized by doctoral candidates, nor are these distinctions relevant to how our respondents conceptualize these terms. Very few of our participants defined the two terms in a manner that is consistent with how interdisciplinary research scholars define them. Furthermore, when presented with these formal definitions, many respondents commented that the manner in which interdisciplinary research scholars distinguish between interdisciplinary and multidisciplinary research was nonsensical.

We asked respondents whether they define their research as interdisciplinary, multidisciplinary, both, or neither. We were able to confirm through additional questions that respondents' self-identifications as inter- or multidisciplinary or not were largely valid. However, we also discovered that respondents' self-identifications were dependent upon their definitions of interdisciplinary and multidisciplinary as well as how they define what constitutes a unique field or discipline. Some respondents identified as interdisciplinary or multidisciplinary based on the assumption that multiple subfields of a discipline or multiple related disciplines constitutes interdisciplinary research, while others felt that one needs to combine very disparate fields in order to be considered interdisciplinary.

Finally, we assessed how the two versions of the Survey of Earned Doctorates' dissertation research field(s) question perform as measures of interdisciplinary research. We asked respondents to complete both versions of the question: Version A, which was used from 2001-2003, and Version B, which has been used since 2004. We compared their answers to their self-described interdisciplinary research status. This analysis shows that half of the respondents answered both versions of the question similarly and in a way that was consistent with their self-identifications as interdisciplinary/multidisciplinary or not. The remaining respondents answered one or both versions of the question in a

manner that was inconsistent with their self-identifications. Overall, the version of the question that uses the term “interdisciplinary” (Version B) performed slightly better than the more general version of the question as an indicator of interdisciplinary research. Interestingly, an additional version of the question that we included in the interview protocol, which used the term multidisciplinary instead of interdisciplinary, was the most successful as an indicator of multidisciplinary/interdisciplinary research. There was no evidence that the list of fields of study that is provided in the Survey of Earned Doctorates caused respondents to falsely report conducting interdisciplinary research. However, there were a few instances in which the list affected responses in other ways.

The interviews also show that the dissertation research fields question may be problematic for individuals who are in interdisciplinary doctoral programs. Students from this program had more difficulty answering these questions (as well as other another questionnaire item asking for field of study) than other interdisciplinary/multidisciplinary researchers. Additionally, there is some evidence that students in fields that are commonly thought of as interdisciplinary in nature (that is, “interdisciplines”) may not answer these questions in a manner that reveals that they conduct interdisciplinary research.

All of these findings suggest that, in general, the dissertation research field(s) questions are a reasonable indicator of interdisciplinary research, but there certainly is room for improvement to make the question a more accurate indicator of interdisciplinary research. One possible solution is to separate the measurement of interdisciplinary research from the dissertation research field(s) question, and to provide a definition of interdisciplinary to assure that respondents use the same construct when answering the question.

Introduction

Interdisciplinary research has garnered much attention in recent years, yet we know very little about this new phenomenon and its measurement. There are multiple definitions of interdisciplinary research. Some researchers utilize a very general definition of interdisciplinary research, while other scholars are more explicit in defining what types of research activities constitute interdisciplinary research.

A common characteristic of these specific definitions of interdisciplinary research is a focus on both the integrative nature of interdisciplinary research and its problem-solving orientation. The National Academy of Sciences' definition exhibits these qualities. In a report entitled *Facilitating Interdisciplinary Research* the National Academies defined interdisciplinary research as

a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice (National Academies 2004: 2).

Observers note that there is a great deal of ambiguity surrounding the various definitions of interdisciplinarity (Jacobs and Frickel 2009) and a lack of consensus among various authors. Klein (1990) argued there is uncertainty about the meaning of interdisciplinarity, and no unified body of discourse about it. Furthermore, other related terms such as "multidisciplinary," "crossdisciplinary," and "transdisciplinary" add to the ambiguity of this topic. Some scholars make clear distinctions between these terms in order to distinguish the degree to which the multiple fields are connected (Jacobs and Frickel 2009). These terms are conceptualized in a hierarchy related to the degree of interaction and integration of disciplines. Although definitions vary, most scholars agree on a hierarchy in which multidisciplinary or crossdisciplinary research are the modes with the least amount of integration,

interdisciplinary is in the middle with a moderate degree of integration, and transdisciplinary represents research with the greatest degree of integration (Klein 1990; Jacobs and Frickel 2009).

Klein defined multidisciplinary as additive; it refers to disciplines working in juxtaposition with each other, but not necessarily integrating. Multidisciplinary approaches add breadth by using perspectives from multiple disciplines, but the disciplinary elements retain their original identity (Wagner et al. 2009). However, interdisciplinary research is more integrative of the different disciplines than the additive methods of multidisciplinary research (Klein 1990). Scholars argue that this integrated synthesis is different and superior to a mere summation of parts (Wagner et al. 2009). Finally, transdisciplinary refers to approaches that transcend the scopes of disciplines to a greater extent than interdisciplinary methods (Klein 1990). Transdisciplinary research involves comprehensive frameworks with an overarching synthesis; examples include theoretical concepts such as feminism or sustainability (Wagner et al. 2009). In a transdisciplinary approach, disciplines become irrelevant (Klein 1990).

Although many theorists who focus on these issues would not use these terms interchangeably, many others tend to use the term interdisciplinary to refer to any research of this nature, or use interdisciplinary and multidisciplinary interchangeably. Also, with all the confusion surrounding the definitions of interdisciplinarity and other related terms, there is no general consensus about how to best identify or measure interdisciplinary research.

One attempt to capture this phenomenon is an item contained in the National Science Foundation's *Survey of Earned Doctorates*. The Survey of Earned Doctorates (SED) asks respondents to report the field(s) of their dissertation research. They are asked to write in the name of the field, and then enter in a corresponding three-digit code from a provided list of fields. Beginning in 2001, respondents have had the option of reporting both a primary as well as a secondary field, if applicable. In 2004, the wording of the question was changed slightly. The new question specifically incorporates

the term “interdisciplinary” into the question pertaining to one’s secondary field of research. Both versions of the question are displayed in Figure 1.

Figure 1. Two Forms of Question used in the Survey of Earned Doctorates to Measure Fields of Dissertation Research

Version A (Used from 2001-2003):

Using the Specialties List (page 7), please write the name and number of the primary field of your dissertation research.

Name of Field

Number of Field

If you had a secondary field for your dissertation research, list the name and number.

Name of Field

Number of Field

Version B (Used from 2004-Present):

Please write the name of the primary field of your dissertation research.

Name of field

Using the list on page 7, choose the code that best describes the primary field of your dissertation research.

Number of field

If your dissertation was interdisciplinary, list the name and number of your secondary field.

Name of field

Number of field

At the request of the National Science Foundation's Division of Science Resources Statistics, we conducted a series of thirty cognitive interviews with doctoral candidates at Washington State University. The purpose of the interviews was to evaluate how individuals interpret and respond to these questionnaire items, and to better understand whether and how these two questions capture interdisciplinary research processes. We examined whether the two versions of the question elicited different types of responses, and if the use of other terms such as "multidisciplinary" would yield yet another type of response. Additionally, we attempted to evaluate how the use of a pre-established list of fields from which respondents must choose from affects how they respond to these items. For example, there was concern that individuals may list multiple fields not because their research is interdisciplinary, but rather because the list of fields did not contain any single field that adequately described their research.

Additionally, we sought to understand how respondents conceptualize and define the concepts of interdisciplinarity and multidisciplinary, and how they define themselves in relation to these terms. The purpose of this portion of the interviews was to gain additional insight into how individual respondents interpreted the SED questions as well as determine what factors influence individuals to define themselves as interdisciplinary, multidisciplinary, or neither. This report summarizes the results of these cognitive interviews.

Interview Methods and Respondents

Targeting Participants

The target population for the interviews was doctoral candidates at the main campus of Washington State University who were nearing completion of their graduate program. There was no available sampling frame limited only to Ph.D. students who met this criterion, so we obtained a list of all doctoral students who had registered for the Fall 2010 semester on the Pullman campus of WSU. In

order to narrow down to only those students who were nearing completion of their programs, in the recruitment phase we identified individuals who were actively involved in dissertation writing or research.

In order to examine how the interview participants respond to the Survey of Earned Doctorates' question of whether their dissertation research uses a secondary field (that is, if their research is interdisciplinary), we sought to include researchers whom were expected to be likely to report interdisciplinary research as well as those expected to be unlikely to report interdisciplinary research. We used descriptions of doctoral programs on the WSU website and past years' SED data to identify programs that would be likely to include interdisciplinary researchers and others which might be less likely to contain interdisciplinary researchers.

We searched each program's website for indicators that programs encourage interdisciplinary research, such as explicit references to interdisciplinary or multidisciplinary projects as well as more subtle indicators such as descriptions of programs that encourage students to work with faculty from multiple departments on campus. We also examined, by field of study, the rate at which doctoral graduates at WSU from 2001-2008 reported multiple fields of dissertation research on the SED. Using both of these methods, we identified each doctoral degree-granting program at WSU's main campus as belonging to one of three categories. These categories represented our expectations about the likelihood that the program/department's doctoral students would define their dissertation research as interdisciplinary or multidisciplinary: very likely to find interdisciplinary students, somewhat likely to find interdisciplinary students, and unlikely to find interdisciplinary students.

We considered programs to be *very likely* to include interdisciplinary students if their websites specifically mentioned the terms interdisciplinary or multidisciplinary, or if nearly all of the prior graduates in those fields indicated two fields on the SED questionnaire. *Somewhat likely* programs consisted of those in which a moderate number of prior graduates listed multiple fields on the SED

(between 30-60%) and programs whose websites had less explicit references to interdisciplinary or multidisciplinary work, such as indicating students are encouraged to explore research in other departments. We labeled programs as *unlikely* to contain interdisciplinary students if their websites contained no references to any activities associated with interdisciplinary/multidisciplinary work and if they had few prior graduates who listed a secondary field on the SED questionnaire. We aimed to recruit 20 individuals who were from departments that were very or somewhat likely to have interdisciplinary students and 10 respondents from departments that were unlikely to have interdisciplinary students. We intended to include a diverse range of programs as well as equivalent numbers of men and women.

Recruitment

In order to recruit participants, we organized the sampling frame by department/program, and then randomly selected individuals from each of the targeted departments. We contacted selected individuals through telephone and/or email and informed them that our research team was conducting interviews on behalf of the National Science Foundation in order to evaluate questions that are used in its Survey of Earned Doctorates. We refrained from informing individuals that the interviews were primarily focused on the responses to the item about interdisciplinary research. We explained that the interviews would last approximately forty-five minutes to one hour and that participants would be given an honorarium of \$30.00 in appreciation for their time and assistance.

Respondents

The final interview sample consisted of 30 respondents. Ten of these respondents were from programs classified as unlikely to contain students conducting interdisciplinary research. Thirteen participants were selected from programs identified as very likely to produce interdisciplinary

researchers, and seven respondents were chosen from programs thought to be somewhat likely to have interdisciplinary students.

Thirteen of the respondents were students in the biological, agricultural, or natural resource sciences. Another six were from programs in the physical sciences, engineering, computer science, and math fields. Eight respondents were students in social sciences, communication, and education programs, and three were from the humanities. The sample contained 15 women and 15 men. According to participants' responses to the ethnicity and race indicators on the SED questionnaire (questions B5 and B6 in Appendix A, page 76) and their discussions with the interviewer about these items, eight respondents identified as Asian, 21 identified as white, one identified as Latina, one identified as American Indian, and one respondent described herself as "multi-racial" (both Latina and white).

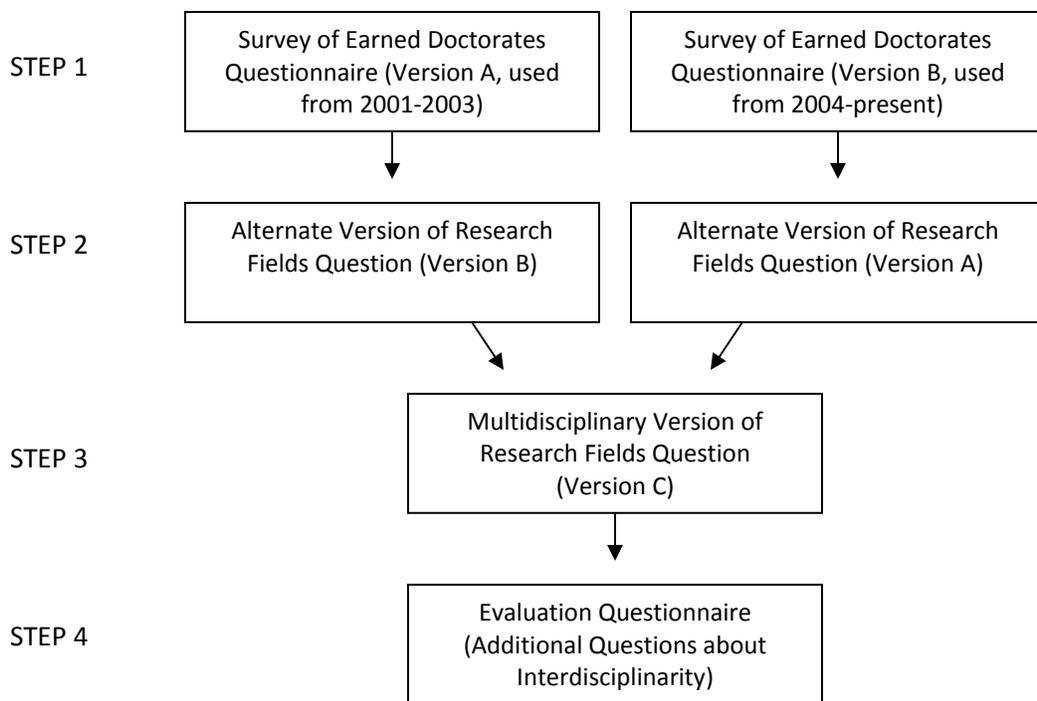
Interview Protocol

The interviews took place between July 20 and August 27, 2010. Each interview was conducted by the first author and lasted between 40 minutes and one hour and 15 minutes. Two graduate student research assistants served as note-takers for the interviews. One note-taker was present during each interview in order to record the critical elements of the interviews. Additionally, the note-takers assisted in the interpretation of the interview results. Each interview was recorded with a digital audio recorder. The note-takers used their personal notes as well as the audio recordings to compile a summary of each interview after it was completed. These summaries as well as respondents' questionnaire responses were used in the analyses that follow.

The interviewer began each interview by describing the nature of the study and obtaining written consent from the respondent. The interviewer then explained the cognitive interview process, which requires that participants complete a questionnaire and speak aloud as they do so. The

interviewer asked participants to speak aloud everything they read, and to explain their thoughts and reactions as they respond to the questions. This process allowed us to record respondents' answers in paper format as well as gain more insight into the responses. Participants then completed a practice questionnaire to illustrate this process before beginning the actual interview. The body of the interviews consisted of four steps, which are illustrated in Figure 2.

Figure 2. Illustration of the Four Steps of the Interview Process



Step 1: In the first portion of the interviews, respondents completed a shortened version of the Survey of Earned Doctorates questionnaire. It included questions about the dissertation title, fields of dissertation research (the question of interest), department, educational institution, information about the current doctoral degree and past degrees earned, and several demographic questions. The list of fields that is attached to the SED was provided with the questionnaire.

We utilized two versions of this questionnaire, Version A and Version B (see Appendices A and B). The two versions of the questionnaire differed only in terms of the question of interest, the item asking about the field(s) of respondents' dissertation research (numbered A2 on these questionnaires). *Version A* contained the dissertation research fields question as it was worded in the 2001-2003 SED, and *Version B* used the current version of the question, adopted in 2004 (see Figure 1 for these two forms of the question). Both versions were used in order to understand if participants' interpretations and response processes are affected by the differences in wording across the two question versions. Each participant was randomly assigned to receive either Version A or Version B of the SED questionnaire. As respondents completed the questionnaire the interviewer used probing questions to fully understand how they responded to question about the field(s) of dissertation research.

Step 2: After respondents completed the SED questionnaire, the interviewer asked them to examine and complete the alternate version of the dissertation research question (question number A2 on the questionnaire answered in Step 1). Respondents who had received Version A of the question in Step 1 were given Version B, while respondents who initially completed Version B in Step 1 were given Version A (these alternate questions, as they were presented to respondents, are included in Appendices C [Version A] and D [Version B]). Depending upon whether individuals' responses to the two versions of the question were the same or different, the interviewer then used a variety of probing questions to determine how respondents answered the alternative version of the question differently (if at all) than the version they originally received. The purpose of this step was to see how each individual responded to both versions of the question. The interviewer encouraged participants to compare and contrast the differences and comment on whether they interpreted them differently or similarly.

Step 3: Next the interviewer asked respondents to complete a third and final version of the question asking for the field(s) of dissertation research. This question, Version C, was the same as Version B except that it uses the term "multidisciplinary" instead of "interdisciplinary" (this version of

the question is shown in Appendix E). The interviewer questioned participants about whether they interpreted this question differently from Version B. Additional probing was used as needed to understand how individuals interpreted, compared, and answered all three versions of the question. The purpose of including this additional version of the question was to understand whether respondents interpret the question differently if “multidisciplinary” is used, as opposed to “interdisciplinary.”

Step 4: In this final step the interviewer asked participants to complete an additional questionnaire which was designed to better understand how respondents conceptualize the terms interdisciplinarity and multidisciplinary. This “evaluation questionnaire” (see Appendix F) contained an item asking individuals to what extent the terms interdisciplinary and multidisciplinary are similar or different. In two other questions, respondents defined these two terms based on their own interpretations (and explained any differences between them, if applicable). Respondents were then asked, based on their definitions, whether their dissertation research is interdisciplinary, multidisciplinary, both interdisciplinary and multidisciplinary, or neither interdisciplinary nor multidisciplinary. They were also asked this same question in reference to their doctoral degree. The questionnaire also contained items to assess whether in fact respondents’ research and/or degree programs have characteristics associated with interdisciplinarity.

In the results that follow, we first discuss findings obtained through Step 4’s evaluation questionnaire before examining the performance of the two versions of the SED research field(s) question (from Steps 1 and 2). First, we examine the respondents’ definitions of the terms multidisciplinary and interdisciplinary, along with any distinctions they made between these two terms. Then we present results showing how respondents identified as either multidisciplinary, interdisciplinary, both interdisciplinary and multidisciplinary, or neither. By discussing these findings from the evaluation questionnaire first, we are able to provide more context from which to then

interpret participants' responses to the SED research field(s) questions, which are discussed in the final section of this report.

How Do Respondents Define and Distinguish Interdisciplinary and Multidisciplinary Research?

In the evaluation questionnaire presented in Step 4 of the interviews, respondents provided their personal definitions of the terms “interdisciplinary” and “multidisciplinary.” We used these responses, and discussions with participants about their answers, to gain insight into how individuals conceptualize these terms and how their ideas affected their reactions to the SED questions.

Are the Terms “Interdisciplinary” and “Multidisciplinary” Viewed Similarly?

Question 1 (Q1) of the evaluation questionnaire (see Appendix F, page 89) asked respondents to what degree the terms interdisciplinary and multidisciplinary are similar or different. The answer choices ranged from “exactly the same” to “completely different.” Table 1 documents the distribution of valid responses to this question.²

Table 1. Distribution of Responses to Question 1 of Evaluation Questionnaire

Question: Do you think the meanings of the terms “interdisciplinary” and “multidisciplinary” are:

<u>Response options:</u>	<u>Number of Respondents</u>	<u>Percentage of Respondents</u>
Exactly the same	1	3.6
Very similar	12	42.9
Somewhat similar	8	28.6
Somewhat different	5	17.9
Very different	1	3.6
Completely different	1	3.6
Total	28	100.0

The table shows that the most common response to this question is that the terms are “very similar.”

Over 75% of respondents said the terms were similar to some degree (either somewhat similar, very

² Two respondents marked multiple answers to this question; these cases have been eliminated from this analysis.

similar, or exactly the same). Only one respondent indicated that they are completely different, and one other respondent indicated they are very different. Overall, these results suggest that a large majority of respondents view the two terms as being similar in some fashion.

How do Respondents Define Interdisciplinary and Multidisciplinary Research?

Question 2 (Q2) of the evaluation questionnaire asked respondents how they define the term interdisciplinary. Then, in question 3 (Q3), respondents were asked to indicate how the meaning of multidisciplinary differs from the meaning of interdisciplinary, if at all. The answers to these two questions form the basis for this analysis of how respondents define and distinguish between these two terms. We looked to see if respondents defined these terms in a manner that is similar to how interdisciplinary scholars define them (as discussed in the introduction; also see Q17 of the evaluation questionnaire in Appendix F, page 94 for a rendition of these definitions) and whether they make explicit distinctions between the two terms, as these scholars do.

Only two respondents provided definitions in questions 2 and 3 that closely matched the definitions and distinctions that interdisciplinary scholars use for the terms.

Respondent 2 wrote that interdisciplinary research is “the merging of multiple disciplines of study” while multidisciplinary research “performs more of a side by side method of study.” He added verbally that interdisciplinary research uses “techniques, methods, and theories from multiple disciplines to achieve one goal” while multidisciplinary research uses two fields, but “does not inter-mix the theories and methods” from each of the fields.

This respondent was part of the University’s interdisciplinary doctoral degree program, and indicated that students in this program must take coursework that discusses the nature of interdisciplinary and multidisciplinary research. This coursework that focused explicitly on the topic likely influenced this

respondent's definitions. However, another respondent from the American studies program, which is a field commonly considered to be an interdiscipline, also had a similar definition:

Respondent 1 defined interdisciplinary research as the "intersections of disciplines of knowledge." She explained that in interdisciplinary research people bring two fields together to solve a problem, but multidisciplinary research is "not using the intersections."

Two additional respondents, who also identified themselves as interdisciplinary, provided definitions that were somewhat similar to the established definitions of multidisciplinary and interdisciplinary research; their definitions were unique but in some way implied the integrative nature of interdisciplinary research, which, according to interdisciplinary scholars, is a defining factor separating it from multidisciplinary research.

Respondent 7 indicated that interdisciplinary research is "incorporating a couple different disciplines into your research or experiments" and multidisciplinary research is different in that it is "using different disciplines for different projects, while interdisciplinary is using multiple disciplines in one project."

Respondent 12 wrote that in interdisciplinary research "the work is done utilizing knowledge from both fields (more than one field) at the same time." She then defined multidisciplinary research as "involving more than one field in the PhD research, but not necessarily for the same paper/project."

Another respondent's definitions were somewhat similar to the established definitions, except that he associated the integrative nature with multidisciplinary instead of interdisciplinary:

Respondent 3 wrote that interdisciplinary research is when "one discipline excludes the other. You need a high level of expertise from separate groups" while in multidisciplinary research a researcher "has training in several disciplines and can use the tools from each to accomplish an objective." He verbally described an example of interdisciplinary work as a project requiring a computer scientist and a botanist: each would be needed for their advanced skills but both have skills exclusive from each other. He explained the difference was that in interdisciplinary

research the different disciplines remain “separate” but multidisciplinary research “integrates” the two disciplines. He described his research as multidisciplinary because his project is one in which “the same person handles diverse tasks.” The interviewer asked if interdisciplinary work necessitates the use of multiple people, and he agreed that “that’s exactly what I’m envisioning.”

The remaining 25 respondents’ definitions and distinctions were not consistent with the distinctions interdisciplinary scholars make between interdisciplinary and multidisciplinary research. Nevertheless, they often made distinctions between the two terms, and there were some common themes among these responses.

First, eight respondents distinguished between interdisciplinary and multidisciplinary based on the similarity of the fields that are being combined in each. These respondents remarked that one form (either interdisciplinary or multidisciplinary, it varied by respondent) involves combining related disciplines or subfields of a common discipline while the other form involves the combination of more disparate fields:

Respondent 9 defined interdisciplinary research as “two divergent fields that are not necessarily in the same dept. [For example,] science and business.” He then indicated that multidisciplinary research “allows for listing of subspecialties as well as divergent fields.” He elaborated verbally that multidisciplinary is more “all-encompassing.”

Respondent 11 wrote that interdisciplinary research is “working in 2 or more fields that are related” while multidisciplinary “means more than 1 but not necessarily related.” He verbally provided examples for each, saying that a combination of food science and crop science is interdisciplinary: crop science entails “how to produce food” while food science looks at how to “assemble those raw ingredients into making food.” Thus, “they’re very related.” He then said that an example of multidisciplinary research is combining “an agricultural business degree with a foreign language degree.” In both of these examples, he acknowledged that the two fields would “complement each other” but in interdisciplinary work the fields are more “by nature done as one” because they are so similar.

Respondent 17 indicated that interdisciplinary research refers to multiple “topics within [an] area or field.” He described an example of multiple specialties within computer science. He wrote that “multidisciplinary could be of a larger scale.” He verbally explained that multidisciplinary is when a researcher “crosses majors.” He drew pictures to help illustrate the differences. Based on these, the interviewer attempted to clarify by asking if he envisions interdisciplinary as using subfields within a discipline and multidisciplinary as involving several separate disciplines. He agreed this is what he had in mind.

Respondent 19 wrote that interdisciplinary is “studying two fairly disparate fields, e.g. biology and physics.” He was unfamiliar with multidisciplinary research, but speculated that “it’s not clear if it does [differ], but could perhaps be leaning toward two fields of study that are not as disparate.”

Respondent 21 said he envisioned multidisciplinary research to involve “big cross-categories” whereas interdisciplinary research involves “some categories that are different but connected.” In his answer to question 2, he wrote “when fields/disciplines have something in common (overlap), have connection with each [other].” He gave an example of two subfields of communication. In response to question 3, he wrote “fields that are not quite connected.”

Respondent 23 defined interdisciplinary research as “related disciplines coming together in a program” and multidisciplinary research as “involving a broader range of disciplines.” She said the disciplines have to be related for interdisciplinary research, but multidisciplinary refers to someone working with several disciplines that do not have much in common.

Respondent 26 wrote that interdisciplinary research involves “separate but still closely related disciplines that would be applied to the research.” The interviewer asked if he thinks of multiple subfields of a discipline as constituting interdisciplinary research, and he agreed. He then said that multidisciplinary research “implies relatively distinct disciplines being utilized for a single research project.”

Respondent 30 said that interdisciplinary refers to different areas of research “within a field” She then wrote that interdisciplinary refers to “different areas within your field.” As an example she described that using multiple specialties within a field constitutes interdisciplinary research. Then she responded in question 3 that she sees “multidisciplinary as different areas working together; such as ... Education and [veterinary medicine] working on a project.”

Four respondents distinguished between interdisciplinary and multidisciplinary research in terms of how many fields are involved in each. They believed the difference between the two is that multidisciplinary research utilizes more fields than interdisciplinary research (although the process is similar):

Respondent 8 wrote that interdisciplinary research is the “interplay between two or more disciplines.” For question 3, which asked how multidisciplinary differs from interdisciplinary, she indicated that interdisciplinary “generally means fewer than 4 disciplines. It’s an issue of volume. [Greater than] 4 disciplines = multidisciplinary.” When the interviewer asked if the process is the same in both forms, the respondent replied that it is the same.

Respondent 10 indicated that interdisciplinary research is “two disciplines integrated as one” while multidisciplinary means there are “many – more than two” fields. When asked if she thinks the process is the same in both forms, she agreed, “yes.”

Respondent 18 thought that interdisciplinary research involves just “a single internal disciplin” [*sic*] while multidisciplinary research refers to “multiple [disciplines] instead of just one.” She further clarified that interdisciplinary research is having one specialty, such as a chemistry major who specializes in forensics, while multidisciplinary is having more than one specialty, such as a chemistry major who specializes in forensics and toxicology. She felt that interdisciplinary referred to having a subfield of a broader discipline, while multidisciplinary referred to situations where someone researched in more than one subfield.

Respondent 25 defined interdisciplinary as a “combination of 2 or more disciplines working together in such a way that each has a significant stake in the outcome of the research.” In his verbal discussion, he said he envisions that interdisciplinary research involves “equal

collaboration” between fields. He explained that multidisciplinary research would involve numerically more disciplines (around 5 as opposed to 2-3). He wrote in question 3 that in multidisciplinary research “more disciplines are involved in the research or outcomes.” He explained that in multidisciplinary research there might just be “little bits and pieces” from some disciplines (as opposed to each contributing significantly, as he said was the case for interdisciplinary research).

Another three participants distinguished between the terms by pointing to the use of collaboration. They believed that the distinction was that multidisciplinary research inherently involves collaboration between multiple researchers while interdisciplinary research can be pursued by an individual. For example,

Respondent 5 wrote that interdisciplinary “means that people in my field have knowledge in many areas,” while multidisciplinary “refers to pulling people from many disciplines to work together—those people would have expertise in their area.” She also verbally noted that multidisciplinary research sounds like a situation in which one would be “working with others on a team.”

Respondent 6’s initial definitions were not very clear. He stated that interdisciplinary research is “using/determining some parameters in your work, which is also done/evaluated by some investigators.” He verbally added to this that these parameters “overlap into another department that’s related” to his own research. He defined multidisciplinary research as “taking the help of some other [departments]/experts to finalize your research goal.” After the interviewer asked him to clarify his definitions verbally it became apparent he was thinking about collaboration as a key element distinguishing the two forms of research. He provided an example for multidisciplinary, saying that a group of bio-technicians may want to integrate a math component into cell biology, but since they are biologists they must get outside help from another department. So, each independently does their own portion of the work and they come together at the end to collaborate. He contrasted this by saying in interdisciplinary research, he is able to contribute to all portions of the project instead of “passing off certain parts to others.”

Respondent 14 wrote that “interdisciplinary is one person [has] expertise in several fields.” She further explained by describing this as a “jack of all trades.” Then she defined multidisciplinary as “a collaborative effort, experts from several fields working together to solve problem from multiple angles.”

Another three respondents made a distinction that was based on viewing one form as a process that results in a new, emerging discipline:

Respondent 13 wrote that in interdisciplinary research the goal is to focus “on the major area A, but utilizing some methods, skills, backgrounds, ideas from another area B.” He distinguished this from multidisciplinary, in which he indicated “there might be no major area or minor area. The objective is to study a new area involving both of the traditional areas.” He gave the example of biochemistry, which involves two traditional areas of biology and chemistry, but together they form a new area of biochemistry.

Respondent 28 defined interdisciplinary as “those places in which meaning occurs between disciplines,” and verbally elaborated that it means “finding places where the concerns of different disciplines (like women’s studies, history, or English) connect and overlap.” She then explained that she thought that multidisciplinary is a “practical approach, for example, saying that you study history and English,” whereas interdisciplinary is more academic. She wrote that “multidisciplinary is less academic/intellectual → interdisciplinary is [trying] to break down barriers between disciplines.” She further elaborated that interdisciplinary is trying to “blur boundaries” and “look for interconnections between disciplines,” while multidisciplinary can just be someone who “dabbles in more than one discipline.” A multidisciplinary researcher would be someone in a traditional academic department, whereas she viewed someone who was trying to do interdisciplinary research as someone who would go into an interdisciplinary field, such as “American studies.”

Respondent 29 wrote that interdisciplinary describes “a new field emerging from two other fields” while multidisciplinary “seems to integrate between them. That is, the term covers both fields.” In verbal elaboration, he gave an example for interdisciplinary research, referring to “information sciences,” which he described as a new field that has researchers who combine

computer science and biology. He seemed to be suggesting that interdisciplinary refers specifically to “interdisciplines” that become their own field by combining two already-established fields. He could not think of an example for multidisciplinary, so the interviewer clarified, asking if he thought that multidisciplinary involves working with two fields, but they are separate from each other? He agreed this is what he had in mind.

There were a few other definitions that were unique and did not match any of the other themes previously discussed. They included:

Respondent 16’s definitions were specifically in relation to her department and experience. She explained that interdisciplinary research is “working outside the department on a project that is not primarily chemistry but receiving a degree in chemistry.” She then said “multidisciplinary refers to disciplines you use for your primary degree (chemistry).” She verbally elaborated that if someone in her program is doing work/research outside of the department but they are still earning a chemistry degree this is referred to as interdisciplinary. But multidisciplinary research refers to “what disciplines someone needs to learn for their project.”

She did not explicitly state this, but it appeared as if in Respondent 16’s mind the primary difference is in which departments the other disciplines are used—in interdisciplinary research, one ventures to other departments to use those disciplines, whereas in multidisciplinary research a person uses other disciplines but is still conducting research in the department from which they are earning their degree.

Respondent 20 identified interdisciplinary research as involving “several disciplines [that are] involved or studied.” She elaborated that it “means your research involves several different disciplines that are kind of intertwined with each other for your project.” She first began to write “I don’t know the differ-“ for question 3, but then explained that she envisions interdisciplinary research as not going into too much depth into one of the disciplines. She then writes that “maybe multidisciplinary a person has more knowledge in each discipline” [*sic*]. She elaborated that she imagines this applies to someone who has actual degrees in each field, rather than just one degree as she explains is the case for an interdisciplinary researcher. However, she admitted that she does not really know the definition of multidisciplinary.

How Do Respondents Distinguish Between Interdisciplinary and Multidisciplinary?

We used respondents' answers to questions Q2 and Q3 of the evaluation questionnaire (Appendix F) to understand whether they believe there are any differences between multidisciplinary and interdisciplinary research. Using these definitions and distinctions, we classified respondents as making *no distinction* between the terms, *clearly distinguishing* between the two terms, or *incompletely/unclearly distinguishing* between the two terms. By incompletely/unclearly distinguishing between the two terms, we mean that the respondents indicated they believed the two terms were different in some way, but they were unable to completely or clearly explicate to the researchers how they differ. Table 2 shows a tally of respondents by whether and how they distinguished between interdisciplinary and multidisciplinary research.

Table 2. Distribution of Respondents by Distinctions Made between Interdisciplinary and Multidisciplinary Research (Reported in Questions Q2 and Q3 in Step 4)

	<u>Number of Respondents</u>	<u>Percentage of Respondents</u>
Make no distinction between ID and MD	2	6.7
Clearly distinguish between ID and MD	25	83.3
Incompletely or unclearly distinguish between ID and MD	3	10.0
Total	30	100.0

Only one respondent directly said the two terms are *exactly the same* and did not attempt to distinguish between them:

Respondent 15 defined interdisciplinary as “using more than 1 dept./discipline.” On question 3, which asks how multidisciplinary differs (if at all), she wrote “does not differ.”

Another respondent was also classified as making no distinction between multidisciplinary and interdisciplinary because although she attempted to distinguish between them, she was unable to produce *any* ideas about this distinction. She initially said the terms are very similar, but not exactly the

same. However, she then realized she did not know how they differed, ceased her attempt to distinguish between them, and ultimately decided they were the same:

As respondent 22 answered question 1 she said the two terms are “very similar” but said she was unsure if they mean “exactly the same thing.” On question 2 she wrote “more than 1 academic discipline work together” [*sic*]. She contemplated question 3 for awhile, trying to think of a difference between them. She ultimately decided that she “doesn’t really know,” and wrote “none” as her answer.

This respondent seemed to be trying to think of a distinction simply because she figured that two separate words must have some difference in meaning.

Three respondents were classified as incompletely or unclearly distinguishing between multidisciplinary and interdisciplinary research. These respondents attempted to distinguish between the two terms but could not do so completely or clearly (but maintained their opinion that there was a distinction to be made, unlike respondent 22). Two of these respondents “gave up” trying to define the distinctions because they realized they did not have a clear idea of how they differed. For example, respondent 4 indicated that the two terms are “somewhat different” in question 1, but had great difficulty in defining how they differed:

Respondent 4 defined interdisciplinary research by saying that “it means that there are multiple fields that are incorporated into the work. For example, a physicist [*sic*] that does research in the neuroscience field.” She defined multidisciplinary as meaning “there are [*sic*] more than one field involved in the research. For example, a physicist, a biochemist, and a neuroscientist work together on a project.” Attempting to clarify the distinction, the interviewer then asked if collaboration between multiple researchers was what distinguished multidisciplinary research from interdisciplinary research. The respondent did not clearly reply, saying it is hard to answer because “they are similar.” The interviewer rephrased the question, and this time the respondent agreed that multidisciplinary refers to multiple researchers collaborating, but then went on to say that there is also collaboration in interdisciplinary work as well, thus leaving the

distinction between the two forms unclear. She seemed to be having great difficulty trying to explain her ideas about how they differed, remarking that “this is hard!” before giving up.

Similarly, another respondent reasoned that there must be a difference between the two words, but became very confused as he tried to distinguish between them:

Respondent 27’s response to question 2 was “I believe that [interdisciplinary] means more than one discipline but I would also include in the notion of more than one discipline the idea of including more than one subdiscipline.” As he tried to conceive of a definition for multidisciplinary research, he said that he “really didn’t know the definition of multidisciplinary.” He wrote “I was tempted to write not sure in Q1 because I do not know how they differ. Multidisciplinary suggest many disciplines I must admit I don’t know what interdisciplinary suggests” [sic]. As he thought about the terms more, he realized that he was confident that “multi-“ meant many, so he started to doubt whether he knew what “interdisciplinary” meant, even though he was originally more comfortable with that word.

The third respondent classified as making an incomplete or unclear distinction was classified as such because his distinctions were not in reference to the actual definitions of the words. He refused to formally define either multidisciplinary or interdisciplinary, and instead discussed how he personally reacts and responds to the two terms:

Respondent 24’s answer to question 2 was that interdisciplinary is “a concept linked to a formal system of education. The goal of which is usually to force the answerer to more specifically identify & specialize their work.” In question three he wrote “for me, the term ‘multidisciplinary’ [sic] is less formal, less institutional, and less jargony. Therefore, I respond to it less rigidly & less formally but not at the expense of accuracy.” It was not clear from these explanations whether he actually believed the two terms refer to different processes or not. Thus, the interviewer asked him how interdisciplinary research works in practice. He replied that it occurs when someone “draws on many formal fields.” When asked if he thinks the process is the same for both interdisciplinary and multidisciplinary, he said “it depends on the individual” but did not clearly explain what he meant by this.

A majority of respondents (n=25) *clearly distinguished* between the two terms. The quotations listed in the previous section illustrate how these respondents were able to explicate different definitions for the two terms. However, we must note that a couple of these respondents (Rs 19 and 20, see above) indicated as they were defining the two terms that they were not sure about the differences between them, even though they were able to clearly define separate definitions.

How Meaningful are these Distinctions?

Although many of the respondents were able to clearly distinguish between the two terms, this does not necessarily mean these distinctions were very large or necessarily very meaningful. In fact, Table 3 shows that twelve of the respondents who made a distinction between interdisciplinary and multidisciplinary admitted at some point in the interview that they or others use the two terms *interchangeably*, or that they interpret the two words *to mean the same thing*. For example,

Respondent 23 indicated that she personally uses the two terms interchangeably, despite the fact that she defines them differently.

Another three respondents indicated that others or most people typically use the two terms interchangeably:

Respondent 2 read the multidisciplinary version of the dissertation research field(s) question in Step 3, and he said that this changed the meaning of the question to him a bit, but noted that he thinks people use the terms interdisciplinary and multidisciplinary interchangeably so often that he would assume the survey was really asking him about interdisciplinary research. Thus he answered it in the same way he answered Version B, which used the word interdisciplinary.

Similarly, when answering Version C of the question in Step 3, Respondent 30 said she thinks “most people” use the two terms interchangeably.

When respondent 8 was asked for her impressions of the definitions provided in question 17 of the evaluation questionnaire (See Appendix F, page 94) at the end of the interview, she said it “seems arbitrary” to say which one is integrative and which one is not integrative. When the interviewer asked if she sees a difference between the definitions, the respondent replied that the terms “are used interchangeably.”

Two of these respondents who mentioned that the two terms are used interchangeably (Rs 8 and 30), as well as eight others also remarked that they interpreted the two words to mean the same thing when they compared Version C of the dissertation research field(s) question to Version B (Version B used the word interdisciplinary and Version C used the word multidisciplinary) during Steps 1-3, despite the fact that they provided distinct definitions in Step 4. The sequence of events through which these individuals remarked that they interpret the terms in the same way suggests that the distinctions they made between the two terms might not be very meaningful. Many of these respondents were trying to make the point that they would answer these questions similarly. It was only later in Step 4, when they were asked explicitly about the distinctions (if any) they saw between the terms (Questions 2 and 3 of the evaluation questionnaire), that they proceeded to distinguish between the two terms. For example,

When comparing Versions B and C of the dissertation fields question, respondent 28 said she interpreted multidisciplinary to mean the same thing as interdisciplinary. Thus, her answers to both versions of the question were the same. However, when she was asked about the similarity or dissimilarity of the two terms, she replied that the two terms were “very similar,” but she “would never say that the two words are exactly the same because words have nuances.” She went on to provide two distinct definitions for interdisciplinary and multidisciplinary.

When comparing Versions B and C, which he answered similarly, Respondent 3 remarked that he “wouldn’t even know the difference between [interdisciplinary and multidisciplinary].” On question 1 of the evaluation questionnaire in Step 4, he answered that the two terms are “somewhat different,” explaining that he knows that interdisciplinary and multidisciplinary are

“two different terms” and that he “knows the difference.” He then provided separate definitions in Q2 and Q3.

Respondent 11 did not make an indication that he recognized that Version C differed from Version B. When the interviewer pointed out that Version B used “interdisciplinary” and Version C used “multidisciplinary” he said that he did not notice this. The interviewer asked if the two versions of the question mean the same thing to him, and he replied, “yep.” He later defined them differently in Step 4 of the interview.

Respondent 25 paused to contemplate the meaning of “multidisciplinary” when he was answering Version C. He then decided that he would interpret multidisciplinary the same as interdisciplinary, and answered the question the same as Version B. In Step 4 he distinguished between the two terms.

Respondent 29 paused for a considerable amount of time after reading the “multidisciplinary” portion of Version C, wondering aloud if there was a difference between the two terms. He ultimately concluded that he did not think there was a difference between the two terms and answered the question the same as Version B. But he then quickly realized what he thought distinguished the two terms from each other, and proceeded to provide separate definitions in Q2 and Q3 in Step 4.

Cases such as this suggest that even though many people made distinctions between the two terms, the distinctions are not meaningful enough to affect how they responded to the two words when they were presented in a practical context (such as in this questionnaire).

In some cases it appeared as if respondents had not previously considered how the words may differ. Clearly, some individuals had never thought about precise definitions for interdisciplinary and multidisciplinary research until they were explicitly asked about whether the terms had any difference in meaning. Four respondents initially interpreted the words to mean the same thing, but then remarked that there must be different meanings because there are *two separate words*. For example,

During Step 3, respondent 22 said she would interpret the research field(s) questions the same regardless of whether they said interdisciplinary or multidisciplinary. But when asked how similar the two terms are (in Step 4, on question 1 of the evaluation questionnaire), she said she is unsure if they are exactly the same because “no two words mean exactly the same thing.” She tried to distinguish between them when answering question 3, but had no actual idea about how interdisciplinary and multidisciplinary research may differ.

Several respondents appeared to be using the roots of the words (inter- and multi-) to try to distinguish between them. For example,

Respondent 23 originally said she uses the terms interchangeably, but began trying to deduce a difference by recalling the meanings of other words with the same prefixes, such as “interstate” and “inter-college.”

Respondent 10 read the multidisciplinary version of the dissertation research field(s) question (Version C) and remarked “that word...[means] a lot of disciplines.” When defining this term in Step 4, she said “from the word multi-, means many...more than two.” So the distinction she made between multidisciplinary and interdisciplinary is that multidisciplinary involves more fields than interdisciplinary.

Respondent 27 said that he did not really know the definition of multidisciplinary, but it was clear to him that “multi-” means many, so he deduced that multidisciplinary “means multiple disciplines.”

Thus, in practical terms, many of the respondents see the two words as very similar to each other, and would react similarly in a questionnaire if they were presented with either the term interdisciplinary or multidisciplinary. It was only in this context, in which both of the terms were presented together and respondents were asked explicitly about their meanings, that some individuals began to think carefully about how interdisciplinary and multidisciplinary may differ.

Table 3: Distinctions Made between Interdisciplinary and Multidisciplinary Research, by Respondents' Self-Identified Research Status

Resp. #	Respondents' description of their research (in Step 4, Q4)	Did R distinguish between MD and ID? (Step 4, Qs 2 & 3)	Was R inconsistent with definitions/distinctions?	Did R make reference to terms being same/interchangeable?	Did R indicate being less familiar with MD?
6	ID	Yes	No	No	No
2	ID	Yes	No	Yes, to others	No
11	ID	Yes	No	Yes	No
20	ID	Yes	No	Yes	No
5	ID	Yes	Yes	No	Yes
14	ID	Yes	Yes	No	No
23	ID	Yes	Yes	Yes	Yes
26	ID	Yes	Yes	No	No
30	ID	Yes	Yes	Yes	No
21	ID	Yes	Yes	No	No
1	ID	Yes	Yes	No	No
4	ID	Yes, but unclearly	Yes	No	No
7	ID & MD	Yes	No	No	No
8	ID & MD	Yes	No	Yes	Yes
24	ID & MD	Yes, but unclearly	No	No	Yes
3	MD	Yes	No	Yes	No
9	MD	Yes	No	No	No
10	MD	Yes	No	No	Yes
16	MD	Yes	Yes	No	No
27	MD	Yes, but unclearly	Yes	Yes	Yes
15	Neither	No	No	Yes	No
22	Neither	No	No	Yes	No
12	Neither	Yes	No	No	No
17	Neither	Yes	No	No	No
28	Neither	Yes	No	Yes	No
19	Neither	Yes	No	Yes	Yes
13	Neither	Yes	Yes	No	No
18	Neither	Yes	Yes	No	No
25	Neither	Yes	Yes	Yes	No
29	Neither	Yes	Yes	Yes	No

Were Respondents Consistent in their Use of Distinct Definitions of Interdisciplinary and Multidisciplinary Research?

Although many individuals clearly distinguished between interdisciplinary and multidisciplinary research, 14 respondents were inconsistent in defining the terms throughout the interview. Table 3 also shows whether respondents were inconsistent with their definitions, organized by whether they labeled themselves as interdisciplinary, multidisciplinary, or neither. One type of inconsistency was that some respondents made remarks that contradicted their initial distinctions and definitions of interdisciplinary and multidisciplinary research. For example,

Respondent 30 originally said the word interdisciplinary indicates using another department or discipline other than your own. However, then she later said that interdisciplinary research involves multiple components within a department/discipline and that multidisciplinary research refers to crossing broader disciplines and departments.

Respondent 1 initially defined multidisciplinary research as research consisting of two completely different fields (while interdisciplinary research is about finding intersections between supposedly more similar fields). However, later in the interview she remarked that multidisciplinary research refers to two similar fields. She then admitted the distinctions (which she initially had no trouble making) were getting confusing as she thought about it more.

Others tended to blur the distinctions they originally made as the interview progressed:

Respondent 21 made a distinction between interdisciplinary and multidisciplinary research based on the relatedness of the multiple fields. He indicated that interdisciplinary refers to research that combines two related subfields while multidisciplinary refers to research that combines more disparate fields. However, in separate places within the interview he used the same example of combining psychology and communications to illustrate both interdisciplinary and multidisciplinary research.

These inconsistencies did not just occur among those who provided incomplete or unclear definitions or distinctions to begin with; twelve of the respondents whose original definitions and

distinctions between multidisciplinary and interdisciplinary research were clear made inconsistent remarks in their use of these definitions and distinctions throughout the interview. This suggests that although many people may view the two terms as somewhat distinct, these distinctions are not necessarily put into use.

How Familiar were Respondents with the Concepts of Interdisciplinary/Multidisciplinary Research?

All of the respondents had some idea of what interdisciplinary and/or multidisciplinary research is, regardless of whether or not they identified themselves as interdisciplinary/ multidisciplinary. Every participant was able to define the term interdisciplinary. These definitions varied in terms of details and respondents' own unique words, but through participants' discussions of the terms, we determined that all interviewees clearly recognized that it is research that spans multiple disciplines or fields of study.

The term "interdisciplinary" was more familiar to some respondents than the term "multidisciplinary." All respondents were familiar with the term interdisciplinary, but seven respondents made some explicit reference to the fact that they were unfamiliar or less familiar with the term multidisciplinary (Table 3 also indicates whether respondents were less familiar with the term multidisciplinary). For example,

After reading the multidisciplinary version of the dissertation field(s) of study question (Version C), respondent 5 remarked that "multidisciplinary is not a word I am familiar with." She went on to say that she, and people in her department, always use the term interdisciplinary, and she likes this term [interdisciplinary] better.

Are Respondents Familiar with How Interdisciplinary Research Scholars Define Interdisciplinary and Multidisciplinary?

In question 17 (Q17) of the evaluation questionnaire (Step 4), respondents read a definition of interdisciplinary research and a definition of multidisciplinary research. These two definitions were based on the common themes found in the interdisciplinary research literature that distinguishes

between interdisciplinary and multidisciplinary research (Klein 1990; National Academies 2004). The question read as follows:

Some scholars define multidisciplinary research as research that uses perspectives from multiple disciplines, but does not necessarily integrate the concepts from the various disciplines.

This is distinguished from interdisciplinary research, which these scholars view as research that integrates perspectives from multiple disciplines to solve problems that are beyond the scope of a single discipline.

Based on these definitions, would you say that your dissertation research is:

- Neither interdisciplinary nor multidisciplinary
- Interdisciplinary
- Multidisciplinary
- Either interdisciplinary or multidisciplinary

After respondents answered this item, the interviewer proceeded to question them about these two definitions to understand whether the participants were familiar with these definitions, and if they had any opinions about them.

We asked many of the respondents whether they recognized these definitions, or if they had seen these words defined in this way before. Table 4 categorizes respondents based on their familiarity/unfamiliarity with these definitions of interdisciplinary and multidisciplinary. Of the 20 respondents who were asked this question directly, only one respondent indicated that she “may have” seen these definitions before. However, the definitions of interdisciplinary and multidisciplinary that she provided earlier in the interview were not similar to these definitions. Thus, it was unclear whether or not she legitimately recognized the definitions; if she had indeed seen them before they did not appear to have any influence on how she conceptualized the terms. Therefore, we classified her as “maybe familiar” with the definitions.

Three others who were asked if they had encountered these definitions previously indicated that the definition of interdisciplinary research seemed very familiar to them but they had not heard this definition of multidisciplinary research. None of these three individuals had mentioned any distinctions based on integration of disciplines when they defined the two terms earlier in the questionnaire. Finally, most individuals (80% of those who were asked) indicated that they had never seen either of the words defined in this manner, and were unfamiliar with these definitions. This is not surprising given that only a few respondents' own definitions of interdisciplinary and multidisciplinary were similar to these definitions. This suggests that although interdisciplinary scholars may carefully distinguish between the terms, most doctoral students, even those involved in interdisciplinary research, are not familiar with the distinctions scholars make between interdisciplinary and multidisciplinary research.

Ten respondents were not directly asked about their familiarity with these definitions. In five cases this was because the respondents indicated that these definitions were similar to how they conceptualized the terms before the interviewer was able to ask them if they were familiar definitions.³ Thus, there were several respondents who made some indication that they were somewhat familiar with the definitions. Four of these respondents were among those whose definitions were similar to these definitions, so we are confident that these participants have actually encountered these definitions before. The other person claimed the definitions were similar to how she defined them, but she had been unable to provide a clear definition of the terms earlier in the interview. Due to this we were unable to determine if in fact the definitions were legitimately similar to how she defined the terms, so we classified this case as "maybe familiar with the definitions." The data in Table 4 confirm that a majority of respondents were indeed unfamiliar with the distinct definitions scholars use for interdisciplinary and multidisciplinary research.

³ In the remaining cases I did not discuss whether the terms were familiar or not with respondents.

Table 4. Respondents' Familiarity with "Official" Definitions

	<u>Number of respondents</u>	<u>Percent</u>
Unfamiliar with definitions	16	64
Unfamiliar with MD definition/familiar with ID definition	3	12
Maybe familiar with definitions	2	8
Familiar with definitions	4	16
Total	25	100

What do Respondents Think of the Definitions Used by Interdisciplinary Scholars?

As noted above, when discussing the definitions in Q17 of the evaluation questionnaire, several respondents indicated they were only familiar with the definition of interdisciplinary research, and had not seen this definition of multidisciplinary research before. Additionally, when asked about their impressions of the definitions, many respondents expressed some concern with the way multidisciplinary research is defined. Twelve of the 30 respondents experienced some degree of confusion, uncertainty, or dislike for the definition of multidisciplinary research. For example, four respondents said they disagreed with the notion that multidisciplinary research does not *integrate* perspectives from multiple disciplines:

Respondent 5 initially said that she does not agree with the definition of multidisciplinary research because it suggests that researchers do not integrate the disciplines. However, she then admitted that she was unsure because she does not do a lot of multidisciplinary research.

Respondent 8 indicated it "seems arbitrary" to say which form [interdisciplinary or multidisciplinary] is integrative and which is not, noting that they are used interchangeably.

Respondent 9 disliked the two definitions, saying that multidisciplinary research *does* integrate the different disciplines, and his definition of multidisciplinary is broader.

Respondent 10 indicated she defines multidisciplinary in the same manner that interdisciplinary is defined in this question.

Six other respondents explained that they did not understand the non-integrative aspect of this definition for multidisciplinary research. This part of the definition seemed nonsensical or confusing to these participants:

After reading the definitions, respondent 19 said he is not sure “why someone would use multiple perspectives but not integrate them.” He also remarked that he was “not clear on the definition or purpose of multidisciplinary research.” Because of this, he indicated that he was not sure what multidisciplinary research “looks like” and was unsure why someone “would not want to integrate” two perspectives.

Respondent 20 struggled to understand the definitions for some time, and eventually concluded that her research does integrate perspectives but she is “still unsure what multidisciplinary means” and unsure how it’s possible “to not integrate perspectives” in this kind of research.

Respondent 22 said she was perplexed by how someone could use perspectives from multiple disciplines but not integrate concepts in multidisciplinary research. After considering this for some time, she concluded that she “doesn’t understand this.” She agreed that this definition is confusing, although the definition provided for interdisciplinary research was straightforward and made sense to her.

After reading the two definitions, respondent 24 asked how someone uses perspectives from multiple disciplines but does not integrate them. He then went on to argue that academic disciplines have always been integrated.

Respondent 26 remarked that he could not understand “the point” of doing multidisciplinary research if “you do not integrate the concepts.” He then said he was unsure sure how a researcher “could move forward” if they did not integrate perspectives from different fields, so he disagreed with this definition.

Respondent 30 said she did not understand the multidisciplinary definition. She remarked that she does not understand how you would use perspectives from multiple fields but not integrate them.

Additionally, two other respondents seemed confused by the function or purpose of multidisciplinary research, but did not mention the non-integrative aspect of the definition specifically:

Respondent 18 wondered “what is the point of multidisciplinary research” if it is not to solve problems?

Respondent 21 indicated that the definition of interdisciplinary that was provided was similar to how he conceptualized it, but said he was having difficulty “understanding how multidisciplinary research could actually function.”

Clearly, the multidisciplinary definition was very unfamiliar and has no relationship to how many respondents view these concepts. Fewer respondents had trouble with the definition of interdisciplinary research. Many said that they agreed with it, that it made sense, or was similar to their ideas. However, two participants seemed somewhat skeptical that it is possible to move “beyond the scope of a single discipline”:

Respondent 3 remarked that he did not understand how something can be “bigger than a discipline.” He pondered this for some time before admitting that “in a methodological sense” he could imagine something larger than a single discipline, but seemed to remain skeptical.

Respondent 6 disagreed that something might be beyond the scope of a single discipline. He argued “you’re able to work within a discipline, but you may need help from other disciplines.”

Thus, although most respondents seemed familiar with the interdisciplinary research definition, to some its scope was exaggerated in this conceptualization. Also, another respondent, number 27, remarked that he was unclear about what it means to “integrate perspectives.” He had difficulty imagining what it means, exactly, to integrate, and whether that was something that was relevant for defining the terms. Also, respondent 21 said he was “more confused by the definition of interdisciplinary” than

multidisciplinary, although he did not elaborate. These examples suggest that the definition of interdisciplinary may be somewhat abstract.

This series of examples illustrates that these “official” definitions that interdisciplinary scholars use are not necessarily related to how many doctoral students think about multidisciplinary and interdisciplinary research. Very few of the respondents actually made distinctions between interdisciplinary and multidisciplinary research in the same fashion as these definitions do (focused on the extent to which the disciplines are integrated or not). In fact, this distinction seemed nonsensical to a number of respondents.

Did the Interdisciplinary vs. Multidisciplinary Wording of the Dissertation Research Field(s) Question affect Responses?

Another way of assessing the extent to which the interviewees distinguish between interdisciplinary and multidisciplinary research is to compare the answers they provided to Version B of the dissertation research field(s) question (presented in either Step 1 or Step 2) to their answers to Version C of the question (Step 3). A majority of respondents provided the same response in both Versions B and C of the question. This provides additional support to the other findings which suggest that for most individuals, the two terms operate similarly (despite the fact that most respondents distinguished between them).

However, seven individuals’ responses to Versions B and C of the dissertation research question were different. One respondent listed only one field for the multidisciplinary version of the question but two fields for the interdisciplinary version of the question. Six respondents did the opposite, listing one field on the interdisciplinary version but two fields on the multidisciplinary version. This implies that “interdisciplinary” may be more restricting to those people who distinguished between these two questions. Students more freely indicated a secondary field when the question said “multidisciplinary.” For example,

Respondent 16 only wrote one field for Version B because she could not find her secondary field on the list. However, when answering Version C, she decided to use the “chemistry, other” category as a secondary field. When the interviewer pointed out how she had listed only one field in Versions A and B, but two in Version C, the respondent remarked that the term multidisciplinary had “triggered [her] to think about all of the disciplines” she works with. Since her definition of interdisciplinary was very specific, the term multidisciplinary seemed more applicable to her situation.

Interestingly, this tendency for respondents to more freely indicate a secondary field in the multidisciplinary version of the question resulted in a greater accuracy rate for question Version C than Version B as an indicator of interdisciplinary research (discussed in more detail below).

How Many Respondents Identified as Interdisciplinary or Multidisciplinary?

The additional, evaluation questionnaire contained two questions, numbered Q4 and Q9 (see Appendix F, pages 90-91) which asked respondents, based on their definitions of interdisciplinary and multidisciplinary, whether their dissertation research (question 4) and their doctoral degrees (question 9) are interdisciplinary, multidisciplinary, both, or neither. The responses to these two questionnaire items allow us to determine which respondents identified as interdisciplinary or multidisciplinary in some form. Questions Q5 and Q10 (plus additional verbal questions when necessary) were then used to verify whether these self-identifications were valid. In questions 5 and 10 respondents were asked to indicate whether they participated in a series of activities, and whether they considered these items to be factors that made their research and/or degrees interdisciplinary or multidisciplinary.

Table 5 shows the distribution of responses to question 4. Nineteen respondents answered Q4 by indicating that their *dissertation research* was either interdisciplinary, multidisciplinary, or both. Another respondent initially answered question 4 by saying his dissertation research is neither interdisciplinary nor multidisciplinary, but later on in the questionnaire realized that he uses multiple

fields in his research. At this point he then verbally changed his answer to question 4, stating he is interdisciplinary, so we included him in this category in the tables. Each of these twenty participants provided information confirming that they are involved in activities associated with interdisciplinary or multidisciplinary research (such as using methods or theories from multiple disciplines). Thus, participants' responses to question 4 suggest that individuals' self-identifications of conducting interdisciplinary or multidisciplinary research (or not) are valid. Of the respondents who identified as conducting interdisciplinary or multidisciplinary research, over half identified as interdisciplinary while only 25% identified only as multidisciplinary. This further suggests that the term interdisciplinary is more common than the term multidisciplinary.

Table 5. Distribution of Responses to Question 4 of Evaluation Questionnaire

Question: Based on your definitions, how would you describe your doctoral dissertation research?

<u>Response options:</u>	<u>Number of Respondents</u>	<u>Percentage of Respondents</u>
Neither interdisciplinary nor multidisciplinary	10	33.3
Interdisciplinary	12	40.0
Multidisciplinary	5	16.7
Both interdisciplinary and multidisciplinary	3	10.0
Total	30	100.0

Ten respondents indicated on question 4 that their research was neither interdisciplinary nor multidisciplinary. In each of these interviews, the interviewer attempted to verify the validity of these responses by verbally discussing the items in questions 5 and 10 (which these respondents were instructed to skip when answering the questionnaire), asking these individuals if they participated in any of these activities. These respondents confirmed that they did not perform many of these activities.

Some explained that while they have cited some research from other fields, this was in a limited fashion and was not extensive enough to make their work truly interdisciplinary.

Nearly all respondents (28) provided the same response to question 9 (about their doctoral degree) as they did for question 4 (about their research). Respondent 14 indicated that her research was interdisciplinary, but her degree is not because she is only getting a degree in one of the fields that she uses in her research. Another respondent (R25) answered that his research was not interdisciplinary (question 4) but his degree is interdisciplinary and multidisciplinary (question 9). Using additional questions, the interviewer ascertained that this participant legitimately did not appear to be conducting interdisciplinary research. However, his responses indicate that his identification of his degree as interdisciplinary and multidisciplinary is problematic. He was confused by the fact that his program is housed in the same department as another program. He felt his degree was interdisciplinary because of this, since he has taken classes in both subjects. Yet as the interview progressed and the interviewer questioned him further about the nature of his degree, it became apparent that the degree this participant would be earning was indeed distinct from the other program in his department, and that his interpretation could be misleading. Since most respondents' answers to question 9 mirrored their responses to question 4, and this participant's response to Q9 was problematic, we rely only on question 4 responses to categorize the participants as interdisciplinary/multidisciplinary or not.

A majority of the students who indicated that their research is interdisciplinary or multidisciplinary were forthcoming about this status beginning when the concept was first introduced in the interview (in Steps 1-3, when they answered Versions B and C of the dissertation fields question). When individuals were answering these questions, most made statements about whether or not the terms interdisciplinary and multidisciplinary were applicable to their research. However, six of the respondents who verbally remarked that they did not consider their research to be interdisciplinary or multidisciplinary when answering the dissertation research questions (although some of them included

two fields in their responses) later said that their research was in fact interdisciplinary or multidisciplinary (when they were explicitly asked in question 4 of the evaluation questionnaire). In these cases, it seems as if the respondents did not think of themselves as interdisciplinary until they had had the opportunity to think about their research and how they define the terms interdisciplinary and multidisciplinary. For example,

Respondent 7 hesitated when he read the portion of Version B of the dissertation research field(s) question, which states “if your dissertation research was interdisciplinary...” He remarked “by interdisciplinary I guess they mean collaborating or using techniques outside the field.” He decided he would not put down a second field on this version of the question, reasoning that his response in the first box of the question covers a multitude of techniques used in his research. Since he had provided two responses in Version A, I asked him if he felt that the word “interdisciplinary” made the secondary field portion of the question inapplicable to him. He agreed. Then on question 4 in Step 4, after defining the terms interdisciplinary and multidisciplinary, he indicated that his research is interdisciplinary and multidisciplinary.

It is clear that some of these respondents had not contemplated these issues much prior to the interviews. Several remarked that they had not really thought about the definitions of interdisciplinary and multidisciplinary before, and so it is not surprising that they lacked a clear preconceived notion of whether their research was interdisciplinary, multidisciplinary, or neither.

Respondent 26 reported two fields in each version of the dissertation research fields question. Verbally he commented that in some ways he considers his research to be interdisciplinary, but he generally does not consider it as such. He said that calling it interdisciplinary or not was like “splitting hairs,” implying the terminology did not mean much to him. After he defined the term interdisciplinary in question 2 of the evaluation questionnaire, he said that he was “starting to wonder” whether his research was interdisciplinary after all. He then commented that he doesn’t “think about these issues” often. In question 4, he responded that his research was in fact interdisciplinary.

How Definitions of “Fields” and “Subfields” Affect Identification

Individuals’ notions of what constitutes a field of study or a discipline affected whether they identified as interdisciplinary/multidisciplinary or not. This resulted in inconsistencies across respondents in how they determined whether their research was interdisciplinary/ multidisciplinary or not. Some respondents commented that using multiple subfields or related fields is multidisciplinary or interdisciplinary research, while others believed the two fields must be disparate in order for the research to be interdisciplinary/ multidisciplinary. It is difficult to distinguish between what constitutes multiple “subfields” or multiple “related fields,” as these distinctions are somewhat subjective. Thus, we only classified respondents as using *subfields* to define their research as interdisciplinary/ multidisciplinary if they explicitly indicated that one or more of their fields are subfield(s).

Subfields as interdisciplinary: Some respondents considered subfields or specialties within a broader discipline to be distinct entities, and they believed that working with many of these is considered to be interdisciplinary or multidisciplinary. Twelve of the interview subjects mentioned that working with multiple subfields of a larger discipline constitutes either multidisciplinary or interdisciplinary research. Seven of these 12 respondents identified as interdisciplinary or multidisciplinary based on the fact that they work with what they consider multiple subfields of a larger discipline or that their specialty is a subfield of the larger discipline they study. For example,

Respondent 16 indicated her research is in both organic chemistry and biological chemistry, which she described as two subfields of chemistry. She believed that using multiple subfields made her research multidisciplinary.

An environmental scientist (respondent 5) labeled herself as interdisciplinary, listing both environmental science and urban/regional planning, the second of which she considered a subfield of environmental science.

This respondent also noted that her discipline, environmental science, is an interdisciplinary field, which may have affected her opinion that her subfield made her work interdisciplinary. Some of the other respondents who identified as interdisciplinary based on the use of subfields also believed their primary fields were interdisciplines, suggesting that in some cases studying an interdiscipline caused respondents to report a subfield as a secondary field in the A2 questions.

Related fields as interdisciplinary: In addition, there were six other respondents who labeled themselves as interdisciplinary or multidisciplinary using two similar or closely related fields. For example,

Respondent 3 listed both botany and biochemistry and considered this to be multidisciplinary research. Both are biological sciences.

Respondent 11 wrote both crop science and food science in his response to the A2 questions. He described these fields as separate entities, but said that they are very related and “by nature” they tend to be combined in research.

Disparate fields only as interdisciplinary: In contrast, among the remaining twelve respondents, many implied or directly said that in order for research to be considered interdisciplinary or multidisciplinary it needs to involve two *completely disparate* fields of study, such as a biological science and a social science. Several of these individuals worked with multiple subfields of a discipline but did not consider this to be interdisciplinary or multidisciplinary research. For example,

Respondent 19 remarked that he works in several biological subfields, but in order for research to be considered interdisciplinary, it must cross broad categories, such as research that uses both a life science and mathematics. He pointed to the list of fields attached to the SED questionnaire to illustrate that he felt that the two fields must span multiple categories on this list for the research to be considered interdisciplinary.

Respondent 15 described her research as using behavioral psychology and social psychology. She did not consider this to be interdisciplinary or multidisciplinary, and said that she would have to be working with another field outside of psychology altogether in order to be considered interdisciplinary or multidisciplinary.

Some respondents recognized that opinions about what constitutes a separate field may vary from person to person. For instance, respondent 1 remarked that what people consider to be multiple fields or disciplines might be “subjective.” She explained that she cites research and publishes in journals that, in her perspective, are from very different disciplines. But she noted that someone else might consider the multiple fields she uses to be similar or even part of one broader category.

Although we are unable to make any definitive conclusions based on these 30 interviews, the data suggest that individuals’ opinions about what types of field or subfield combinations constitute interdisciplinary or multidisciplinary research were somewhat dependent upon their areas of study. Many of the life sciences students viewed research involving multiple subcategories of a life science discipline or two life science fields as interdisciplinary or multidisciplinary. In contrast, many of the social science and humanities respondents argued that working with multiple subfields of these areas does not alone comprise interdisciplinary or multidisciplinary research.

This disparity seems to reflect the way these different fields are viewed and organized by the university and the scientific community in general. There is a lot of emphasis on interdisciplinary research within the biological and environmental sciences at this university, and elsewhere. This perhaps has influenced how life science doctoral students define their own work. The fields of study list which is presented in the SED illustrates this type of disparity quite well. On the list, the life sciences are broken up into very distinct, specific categories, but for many of the social sciences there is only one or two entries on the list that to encompass the entire field (examples include sociology, anthropology, and criminal justice). There was no evidence that the list itself actually affected people’s perceptions of

whether they were interdisciplinary or not (this is discussed in more detail below), but rather, the list seems to be reflective of common conceptualizations of the fields within the academic community.

Many of the life science interview subjects gave convincing arguments for why their work with multiple subfields/related fields is legitimately interdisciplinary. For example, one respondent (R9) working in the biological sciences explained that these days, there is an inherent multidisciplinary nature to much of the biological research. He argued that while there are distinct fields within biology, nearly all biological researchers have to be knowledgeable of many different areas of study and a variety of methods, so in a way biology has become an inherently interdisciplinary/multidisciplinary discipline.

On the other hand, some of those in the social sciences and humanities who did not believe using multiple subfields or related fields constitutes interdisciplinary/multidisciplinary research were very convinced of the reasons this is the case. For example, a historian argued that using multiple different subfields of history is not interdisciplinary because the subfields are still a part of history. She said these subfields all use the same methods; the only difference between them is that they are focused on different areas or time periods.

Contrasting these two perspectives, it seems as if determining whether a field or subfield of research is distinct from other similar fields/subfields might be related to how diverse a discipline is in terms of its subject matter, perspectives, and methods. There is a much greater diversity of methods and subjects within the biological sciences than in history, which may explain the disparate ideas about whether using multiple subfields constitutes interdisciplinary research.

If one relies on the perspective that two *disparate* fields must be combined in order for a person to be legitimately labeled interdisciplinary or multidisciplinary, then using the dissertation research field(s) question from the SED as an indicator of interdisciplinary research likely results in an overestimation of the prevalence of interdisciplinary research among doctoral students. In these interviews, many of the respondents who identified as interdisciplinary or multidisciplinary did so based

on the use of multiple fields that are closely related to each other. Fewer combined fields that are quite distinct from each other (e.g. not within the same over-arching discipline, such as combining a life science field with an education field). For the sake of the following analysis of the dissertation research questions, we have relied on students' self-identifications as conducting interdisciplinary/multidisciplinary research or not regardless of how closely related (or not) their multiple fields are to each other.

Are the SED Questions about Fields of Dissertation Research Capturing Interdisciplinary Research?

Next, we examined how well the two versions of the SED's dissertation research field(s) question can be used as measures of interdisciplinary research. We analyzed whether the number of fields participants indicated in both versions of this question was consistent with whether they described their dissertation research as interdisciplinary and/or multidisciplinary—that is, if respondents who identified as interdisciplinary or multidisciplinary researchers listed two fields, while those who did not identify as interdisciplinary or multidisciplinary only listed one field.

We considered students' responses to each of the two versions of the SED question about the field(s) of their dissertation research to be "accurate" if the number of fields they listed was consistent with how they identified their dissertation research (interdisciplinary/ multidisciplinary or not).⁴ By accurate, we mean that a respondent listed two fields if he/she conducts interdisciplinary or multidisciplinary research, or if a respondent listed one field if they do not conduct interdisciplinary or multidisciplinary research.

⁴ Each respondent answered one version of this question (either A or B) in Step 1's SED questionnaire. Then, in Step 2, participants responded to whichever version they had not answered in Step 1. We altered the order in which the two versions were presented to control for the effects that one question version may have on participants' responses to the other. We did not see any noticeable differences in patterns of response based on which version of the question respondents received first.

Table 6. Number of Fields Reported in Three Versions of the Dissertation Research Fields Question, by Respondents' Self-identified Research Status⁵

Resp. #	Respondents' description of their research (Q4 in Step 4)	Number of fields listed in version A of question A2	Number of fields listed in version B of question A2	Number of fields listed in version C of question A2
14	ID	1	1	2
21	ID	1	1	1
5	ID	1	2	2
6	ID	1	2	1
23	ID	1	2	2
4	ID	2	1	2
1	ID	2	2	2
2	ID	2	2	2
11	ID	2	2	2
20	ID	2	2	2
26	ID	2	2	2
30	ID	2	2	2
7	ID & MD	2	1	2
24	ID & MD	2	1	2
8	ID & MD	2	2	2
9	MD	1	1	2
16	MD	1	1	2
27	MD	1	1	1
3	MD	2	2	2
10	MD	2	2	2
13	Neither	1	1	1
17	Neither	1	1	1
18	Neither	1	1	1
22	Neither	1	1	1
25	Neither	1	1	1
29	Neither	1	1	1
12	Neither	2	1	1
15	Neither	2	1	1
19	Neither	2	1	1
28	Neither	2	1	1

⁵ Boldface entries represent respondents whose answers to Versions A and B of the question differed.

We then categorized participants' answers based on two factors: whether their responses were "accurate" representations of whether they conduct interdisciplinary or multidisciplinary research, and whether they provided the same response to both versions of the question. Table 6 outlines the number of fields reported in each version of the dissertation research field questions, organized by whether respondents indicated they conducted interdisciplinary or multidisciplinary research. Table 7 summarizes respondents' answers to the two versions of the question according to their accuracy or inaccuracy as a measure for interdisciplinary research.

Table 7. "Accurate" and "Inaccurate" Responses to Dissertation Research Fields Question

Answered "Accurately"	15
ID/MD respondent reported two fields	9
Non ID/MD respondent reported one field	6
Answered "Inaccurately"	15
ID/MD respondent reported one field on Versions A & B (false negative)	5
ID/MD respondent reported one field on Version A (false negative)	3
ID/MD respondent reported one field on Version B (false negative)	3
ID/MD respondent reported two fields on Version A (false positive)	4

Both Questions Answered Similarly and Accurately

Fifteen students' responses to both versions of the SED question matched their later descriptions of their research as interdisciplinary or multidisciplinary. They listed the same number of fields in each version of the question. Also, those who listed two fields said they conduct interdisciplinary or multidisciplinary research (n=9), while those who listed one field said they do not do this type of research (n=6). Thus, in half of the cases, both questions are performing "accurately" as a measure of interdisciplinary research, and they are both performing similarly to each other.

Both Questions Answered Similarly, but Inaccurately

Five other respondents also provided the same answers to both versions of the question, but these answers were inconsistent with the participants' later descriptions of the interdisciplinary/

multidisciplinary status of their research. Each of these respondents indicated only one field in both versions of the question, but their responses in Step 4 of the interview suggest that their research actually is interdisciplinary or multidisciplinary. These five respondents are cases of “underreporting” or “false negative” reports of interdisciplinary/ multidisciplinary research on both question versions.

There were a variety of explanations as to why these five students only responded with one field in the SED questions although they considered their research to be interdisciplinary or multidisciplinary. For example, one respondent appeared to be “satisficing” throughout the interview process by putting forth the least possible effort, which resulted in incomplete responses:

When answering the dissertation research field(s) question, respondent 9 wrote one field and mentioned another that he could also include, but he reasoned that just indicating one was “good enough.” It wasn’t until answering the multidisciplinary version of the question (which he felt best applied to him) that he made a concerted effort to completely answer the question, which involved indicating both of his fields.

Respondent 14, in contrast, misinterpreted both Version A and Version B of the question, resulting in incomplete responses that were inconsistent with her later description of her research as interdisciplinary:

When answering Version A, respondent 14 did not write a second field. She explained that she interpreted “secondary field” to be asking if she had a minor field. When responding to Version B, she indicated her primary field, and then read the second part of the question. In response to this she said “no, it’s not applicable, at least in the primary field of it.” She thought this part of the question was asking if her *primary field* was an interdisciplinary field.

Another respondent’s incomplete response was partially a result of the fields of study list.

Respondent 16 intended to write both of her fields, but since her secondary field (biological chemistry) was not on the list, she left the secondary field portion of the question blank on both Versions A and B.

Finally, respondent 21 only indicated one field in each question because he initially did not consider his research to be interdisciplinary:

As Respondent 21 completed the dissertation research question, he said that he did not have a secondary field, and thus left the secondary field box blank in each version of the question. Later, on Q9 of the evaluation questionnaire administered in Step 4, he suddenly recalled that his field, communication, is considered an interdiscipline that is “a hybrid of other fields.” He remarked that it has been “well established as such” for quite some time. Once he realized this, he began to recall ways in which his research is interdisciplinary. He indicated that he borrows theories from psychology in his research.

Questions Answered Differently, with an Inaccurate Response to One Version of the Question

The remaining ten respondents answered the two versions of the dissertation research field(s) differently, so that only one version matched their later identification as interdisciplinary/multidisciplinary or not. Six of these respondents wrote only one field on either Version A or Version B (and two fields on the other) but later clearly identified as interdisciplinary or multidisciplinary. Thus, these six cases are other forms of underreporting, or “false negative” reports of interdisciplinary or multidisciplinary research. For a variety of reasons, these six individuals who falsely reported not conducting interdisciplinary or multidisciplinary research did not interpret one of these questions in a way that coincided with their own descriptions of their research.

Three of these respondents only reported one field on Version A, but more accurately answered two fields on Version B (the version that includes the term “interdisciplinary”). The phrase “secondary field” appears to have caused some confusion in Version A. For example,

Respondent 6 answered Version B first, and seemed to understand what was meant by the question asking if his research was interdisciplinary. He explained how his research is interdisciplinary and listed two fields. When answering Version A, the respondent remarked that he was “unsure what secondary field means.” He therefore decided to leave this portion of the question blank.

Respondent 23 also indicated that she was unsure what “secondary field means” when answering Version A. Since she was unsure, she left this part blank. Upon seeing the interdisciplinary wording of this question in Version B, she reported a secondary field. When the interviewer pointed out the difference in responses she provided to the two questions, the respondent noted that she reported a second field because the question uses the word interdisciplinary. She thought that Version A of the question was less clear, and felt her answer to Version B was more accurate.

In one instance, the error on Version A was partially a result of the unclear meaning of “secondary field,” but also seemed to be partially a result of the fact that the respondent did not carefully look at the list when answering the question the first time:

Respondent 5 answered Version A first, and on this version only listed one, primary field (environmental science) and remarked that she does not have a secondary field. When completing question A4 about the fields of study for her prior degrees, she came across the code for Urban/City, Community & Regional Planning. She commented that she had not seen that field on the list the first time she looked at it, and that she could have used it for her Ph.D. field as well. She also indicated that she may have wanted to list both numbers on question A2 because she had not felt like she could “capture” what she does with “just one field number.” When answering Version B of the A2 question, she remarked that this version “makes a lot more sense” to her, and she reported her secondary field on this question. She added that the word interdisciplinary helped her understand the meaning of the question.

Respondent 5 indicated that the term interdisciplinary helped her interpret the question better, which implies that Version A may have been unclear to her. However, she had also noted that she may have answered Version A differently if she knew her second field was on the list. Thus, it is not entirely clear if the change in how this respondent answered the question was a result of the addition of the term interdisciplinary or a result of the knowledge that her secondary field was on the list.

Another three respondents accurately indicated two fields in Version A, but only one field in Version B. Each of these three participants answered this way for different reasons.

Respondent 24 received Version B of the dissertation research field(s) question first. When reading the part of the question that asks for a secondary field if the research is interdisciplinary, the respondent commented that “all of American studies [his primary field] is interdisciplinary.” He decided to leave this portion of the question blank, even though he indicated he was interdisciplinary. When answering Version A, he decided to report a second field, even though he was disturbed that he was only allowed to indicate one secondary field (he indicated he has many). When asked about why he answered differently to the two versions, he said that the use of the term interdisciplinary in Version B lead him to think “more formally,” whereas Version A seemed “less formal” and “has more play” to it. Because he was not allowed to indicate more than two fields on either version, he felt that if he were to only write one of his secondary fields on Version B, the more formal version, then it would be inaccurate. But he did not feel like this was inaccurate to do on Version A because the question seemed less formal.

This respondent later went on to say he felt “disrespected” by the questions because they [meaning the surveyors, we presume] assumed he only had two fields and they did not seem to really want to know anything about him. Also, several times he displayed feelings of mistrust toward the questionnaire and its sponsors, and seemed to respond to questions in a very guarded way, making it hard to interpret what exactly he was thinking as he answered the questions.

Respondent 4 reported her primary field, neuroscience, and a secondary field (cellular biology) on Version A. She explained that her research “could also be considered molecular and cellular biology, if they want another name for it.” She selected the code for cellular biology for her secondary field, but noted that she usually just thinks of her research as neuroscience. Then on Version B she only wrote neuroscience. When she read the part of the question which asks for a secondary field if the dissertation is interdisciplinary, she replied that her dissertation research is interdisciplinary because neuroscience is considered to be an interdiscipline. This seemed to confuse her, because her primary field itself is interdisciplinary but she did not think she should

write a second field given how the question was worded. She decided to not include a secondary field because her research is just within neuroscience.

Respondent 7's inconsistent responses were more a product of the wording of the part of the question asking for the primary field than the wording asking about a secondary field. In Version A, the question refers respondents to the list of field codes before asking them to fill in the name of their primary field. On Version B, respondents are asked to fill in the name of their primary field, and then asked to look at the list to find a code that represents it. This difference caused Respondent 7 to write slightly different responses in the two versions of the question for his primary field.

In Version A, Respondent 7 listed the general title of his primary field as it is written on the list (microbiology). When reading the portion of the question about a secondary field, he expressed some uncertainty about the meaning of "secondary field" but figured it meant "another category that can apply" to the research. He said he does a lot of molecular biology in his research, so he listed this as a second field. On Version B, which did not refer him to the list first, his answer for the primary field was more narrowed down to his specific research topic (but he still used the general microbiology code from the list). He decided not to include a second field, noting that his response to the primary field question "covers a multitude of techniques" he uses in his research. When asked about the different answers to the two versions of the question, the respondent spoke about how Version A restricted him to the list of predetermined fields and that he could more accurately describe what he does in Version B.

Finally, four respondents incorrectly listed two fields on Version A of the question but only one field on Version B. These four cases represent the only "false positive" or over-reports of interdisciplinary or multidisciplinary research in the interviews. These individuals did not identify as interdisciplinary or multidisciplinary, and this was reflected in their responses to the question with that term. When these respondents answered Version B, they indicated that this secondary field question did not apply to them because their research is not interdisciplinary. However, without this word in Version A, they interpreted the question differently and wrote in a secondary field. For example,

Respondent 12, who answered Version B first, listed economics as her primary field on Version B, and left the second part blank. She indicated that her research is not interdisciplinary and she does not have a secondary field. When answering Version A, however, she listed economics as a primary field and econometrics as a secondary field. When she was asked about the differences in responses, she remarked that the first question she answered contained the word interdisciplinary and this “changed the meaning of the question.”

Through later questioning it was clear that respondent 12 was not an interdisciplinary researcher, and the response she gave in Version A was misleading as a measure of interdisciplinary research. Similarly, respondent 15 answered two fields in Version A, including what she considered to be a subcomponent of her primary field as a secondary field.

Respondent 15 answered Version A of the question first. In this version she entered experimental psychology as the primary field, which she explained is a broad category that encompasses all of her research. She then wrote a sub-discipline of psychology as a secondary field. She seemed to think that she was supposed to provide more detail about her specific research topic, since there was an opportunity to do so. Yet when answering Version B, she read the portion of the question asking about a second field and decided to leave it blank, responding that she “wouldn’t count it as interdisciplinary.”

Another respondent had only intended to write one general field, zoology, but when he saw how detailed the list was (including much more narrow and specific categories than he expected), he felt the surveyors wanted him to be more detailed than he envisioned.

Respondent 19 read the first question stem of Version A, flipped back to the list and remarked “Whoa!” as he was surprised about how many fields were on the list. He commented that the list of life sciences was “very specific” and he seemed concerned because he felt his research could be classified in two or three of these categories (some of which he felt were more specific components of more general categories on the list). Thus, he listed two fields on Version A which he felt were both subcomponents of the larger field he originally intended to use. But when answering Version B he did not include a second field, saying he does not consider his research to be interdisciplinary.

Finally, another respondent reported two fields in Version A because of her unique interpretation of the question wording.

Respondent 28 first answered Version B. She included just one field, American history, and noted that her research is not interdisciplinary. However, when answering Version A, she explained that she interpreted the “secondary field” wording of this version to refer to her secondary preliminary examination area of emphasis. She explained that her program requires students to take exams in two specialty areas. She said her dissertation research is focused on the field she listed as her primary field, and that she does not involve her secondary exam area in her dissertation. Yet, she felt compelled to report it because the wording was similar to how her department refers to examination areas.

While there were not a large number of respondents who provided “false positive” reports of interdisciplinary research, the fact that all four of these reports occurred with Version A suggests that this version is less clear than Version B. The wording of Version A is less specific than Version B, in that it just asks for a secondary field without defining this as something specific to interdisciplinary researchers. This generic phrasing did cause a few respondents to indicate they were unsure of what was being asked of them on this version of the question. However, in contrast, two respondents explicitly stated that they preferred the wording of Version A. Also, a majority of respondents provided the same answer to both questions, indicating that in general the two questions have a somewhat similar meaning. In fact, several respondents stated that they believed the two versions of the question were eliciting similar information.

Nevertheless, the numbers show that the second version of the question is slightly more “accurate” as an indicator of interdisciplinary research than the first version. Accounting for all responses, Version A yielded an “accuracy” rate of 60% and Version B elicited an “accurate” response 73% of the time. The introduction of the “interdisciplinary” wording seems to have improved the

performance of the question in terms of whether reporting two fields corresponds to conducting interdisciplinary research.

Interestingly, Version C of the question, which we constructed as a comparison to Version B, had the highest accuracy rate as an indicator of interdisciplinary/multidisciplinary research of all three versions of the dissertation research question. Ninety percent of respondents' answers to this version coincided with their descriptions of their research as interdisciplinary /multidisciplinary or not. This is somewhat surprising given that several respondents indicated that they were unsure of the meaning of multidisciplinary research or that they had not heard this term before. However, Version C of the question was presented to respondents after they had already seen Versions A and B; its position in the sequence was always last. This order may have resulted in the greater accuracy rate for Version C. Perhaps respondents were better able to answer Version C accurately after having the extra time to think about their answers as they answered the other two versions of the question before receiving Version C.

Does the List of Fields of Study affect Responses?

One concern expressed by the National Science Foundation was that respondents might report multiple fields on the dissertation research field(s) questions not because they are interdisciplinary or multidisciplinary, but because they cannot find one field on the list that accurately describes their research; in other words, the list might be producing false positive reports of interdisciplinary research. There was no evidence of this in the interviews. People's decisions whether to report one or two fields was never a result of not being able to find their field on the list.

However, in several instances the list altered people's responses in other ways. Appendix G outlines problems with the fields of study list that are not directly related to the subject of this report. Here we discuss factors that are more relevant to how respondents' answers corresponded to their

identifications as interdisciplinary or not. First, one respondent did not expect his two fields to be listed separately:

Respondent 11 had two fields and automatically wrote both of them in the primary field box. When he saw that these two fields were presented separately on the list, he split them apart and wrote one as a primary field and the other as his secondary field. When he was asked about this, he indicated that before looking at the list he was concerned that it would not break his fields down into two areas, but he was pleased to see that it did, noting it was “accurate after all.” He did see them as two distinct, different fields, and later discussions revealed that he considers them separate fields that he uses together in an interdisciplinary way.

Another respondent (R16) did not write multiple fields (which she intended to do) because she could not find her secondary field on the list (see discussion on page 54). Another respondent (R19) was only planning to write one, broad primary field, but ended up listing two fields in Version A because the list was much more detailed and specific than he expected it to be (see page 59). This case illustrates how it is possible that the list can prompt individuals to write more fields than they perhaps normally would think to include. However, respondent 19 was the only interview subject who made such remarks. Most respondents tended to think at a greater level of specificity when asked about their research fields than this respondent did.

Do Respondents in “Interdisciplines” Answer the Questions Differently?

Twelve respondents identified their primary fields as interdisciplinary or multidisciplinary in nature; that is, they felt these fields alone were interdisciplinary or multidisciplinary regardless of whether they are combined with other fields. Our sample did not include enough people who are in established interdisciplines to allow us to make any definitive conclusions about this issue, but we noted if these respondents answered differently than others.

Overall, there were no major differences in how these respondents answered the dissertation research field(s) questions compared to the other respondents who indicated they are interdisciplinary or multidisciplinary. Most of the participants earning degrees in interdisciplinary subjects did not even mention that their fields were interdisciplines at the time they were completing Versions A, B, and C of the A2 question. Rather, they only indicated as such in Q10, item a of the evaluation questionnaire (see Appendix F, page 91). However, two of the respondents who determined that their fields are interdisciplinary in nature were somewhat troubled or confused by the use of the word “interdisciplinary” in Version B of the question. These respondents only listed one field for this version of the question, but noted that this one field in and of itself is interdisciplinary.

For example, a neuroscience student (respondent 4) wrote neuroscience as the primary field of her dissertation research, and no secondary field, on Version B. As discussed above on page 57, when she read the second part of the question, she commented that her dissertation research is interdisciplinary because neuroscience is considered to be an interdiscipline. She did not feel her research used other fields outside of neuroscience, so in this sense of listing *multiple* fields as an indicator of interdisciplinarity, she felt as if her research was not interdisciplinary. This question confused her and made her uncertain about whether her research should be considered interdisciplinary or not. This example suggests that in some cases of people working in established interdisciplines, the dissertation research field questions may not picking up on actual interdisciplinary research through the method of counting multiple fields.

However, others who considered their fields to be interdisciplines did not have this problem and listed two fields without hesitation. Several of these respondents were among those who listed a subfield as a secondary field and believed that working with multiple subfields or a subfield of a larger discipline constitutes interdisciplinary/multidisciplinary research. This suggests that perhaps individuals in interdisciplinary fields felt the need to include a more specific subfield as a secondary field in

response to the A2 questions because they recognized that the question wanted them to list a secondary field in order for their research to be considered interdisciplinary.

Are the SED Questions Appropriately Capturing Students in Interdisciplinary Degree Programs?

One of the respondents (R2) was involved in the university's Individual Interdisciplinary Doctoral Program (IIDP), which allows students to earn a doctorate that is a Ph.D. in interdisciplinary studies and combines three distinct disciplines that the students choose to form an individualized program of study. Another respondent (R20) was in the process of transferring into this program. Both of these students had difficulty answering each version of the dissertation research fields question, as well as the question which asks respondents to list the primary field of study for their doctoral degree (See Appendix A, page 75 for question A4, part c). When answering question A2 (about the fields of dissertation research), respondent 2 indicated that he does not have "one primary field" and did not want to "rank them." He had trouble deciding which of his three fields he should write. He settled on the department in which his research assistantship is based, but seemed troubled by the fact that this would imply that he uses this field more than his other two, or that it would imply he considers this field more important than the other two. Respondent 20 had similar difficulty. She said she was confused by the question asking for her primary field. Since she is interdisciplinary, she believes she does not have one primary field.

Both of these respondents faced similar troubles when naming the field of study for their degree in question A4. Both respondents wrote "interdisciplinary" as their response for this question. Respondent 2 indicated this would "be a problem" when he realized he was also supposed to report a field code to correspond to his answer. He selected a generic code (Social Sciences, Other - 699), which was different than any of the codes he discussed using in question A2. He opted not to use one of the codes he used in A2 because he said that would be inaccurate. Respondent 20 selected the code that

corresponds to the field of study for her current department. But since she is in the process of leaving this program to move into the interdisciplinary program, she explained that this was “misleading.”

Do Respondents Answer Questions A2 and A4 Similarly?

In each interview, we noted whether respondents’ answers to the primary field portion of question A2 (the question about the fields of dissertation research) were different from their answers to question A4-c (which asks for the primary field of study for the doctoral degree). Other than the two students in the interdisciplinary doctoral program whose responses to A4 were just discussed, there were no students who provided different responses to these two questions. One student initially wrote a more general discipline title on the question about the field of study than he did for his dissertation research primary field. However, he ended up changing his A4 answer to match that of question A2 once he realized he was supposed to report a code along with the name of the field of study. The fact that few students reported different answers to these questions suggests that they interpreted the two questions in a similar fashion. In fact, two respondents remarked that they thought they had already answered this question. Respondent 17 seemed slightly confused, and asked, “why are they asking me this again?” Similarly, respondent 30 said, “they’ve already asked me, but I’ll answer again.”

How Did the Timing of When Respondents Were Referred to the List of Fields of Study Affect Responses?

As alluded to briefly above, another difference in the construction of Versions A and B of the dissertation research field(s) question is when respondents are directed to consult the list of fields of study. Version A instructs respondents to use the list as they write the name of their primary field. Version B first asks respondents to write the name of their primary field, and then afterwards refers them to the list to find a code that corresponds to the field they wrote. This difference affected how individuals respond to the two versions of the question.

When answering Version A, most respondents proceeded to examine the list before writing the name of their field, and therefore wrote the field title as it appeared on the list. However, on Version B, respondents tended to write the name of the field as they typically describe it, and then find a code that best matched their description. For example,

Respondent 16, who received Version B initially, questioned whether to write her specific field, organic chemistry, or just a more general response of “chemistry.” She decided to just write chemistry, and then looked at the list and saw that it broke chemistry down into subfields, so she selected the code for organic chemistry. When she first read Version A, she immediately remarked that in this version she would write “organic chemistry” as opposed to just “chemistry” because it referred her to the list first.

Several respondents commented that Version A was easier to answer because, by asking them to refer to the list first, this question was clearer about how detailed respondents’ answers should be. For example,

Respondent 12, who answered Version B first, seemed troubled because she wrote a very specific description of her research area, and then realized that the list had more general categories. She remarked at this point that it would help if the question instructions prompted her to refer to the list before writing her answer. When she later responded to Version A, she said this form was more “straightforward” because it specifically asks her to look at the list from the beginning.

Similarly, Respondent 13 said he preferred Version A to Version B because it guides him and tells him “exactly what it wants” by referring to the list immediately.

Other respondents preferred the sense of freedom that Version B allowed them in naming their primary field in the manner they chose.

Respondent 15 felt that Version B permitted her to provide more detail about her research fields. When answering Version A, she wrote “experimental psychology” in the box because that was how it appeared on the list. Then on Version B, she wrote “behavioral psychology,” which

was not on the list. She used the code for experimental psychology, which she said is a more general, broader category which includes behavioral psychology. When asked if she thought it was helpful for the question to refer to the list first, she replied that “it depends” on what the researchers are trying to get from the question. She elaborated that if the researchers are only going to look at the codes respondents report, then it might be helpful to just refer people to the list first. But she believed that being able to write a title that is not on the list (as she did in Version B) “gives more information.”

Respondent 3 had a different type of comment about the timing of the reference of the list. He received Version B first, and when selecting a code for his primary field he scanned the list very briefly and chose the first code that he felt applied to his written response. As he looked over the list afterwards, he realized there were other codes on it that were more applicable than his first choice. He commented after answering Version B that if the question had referred him to the list first, he would have looked through it more carefully and found the code that better represented his primary field. Later, when answering Version A, he mentioned this again, saying that this question inspired him to look more carefully at the list, which allowed him to find a code that better represents his field.

Conclusion and Recommendations

Summary and Implications

These interviews suggest it is reasonable to assume that doctoral candidates, who are likely to soon complete the Survey of Earned Doctorates, are relatively familiar with the term interdisciplinary and understand that it refers to research that crosses or encompasses multiple disciplines. However, while all 30 of the participants in these interviews understood the *general* meaning of the term, there was quite a bit of variation in the *specific* definitions provided by these respondents. Furthermore, very few respondents were familiar with the definitions common among interdisciplinary research scholars.

Therefore, when using “interdisciplinary” in a questionnaire, surveyors must recognize that individual respondents are interpreting the question in slightly different ways. If the surveyors have a broad, general idea of interdisciplinary that they are trying to measure (i.e., research that encompasses multiple disciplines), then this variation in interpretations may not present much of a problem. However, if one is trying to capture a very specific definition of interdisciplinary research, then simply using the word “interdisciplinary” without additional defining material is likely to result in greater measurement error.

Since some respondents were more familiar with the word interdisciplinary, using this term may be preferable to the use of the word multidisciplinary. However, a few individuals insisted their research was multidisciplinary, not interdisciplinary, and this affected how several of them answered the various versions of the dissertation research field(s) question. Although most individuals indicated that these two terms have different definitions, overall it seems as if respondents view the words interdisciplinary and multidisciplinary similarly, and the distinctions they make between them do not appear to be very salient. However, the version of the A2 question which used the term multidisciplinary was more accurate than the other two versions of the question, suggesting that although many individuals seemed to believe the two terms were somewhat similar, in some instances they elicit different responses. From the standpoint of how the words are recognized and interpreted, the use of interdisciplinary alone seems suitable in most cases, but with others who preferred the term multidisciplinary, perhaps using both interdisciplinary and multidisciplinary in a questionnaire would be helpful.

Most of the interdisciplinary/ multidisciplinary respondents identified themselves as such when they were presented with the A2 questions (steps 1-3). This suggests that the dissertation research question can prompt respondents to recognize their status as interdisciplinary or not. However, in some instances interdisciplinary/ multidisciplinary respondents did not answer the A2 questions in a way that was consistent with their descriptions of their research. There were a variety of reasons for these

inconsistencies, making it difficult to pinpoint a specific problem behind all of these errors. Often these inconsistent responses resulted from behaviors unique to individual respondents, such as uncommon interpretations of the questions or personal reactions to certain terms used in the questions.

These results show that the SED fields of dissertation research questions are somewhat successful as measures of interdisciplinary research. A majority of respondents' answers to these questions were consistent with their descriptions of their research as interdisciplinary/ multidisciplinary. However, neither version of the question was completely accurate. Both renditions obtained several "false negative" reports of interdisciplinary research (interdisciplinary researchers who failed to indicate multiple fields on the A2 questions). Version A also had some "false positive" reports (non-interdisciplinary researchers who reported multiple fields). Thus, Version B is more accurate as an indicator of interdisciplinary research than Version A. This is likely due to the fact that Version B is more explicitly trying to measure interdisciplinary research because of the use of this term; the "secondary field" wording of Version A is vaguer without the use of the term "interdisciplinary."

Using the dissertation research field(s) question as an indicator of interdisciplinary research may also be problematic in instances in which respondents are earning degrees in interdisciplinary fields. An instance in our interviews suggests that in some cases these respondents may not indicate two fields, even though they consider their research to be interdisciplinary. Furthermore, the interviews indicate that the SED questions are problematic for individuals who are in designated interdisciplinary degree programs. These individuals had difficulty answering the question about the fields of research for their dissertation as well as the question about their field of study for the doctoral degree.

Recommendations for Improving the Measurement of Interdisciplinary Research in the SED

The concept of interdisciplinary research is difficult to measure, in part because it is difficult to define. With no broad consensus of a definition of the term, constructing a valid and reliable indicator of

interdisciplinary research will be challenging. The results of these interviews show that there is a great deal of variation in how individuals define interdisciplinary research, as well as multidisciplinary research. Therefore, there is likely to be much variation in the meanings of individuals' responses to questions that aim to measure whether one conducts this type of research.

Because some individuals did not recognize that the question asking for the field(s) of their dissertation research was also indirectly asking if their research is interdisciplinary, it may be helpful to use an additional, separate question as an indicator of interdisciplinary or multidisciplinary research. This may make the purpose of each question clearer to respondents. Question A2 can continue to be used as an indicator of the field or fields of respondents' research, while a second question could serve the purpose of directly asking respondents if their research is interdisciplinary (or multidisciplinary). Figure 3 contains an example of how these two separate questions might be constructed.

Using this method, respondents' answers may be more easily interpreted; we could be more certain that individuals' specific definitions of the term interdisciplinary have not affected whether or not they report a secondary field for their dissertation research, and we would not have to deduce respondents' self-identified interdisciplinary status from their report of multiple fields. Additionally, this method would solve the problem of identifying interdisciplinary researchers within interdisciplines, who might only list one field yet still conduct interdisciplinary research. Overall, the results suggest that whether respondents report two fields is not perfectly correlated with whether they consider their research to be interdisciplinary, so using a single measure for both of these concepts results in some imprecise measures.

However, if the question of whether respondents' research is interdisciplinary is separated from the dissertation research field(s) question, question A2 may need some additional clarification. Several respondents were confused by the meaning of the "secondary field" phrase in Version A of the question, and felt that the version that included "interdisciplinary" was clearer. Therefore, if the interdisciplinary

component is removed, the question may need some revision to specify what is meant by a secondary field.

Figure 3. Example of Revised Questions for Asking For Fields of Dissertation Research and Interdisciplinary Research

A2. Please list the field (or fields) of your dissertation research:

name of field 1

name of field 2 (if applicable)

Using the list on pages 7 and 8, please list the code(s) that best describe the field(s) of your dissertation research listed above.

code 1

code 2

A3. Is your dissertation research interdisciplinary? (*By interdisciplinary we mean research that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines*).

Yes

No

Not sure

Additionally, the fact that there was a lot of variation in respondents' definitions of interdisciplinary research suggests that simply including a separate question will not solve all problems. These unique definitions affect whether and how people identify as interdisciplinary in multiple, unique ways. Using the word multidisciplinary as well may be helpful, since with both words some respondents who have very specific definitions of interdisciplinary may feel more inclined to indicate their research is

interdisciplinary *or* multidisciplinary. Ultimately, however, if the surveyors have a specific definition of interdisciplinary research in mind, it seems necessary to include a definition in the question to assure that all respondents are using the same guidelines for determining whether their research falls into this category. Alternatively, a question could be constructed to ask if respondents perform certain activities associated with interdisciplinary research (such as integrating methods from multiple fields), rather than simply asking if their research is interdisciplinary.

Another issue discovered in the interviews was that respondents in programs specifically labeled as interdisciplinary degrees had difficulty answering both the A2 question about dissertation research fields as well as question A4, about their fields of study. These respondents disliked the “primary” and “secondary” phrasing of question A2. Perhaps the wording of this question should be changed so as not to imply that one of the fields is more important than the others. Also, the inclusion of a category called “interdisciplinary” studies on the list would be helpful for students such as these when responding to question A4, about the field of study for their doctoral degrees.

Since many respondents could not find their fields on the list of fields of study, it may be helpful to keep the reporting of field names separate from the reporting of field numbers from the list. In the first portion of Version B of the A2 question, respondents are asked to write the name of their field before referring to the list to find an appropriate code. This allows respondents to report the field exactly as they wish before trying to place it within a predetermined category. This sequence (asking for the name of the field before asking for the category on the list) could be extended into the portion of the question asking for respondents’ secondary fields as well. If respondents were asked to list the names of both fields, and then referred to the list, both of the verbatim fields listed by respondents could be analyzed to determine how well the list of fields of study matches responses. Alternatively, respondents could be given the option of listing a field that is not contained on the list if they were unable to find a suitable category.

Appendix A

Version A of the SED Questionnaire Used in Step 1 of the Interviews

Select Items from the Survey of Earned Doctorates (SED)

INSTRUCTIONS

Thank you for taking the time to complete this questionnaire. Directions are provided for each question. Please print all responses; you may use either a pen or a pencil.

PART A – EDUCATION

A1. What is the title of your dissertation?

- Please mark (X) this box if the title below refers to a performance, project report, or musical or literary composition required instead of a dissertation.

Title

A2. Using the Specialties List (pages 5 and 6), please write the name and number of the primary field of your dissertation research.

Name of Field

Number of Field

If you had a secondary field for your dissertation research, list the name and number.

Name of Field

Number of Field

A3. Please name the department (or interdisciplinary committee, center, institute, etc.) of the university that supervised your doctoral studies.

Department/Committee/Center/Institute/Program

A4. The next few questions ask about the doctoral degree you are currently working on (or just received) and other degrees you have earned. Please provide the following information for this doctoral degree, your most recent master's degree, and your first bachelor's degree in the appropriate columns below.

	This research doctoral degree	Most recent master's degree (e.g. MS, MA, MBA) or equivalent	First bachelor's degree (e.g. BA, BS, AB) or equivalent
a. Have you received a degree of this type?.....		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
b. Month/year degree was or will be <u>granted</u>	<input type="text"/> <input type="text"/> Month <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Year	<input type="text"/> <input type="text"/> Month <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Year	<input type="text"/> <input type="text"/> Month <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Year
c. Primary field of study.....	<hr/> <hr/>	<hr/> <hr/>	<hr/> <hr/>
d. Field number from list on pgs. 5-6.....	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>
e. Institution name.....	<hr/> <hr/>	<hr/> <hr/>	<hr/> <hr/>

PART B – BACKGROUND INFORMATION

B1. Are you –

Male Female

B2. What is your date of birth?

Month Day Year

B3. What is your marital status?

Mark (X) one

- Married
- Living in a marriage-like relationship
- Widowed
- Separated
- Divorced
- Never married

B4. Not including yourself or your spouse/partner, how many dependents (children or adults) do you have – that is, how many others receive at least one half of their financial support from you?

Write in number of dependents

5 years of age or younger

6 to 18 years

19 years or older

Mark (X) if none

B5. Are you Hispanic or Latino?

- Yes
- No

B6. What is your racial background?

Mark (X) one or more

- American Indian or Alaska Native
- Native Hawaiian or other Pacific Islander
- Asian
- Black or African-American
- White

Please Turn Page for Specialties List

BUSINESS MANAGEMENT/ADMINISTRATION

900 Accounting	916 International Business/Trade/Commerce	935 Organizational Behavior (<i>see also PSYCHOLOGY/Industrial & Organizational</i>)
905 Banking/Financial Support Services	920 Marketing Management & Research	938 Business Management/Administration, General
910 Business Administration & Management	917 Management Information Systems/Business Statistics	939 Business Management/Administration, Other
915 Business/Managerial Economics	930 Operations Research (<i>also in ENGINEERING & in MATHEMATICS</i>)	
901 Finance		
921 Human Resources Development		

COMMUNICATION

940 Communication Research	950 Film, Radio, TV & Digital Communication	958 Communication, General
957 Communication Theory	947 Mass Communication/Media Studies	959 Communication, Other

COMPUTER & INFORMATION SCIENCES

400 Computer Science	410 Information Science & Systems	419 Computer & Information Science, Other
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EDUCATION**RESEARCH & ADMINISTRATION**

840 Counseling Education/Counseling & Guidance	810 Educational/Instructional Media Design	845 Higher Education/Evaluation & Research
800 Curriculum & Instruction	807 Educational Leadership	825 School Psychology (<i>also in PSYCHOLOGY</i>)
805 Educational Administration & Supervision	822 Educational Psychology (<i>also in PSYCHOLOGY</i>)	830 Social/Philosophical Foundations of Education
820 Educational Assessment/Testing/Measurement	815 Educational Statistics/Research Methods	835 Special Education

TEACHER EDUCATION

858 Adult & Continuing Teacher Education	850 Pre-elementary/Early Childhood Teacher Education	856 Secondary Teacher Education
852 Elementary Teacher Education		

TEACHING FIELDS

860 Agricultural Education	866 Foreign Languages Education	882 Reading Education
861 Art Education	868 Health Education	884 Science Education
862 Business Education	874 Mathematics Education	885 Social Science Education
864 English Education	876 Music Education	888 Trade & Industrial Education
870 Family & Consumer/Human Science (<i>also in Fields Not Elsewhere Classified</i>)	878 Nursing Education	889 Teacher Education & Professional Development, Other
	880 Physical Education & Coaching	

OTHER EDUCATION

898 Education, General	899 Education, Other	
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ENGINEERING

300 Aerospace, Aeronautical & Astronautical Engineering	376 Engineering Management & Administration	357 Nuclear Engineering
303 Agricultural Engineering	327 Engineering Mechanics	360 Ocean Engineering
306 Bioengineering & Biomedical Engineering	330 Engineering Physics	363 Operations Research (<i>also in MATHEMATICS & in BUSINESS MANAGEMENT</i>)
309 Ceramic Sciences Engineering	333 Engineering Science	366 Petroleum Engineering
312 Chemical Engineering	336 Environmental Health Engineering	369 Polymer & Plastics Engineering
315 Civil Engineering	339 Industrial & Manufacturing Engineering	372 Systems Engineering
318 Communications Engineering	342 Materials Science Engineering	398 Engineering, General
321 Computer Engineering	345 Mechanical Engineering	399 Engineering, Other
324 Electrical, Electronics & Communications Engineering	348 Metallurgical Engineering	
	351 Mining & Mineral Engineering	

HUMANITIES**HISTORY**

706 African History	705 European History	708 Middle/Near East Studies
700 American History (U.S. & Canada)	710 History, Science & Technology & Society	718 History, General
703 Asian History	707 Latin American History	719 History, Other

FOREIGN LANGUAGES & LITERATURE

768 Arabic	746 Italian	755 Slavic (other than Russian)
758 Chinese	762 Japanese	749 Spanish
740 French	752 Russian	769 Other Languages & Literature
743 German		

LETTERS

732 American Literature (U.S. & Canada)	734 English Language	736 Speech & Rhetorical Studies
720 Classics	733 English Literature (British & Commonwealth)	738 Letters, General
723 Comparative Literature	724 Folklore	739 Letters, Other
735 Creative Writing		

OTHER HUMANITIES

770 American/U.S. Studies	780 Music	785 Philosophy
773 Archaeology	786 Music Theory & Composition	790 Religion/Religious Studies
776 Art History/Criticism/Conservation	787 Music Performance	798 Humanities, General
792 Bible/Biblical Studies	788 Musicology/Ethnomusicology	799 Humanities, Other
795 Drama/Theater Arts	789 Music, Other	

LIFE SCIENCES**AGRICULTURAL SCIENCES/NATURAL RESOURCES**

005 Agricultural Animal Breeding	055 Fishing & Fisheries Sciences/Management	030 Plant Pathology/Phytopathology (<i>also in BIOLOGICAL SCIENCES</i>)
000 Agricultural Economics	043 Food Science	039 Plant Sciences, Other
025 Agricultural & Horticultural Plant Breeding	044 Food Science & Technology, Other	046 Soil Chemistry/Microbiology
020 Agronomy & Crop Science	066 Forest Sciences & Biology	049 Soil Sciences, Other
010 Animal Nutrition	070 Forest/Resources Management	080 Wildlife/Range Management
014 Animal Science, Poultry (or Avian)	079 Forestry & Related Science, Other	072 Wood Science & Pulp/Paper Technology
019 Animal Science, Other	050 Horticulture Science	098 Agriculture, General
081 Environmental Science	074 Natural Resources/Conservation	099 Agricultural Science, Other

LIFE SCIENCES (continued)**BIOLOGICAL/BIOMEDICAL SCIENCES**

130 Anatomy	136 Cell/Cellular Biology & Histology	166 Parasitology
110 Bacteriology	142 Developmental Biology/Embryology	175 Pathology, Human & Animal
100 Biochemistry (see also PHYSICAL SCIENCES/ Chemistry, other)	139 Ecology	180 Pharmacology, Human & Animal
102 Bioinformatics	145 Endocrinology	185 Physiology, Human & Animal
103 Biomedical Sciences	148 Entomology	115 Plant Genetics
133 Biometrics & Biostatistics	137 Evolutionary Biology	120 Plant Pathology/Phytopathology (also in AGRICULTURAL SCIENCES)
105 Biophysics (also in PHYSICS)	170 Genetics/Genomics, Human & Animal	125 Plant Physiology
107 Biotechnology	151 Immunology	169 Toxicology
129 Botany/Plant Biology	157 Microbiology	189 Zoology
158 Cancer Biology	154 Molecular Biology	198 Biology/Biomedical Sciences, General
	160 Neurosciences	199 Biology/Biomedical Sciences, Other
	163 Nutrition Sciences	

HEALTH SCIENCES

210 Environmental Health	240 Medicinal/Pharmaceutical Sciences	200 Speech-Language Pathology & Audiology
211 Environmental Toxicology	230 Nursing Science	250 Veterinary Sciences
220 Epidemiology	215 Public Health	298 Health Sciences, General
212 Health Systems/Services Administration	245 Rehabilitation/Therapeutic Services	299 Health Sciences, Other
222 Kinesiology/Exercise Science		

MATHEMATICS

425 Algebra	440 Logic	450 Statistics (also in SOCIAL SCIENCES)
430 Analysis & Functional Analysis	445 Number Theory	455 Topology/Foundations
420 Applied Mathematics	465 Operations Research (also in ENGINEERING & in BUSINESS MANAGEMENT/ADMIN.)	498 Mathematics/Statistics, General
460 Computing Theory & Practice		499 Mathematics/Statistics, Other
435 Geometry/Geometric Analysis		

PHYSICAL SCIENCES**ASTRONOMY**

500 Astronomy	505 Astrophysics	
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ATMOSPHERIC SCIENCE & METEOROLOGY

510 Atmospheric Chemistry & Climatology	514 Meteorology	519 Atmospheric Science/Meteorology, Other
512 Atmospheric Physics & Dynamics	518 Atmospheric Science/Meteorology, General	

CHEMISTRY

520 Analytical Chemistry	530 Physical Chemistry	538 Chemistry, General
522 Inorganic Chemistry	532 Polymer Chemistry	539 Chemistry, Other (see also BIOLOGICAL/Biochemistry)
526 Organic Chemistry	534 Theoretical Chemistry	

GEOLOGICAL & EARTH SCIENCES

542 Geochemistry	544 Geophysics & Seismology	550 Stratigraphy & Sedimentation
540 Geology	548 Mineralogy & Petrology	558 Geological & Earth Sciences, General
552 Geomorphology & Glacial Geology	546 Paleontology	559 Geological & Earth Sciences, Other

OCEAN/MARINE SCIENCES

585 Hydrology & Water Resources	595 Marine Sciences	
590 Oceanography, Chemical & Physical	599 Ocean/Marine, Other	

PHYSICS

560 Acoustics	574 Condensed Matter/Low Temperature Physics	570 Plasma/Fusion Physics
576 Applied Physics	568 Nuclear Physics	572 Polymer Physics
561 Atomic/Molecular/Chemical Physics	569 Optics/Photonics	578 Physics, General
565 Biophysics (also in BIOLOGICAL SCIENCES)	564 Particle (Elementary) Physics	579 Physics, Other

PSYCHOLOGY

600 Clinical Psychology	615 Experimental Psychology	627 Physiological/Psychobiology Psychology
603 Cognitive Psychology & Psycholinguistics	620 Family Psychology	633 Psychometrics & Quantitative Psychology
606 Comparative Psychology	613 Human Development & Family Studies	636 School Psychology (also in EDUCATION)
609 Counseling	621 Industrial & Organizational (see also BUSINESS MANAGEMENT/Organization Behavior)	639 Social Psychology
612 Developmental & Child Psychology	624 Personality Psychology	648 Psychology, General
618 Educational Psychology (also in EDUCATION)		649 Psychology, Other

SOCIAL SCIENCES

650 Anthropology	667 Economics	686 Sociology
652 Area/Ethnic/Cultural/Gender Studies	670 Geography	690 Statistics (also in MATHEMATICS)
657 Criminal Justice & Corrections	674 International Relations/Affairs	694 Urban Affairs/Studies
658 Criminology	676 Linguistics	695 Urban/City, Community & Regional Planning
662 Demography/Population Studies	678 Political Science & Government	698 Social Sciences, General
668 Econometrics	682 Public Policy Analysis	699 Social Sciences, Other

FIELDS NOT ELSEWHERE CLASSIFIED (NEC)

960 Architecture/Environmental Design	972 Library Science	984 Theology/Religious Education (see also OTHER HUMANITIES/Religion/Religious Studies)
964 Family/Consumer Science/Human Science (also in EDUCATION)	974 Parks/Sports/Rec./Leisure/Fitness	989 Other Fields, NEC
968 Law	976 Public Administration	
	980 Social Work	

Appendix B

First Page of Version B of the SED Questionnaire Used in Step 1 of the Interviews

(The two versions of the questionnaire were similar except for Question A2)

Select Items from the Survey of Earned Doctorates (SED)

INSTRUCTIONS

Thank you for taking the time to complete this questionnaire. Directions are provided for each question. Please print all responses; you may use either a pen or a pencil.

PART A – EDUCATION

A1. What is the title of your dissertation?

- Please mark (X) this box if the title below refers to a performance, project report, or musical or literary composition required instead of a dissertation.

Title

A2. Please write the name of the primary field of your dissertation research.

Name of Field

Using the list on pages 5 and 6, choose the code that best describes the primary field of your dissertation research.

Number of Field

If your dissertation research was interdisciplinary, list the name and number of your secondary field.

Name of Field

Number of Field

Appendix C

Step 2's Alternate A2 Question for Respondents Receiving

Version A of the SED Questionnaire in Step 1

A2a. Please write the name of the primary field of your dissertation research.

Name of Field

Using the list on pages 5 and 6, choose the code that best describes the primary field of your dissertation research.

Number of Field

If your dissertation research was interdisciplinary, list the name and number of your secondary field.

Name of Field

Number of Field

Appendix D

Step 2's Alternate A2 Question for Respondents Receiving

Version B of the SED Questionnaire in Step 1

A2b. Using the Specialties List (pages 5 and 6), please write the name and number of the primary field of your dissertation research.

Name of Field

Number of Field

If you had a secondary field for your dissertation research, list the name and number.

Name of Field

Number of Field

Appendix E

Step 3's Multidisciplinary Question Version

A2c. Please write the name of the primary field of your dissertation research.

Name of Field

Using the list on pages 5 and 6, choose the code that best describes the primary field of your dissertation research.

Number of Field

If your dissertation research was multidisciplinary, list the name and number of your secondary field.

Name of Field

Number of Field

Appendix F

Evaluation Questionnaire Administered in Step 4

Additional Questions

Next we would like to ask you a series of questions about the concepts of interdisciplinarity and multidisciplinary. Please provide as much information as you can; your responses are important for helping us understand how to improve the questions used in the NSF questionnaires.

Q1. Do you think the meanings of the terms “interdisciplinary” and “multidisciplinary” are:

- Exactly the same
- Very similar
- Somewhat similar
- Somewhat different
- Very different
- Completely different

- Not sure

Q2. What exactly does “interdisciplinary” mean to you?

Q3. How do you think the meaning of “multidisciplinary” differs from the meaning of “interdisciplinary” (if at all)?

Q4. Based on your definitions, how would you describe your doctoral dissertation research?

Neither interdisciplinary nor multidisciplinary → **SKIP to Q9 on pg. 3**

Interdisciplinary

Multidisciplinary

Both interdisciplinary or multidisciplinary

Q5. (If interdisciplinary and/or multidisciplinary) Do you consider your research to be interdisciplinary or multidisciplinary for any of the following reasons? Mark Yes or No for each item.

	Yes	No	Does not apply
You cite research from multiple fields/disciplines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You use research from multiple fields/disciplines to formulate your research questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You use theories or methods from multiple fields/disciplines to conduct your research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your research's implications are relevant or applicable to multiple fields/disciplines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You have presented or plan to present your research at a multidisciplinary or interdisciplinary conference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your research may be publishable in a journal that speaks to multiple disciplines or in an interdisciplinary journal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your committee consists of faculty from multiple fields/disciplines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You have another degree in a different field/discipline	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6. If there are additional reasons (not listed above) why you consider your research to be interdisciplinary or multidisciplinary, please describe them here:

Q7. Did you begin your graduate studies with the intention of conducting interdisciplinary or multidisciplinary research?

Yes

No

Q8. What factors influenced your decision to do interdisciplinary or multidisciplinary research?

Q9. Based on your definitions of interdisciplinary and multidisciplinary, would you say that the doctoral degree you will earn (or have just earned) is:

Neither interdisciplinary nor multidisciplinary → **SKIP to Question Q12 on pg. 4**

Interdisciplinary

Multidisciplinary

Both interdisciplinary or multidisciplinary

Q10. (If interdisciplinary and/or multidisciplinary) Do you consider your degree to be interdisciplinary or multidisciplinary for any of the following reasons? Mark Yes or No for each item.

	Yes	No	Does not apply
Your discipline is considered to be an interdisciplinary discipline	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You are earning a minor in an additional field/discipline	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You took courses from multiple academic departments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You took courses that were cross-listed to multiple departments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your committee consists of faculty from multiple fields/disciplines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your program/department has faculty from multiple fields/disciplines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Your research uses theories or methods from multiple fields/disciplines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q11. If there are additional reasons (not listed above) why you consider your doctoral degree to be interdisciplinary or multidisciplinary, please describe them here:

Q12. In your opinion, is there a difference between doing interdisciplinary/ multidisciplinary research for a dissertation and getting an interdisciplinary/ multidisciplinary doctoral degree?

- Yes
- No
- Not sure

Q13. In general, do you think that interdisciplinary or multidisciplinary research is typically:

- Of higher quality than research produced within a single discipline
- Of the same quality as research produced within a single discipline
- Of lower quality than research produced within a single discipline
- Not sure

Q14. How supportive or unsupportive do you think WSU is of graduate students who conduct interdisciplinary or multidisciplinary research?

- Very supportive
- Somewhat supportive
- Neither supportive nor unsupportive
- Somewhat unsupportive
- Very unsupportive
- Not sure

Q15. To what extent do you think that doctoral students who conduct interdisciplinary or multidisciplinary research are advantaged or disadvantaged when looking for a job, compared to students whose research is based only in one discipline?

- Very advantaged
- Somewhat advantaged
- Neither advantaged nor disadvantaged
- Somewhat disadvantaged
- Very disadvantaged

- Not sure

Q16. Thinking about career advancement and success in general, do you think conducting interdisciplinary or multidisciplinary research is advantageous or disadvantageous for researchers?

- Very advantageous
- Somewhat advantageous
- Neither advantageous nor disadvantageous
- Somewhat disadvantageous
- Very disadvantageous

- Not sure

Q17. Some scholars define multidisciplinary research as research that uses perspectives from multiple disciplines, but does not necessarily integrate the concepts from the various disciplines.

This is distinguished from interdisciplinary research, which these scholars view as research that integrates perspectives from multiple disciplines to solve problems that are beyond the scope of a single discipline.

Based on these definitions, would you say that your dissertation research is:

- Neither interdisciplinary nor multidisciplinary
- Interdisciplinary
- Multidisciplinary
- Either interdisciplinary or multidisciplinary

Appendix G

Additional Problems with the List of Fields of Study

Additional Problems with Fields of Study List

Many respondents had some difficulties using the Fields of Study list, for a variety of reasons.

This is a summary of the issues that arose in the interviews as respondents completed the SED questionnaire.

Issue 1: Respondents' Fields Were Not on the List

Many respondents could not find certain fields on the list. This occurred as they answered the A2 questions about fields of dissertation research as well as question A4 as respondents listed the fields of study for their doctoral, master's, and bachelor's degrees. The fields respondents expected to find but were not on the list include:

- *Interdisciplinary*. Three respondents wanted there to be an Interdisciplinary code on the list. They instead used codes that were close to one of their fields, or a general category code.
- *Viticulture and enology*. The respondent chose "Food Science and Technology, Other" (044) instead, but was unsure if this accurately represented the fields.
- *Industrial organization*. The respondent chose "Economics (667)" instead, noting that industrial organization is a specialty within economics.
- *Behavioral psychology*. The respondent chose "Experimental Psychology" (615) instead, noting that behavioral psychology is encompassed by experimental psychology.
- *Biological chemistry*. Respondent did not report another code to replace this.
- *Radiochemistry*. Respondent used "Chemistry, Other" (539) as a replacement.
- *Media advocacy*. Respondent chose "Mass Communication/Media Studies" (947) instead. He also commented that in general he did not feel that the Communication section of the list was exhaustive enough to cover a variety of subfields within Communication.

- *Writing and Literature*. Respondent said it did not classify as “Creative Writing” (735) and it was not “Comparative Literature” (723). The respondent chose “English Language” (734) but felt this probably was not very accurate.
- *Volcanology*. Respondent did not list an alternative code.
- *English and American literature*. Respondent wrote both the codes for “American Literature” (732) and “English Literature” (733).
- *Literacy*. Respondent used the code for “Reading Education” (882) but did not see this as a good fit. Respondent said this terminology would not be used by education scholars.
- *Speech and hearing*. Respondent used a code for “Special Education” (835) to classify it, but realized this was not very accurate.
- *Rural sociology*. Respondent did not use an alternative code.

Issue 2: Problematic Titles of Fields on the List

Several respondents had trouble locating an appropriate code because they were labeled with titles that were strange or unfamiliar to them.

- Two respondents could not find a code for *general biology* because they did not interpret the “Biological/Biomedical Sciences, General” (198) code to be appropriate for general biology. Both indicated that the presence of “biomedical” in the title implied that there must be some sort of medical emphasis to the degree, so the code did not seem appropriate for their general biology degrees.
- A respondent could not find her field, *materials science*, on list. She insisted it was different than “Materials Science Engineering” (342) because her field is not engineering and is housed in the physics department. She expected her field to be listed under the Physics classification.

- One respondent could not find a *general mathematics* degree code. He did not feel that the “Mathematics/Statistics, General” (498) code applied to him because this title implied that the degree had a statistics focus. He explained that statistics is a category of mathematics, so it makes this title seem like a degree in math with a focus on statistics.

Issue 3: Unexpected Location of Fields on the List

Other respondents had difficulty locating their field on the list because it was under a different category than they expected it to be.

- One respondent could not find *women’s studies or feminist studies* on the list. She expected it to be classified in the Humanities section of the list, so when she could not find it here, she chose the “Humanities, Other” (799) category instead. There was one category which was similar to what she was looking for (“Area/Ethnic/Cultural/Gender Studies” - 652), but it was classified under Social Sciences so she did not find it on her own.
- Another respondent could not find *cultural studies* on the list because he expected it to be in the Humanities section, but this category (“Area/Ethnic/Cultural/Gender Studies” - 652) is in the Social Sciences section.
- One respondent could not locate *agricultural economics* (000) because it was in the Agricultural Sciences section of the list. He expected it to be classified with the Social Sciences.
- A respondent had trouble locating the *general biology* code (“Biological/Biomedical Sciences, General” - 198) because it was at the end of the list of biological sciences, rather than being alphabetized.
- One respondent expected her field, *analytical chemistry*, to be classified in life sciences. She eventually found “Analytical Chemistry” (520) under the physical sciences, but said some

components of chemistry are more related to the life sciences than the physical sciences. She thought it was strange that chemistry (as a whole) was classified as a physical science.

- One respondent could not initially find a code relevant for *crop science-plant breeding* because this code (“Plant Genetics” - 115) was not found near crop science on the list.
- One respondent was puzzled because she could not find *archaeology* on the list. “Archaeology” (773) is in the Humanities section, and she expected it to be classified in the Social Sciences category.

Issue 4: Problems with the Level of Specificity of Fields in the List

- A respondent who was looking for a code for *women’s studies or feminist studies* used the code “Area/Ethnic/Cultural/Gender Studies” (652), but noted that it was strange that the list considers all of these areas to be one field, because to her they are all very different. She mentioned that there was an inconsistency in the lists’ levels of specialization (in the hard sciences the field categories are very specific and specialized but in humanities and social sciences they are very broad). She was offended by this and felt the list was biased in favor of the “hard” sciences.
- Another respondent indicated his primary field was *food engineering*, which is not on the list. He chose “Food Science and Technology” (044) instead. He mentioned that food engineering is generally considered to be agricultural engineering (which is on the list – number 303) at the undergraduate level, but he seemed to think this code was not specialized enough for his field at the doctorate level.
- A respondent remarked that the list is outdated because it lists all of the biological sciences separately. He said that 11 of the different fields listed under the Biological/Biomedical Sciences category applied to him. He felt that the biological sciences are inherently multidisciplinary and

intertwined these days, so it seemed strange to him that all of these would be separate options but that he could not list them all.

- Another respondent seemed to think the list was too detailed and contained too many specific sub-categories in biological sciences. The list appeared to overwhelm him and resulted in an uncertain search for any codes that could apply to his research when he actually wanted to just list a very broad field.
- A respondent used code 657 (“Criminal Justice and Corrections”), which applied well to him, but said it was strange because *corrections* is just one subfield of criminal justice. He pointed out that others studying criminal justice with other specialties, such as *policing*, may have a problem with this listing because it forces them to choose a specialty that is not relevant to them. He wanted to see this code listed simply as “Criminal Justice,” or for the list to elaborate into more of the subfields of criminal justice.

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