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for consideration for the

2017 ROBERT J. MENGES AWARD FOR OUTSTANDING RESEARCH

IN EDUCATIONAL DEVELOPMENT

Instructions:

- Boxes will expand to accommodate text
- Total **word count must not exceed 2000 words** for the body of the proposal, excluding references and appendices.
- Supporting information (e.g. tables, figures, images, references, instruments, details of experimental design) may be placed in appendices. Though not limited, the strongest proposals are typically supported by no more than 10 pages of appendices. To conserve space, for example, you can place multiple figures on one page, single-space survey instruments, etc. Keep in mind, the selection committee is not required to read beyond this general limit.
- Please be sure to include the word counts in each section, as well as the total for all sections (see below). Proposals without the word counts noted will not be read.
- Incomplete proposals will not be read.

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SESSION TITLE:	Instructors' conceptualization of course design and what matters in faculty development

1. RESEARCH QUESTION(S) & WHY THEY ARE IMPORTANT TO THE FIELD:

Course design – the intentional integration of content, pedagogy, and assessment pertinent to a set of learning objectives – is a foundational process of teaching and learning, and defines the interaction between teachers and learners, between learners, and potentially between teachers. Whether creating new courses or redesigning existing ones, course design is essential to faculty work. Course reform has grown in the last decade to be an important signature program of faculty-development centers[1]. In addition to being a practice of individual teachers, recent initiatives supported teams of faculty or entire departments to reconsider course design[2-5]. Despite the importance to instructor work, faculty-development programs, and institutional initiatives, the matter of how instructors conceptualize course design remains poorly known.

The study pursues this question: *How do college science and math teachers who have participated in a course-design program describe and understand the concept of course design?*   We aim to contribute to the research on teaching professional learning by informing faculty developers about faculty members' perception of course design.

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2. DESCRIPTION OF RESEARCH DESIGN:

We approach the investigation with a phenomenographic framework, where the objective of study is the variation among subjects of the meaning, understanding, conceptualization and awareness or ways of experiencing a phenomenon[6-8]. Phenomenography asserts that individuals have different concepts of the world because any person at any time only partially experiences a phenomenon. Therefore, at any one point in time and context, people discern different aspects of any concept or phenomenon to different degrees. This leads to the fundamental non-dualistic ontological position in phenomenography: Object (in this case, course design) and subject (i.e., teacher) are not separate; the subject's experience and understanding of the object is a relationship between the two. The phenomenographic approach originated within and has been utilized extensively in higher-education research[9] to determine how students and teachers conceptualize, respectively, learning and teaching [10-12], and how this faculty view development as teachers [13,14]. Phenomenography has spawned variation theory, with application to action research and course design[15].

The research employed individual structured interviews with nine STEM faculty or graduate teaching assistants. Concrete examples were elicited from the participants to understand how they conceptualize course design (i.e., what is course design?) and to identify the factors that lead to redesign. Each interview was a pre-established protocol of open-ended questions (see Appendix A) with further probing by the interviewer to gain understanding of how participants conceptualize the

course-design phenomenon. Using criterion sampling, participants were selected from among participants in a STEM professional-development program of course design/re-design at a research-intensive university. Interviews were conducted by an investigator who was not connected to this program.

The authors (investigators) qualitatively analyzed transcripts from audio recordings of these interviews. Analysis began with reading all interview transcripts to determine categories of description[12], identified as a number of qualitatively different meanings or ways of experiencing the phenomenon. The five categories (described below) were refined during an iterative process of challenging, revising, and aligning the transcribed interview utterances to the proposed categories[8] during a series of conferences among the investigators.

The category descriptions were refined by the development of the outcomes space[16]. The research team analyzed each category to ensure distinct, logical, and hierarchical relationships within this space as is crucial for phenomenographic analysis[12,14].

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3. LITERATURE REVIEW & THE RELATIONSHIP OF THE LITERATURE TO YOUR RESEARCH QUESTION(S):

Although many course-design models exist [17-20], there is almost no researched understanding of how university instructors experience and conceptualize initial course design or redesign of existing courses. Research does characterize how teachers define teaching, how they describe their developmental improvement as a teacher, and how they undertake that development.

Qualitative studies show consistent variations in how college teachers describe and conceptualize teaching. These views range from teacher-focused strategies intending to transmit knowledge, through variously defined intermediate stages to learner-focused strategies intended to foster students' construction of knowledge and conceptual change [21-24].

A parallel hierarchical view of what it means to develop through time as a teacher is elucidated in the research of Åkerlind[13] and McKenzie[14]. Faculty views range from becoming more familiar with what to teach (in order to be a more comfortable and confident teacher) to becoming a more effective facilitator of students' learning via research-based practices (focused on student development). Although this research illuminates the individual dimension of professional learning about teaching, a recent study by Boelryk & Amundsen[25] includes social influences of interactions with peers and students, and the context of the institutional priorities and supports.

Principal among intended institutional supports for course design are faculty-development programs that assist traditional didactic teachers to adopt research-informed practices through combinations of dissemination of research evidence and reflective practice in teaching[1,5,18,26]. However, it is unknown if differences such as those summarized above regarding perceptions of teaching and teacher development also emerge in university teachers' conceptualization of course design or the role of faculty development programs, or other individuals or groups, in this conceptualization. Hence, the origin of our research question.

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4. FINDINGS, INCLUDING THEIR SIGNIFICANCE & LIMITATIONS:

Five qualitatively distinct approaches to designing/redesigning a course emerged from analysis of the interview transcripts. Inclusively, the categories form an outcomes space enclosing the variation of the conceptualizations that represent the phenomenon of course design. Furthermore, these categories are hierarchically related and ordered in terms of comprehensiveness and complexity that indicates increasing breadth of awareness of the experienced phenomenon. The categories forming the outcomes space are as follows:

- Category 1- Course design/redesign is *based on what to teach*; a primarily individual action to determine course content based on topical priorities and/or stated learning outcomes.
- Category 2- Course design/redesign is *based on how to teach*; a primarily individual action to determine the strategies and tools for instruction and assessment.
- Category 3- Course design/redesign is *based on individual reflection* on data, experiences, and/or beliefs to adjust teaching and learning.
- Category 4- Course design/redesign is *based on collaborative efforts* to synchronize and improve teaching across sections and/or courses within a department.
- Category 5- Course design/redesign is *based on a culture of innovating* teaching and learning by collective engagement with others across disciplines and universities.

 Appendix B provides example participant utterances that support these categories.

The most basic conceptualization of course design/redesign, Category 1, is individual focus on the content to teach; instructors ask, "what do I teach?" The focus in Category 2 orients toward how to teach the content; instructors ask, "how do I best teach this material?" Course redesign in Category 3 involves individual instructor reflection on data and experiences that inform adjustments to both what is taught and how it is taught; instructors ask, "What is working, what is not working, and how can I make it better?" At Category 4, course redesign extends beyond an individual activity to collaborative and/or cooperative activities within the department. In these circumstances instructors ask, "How can we align our teaching across sections and courses to make learning experiences better for students?" In Category 5, there is further outward expansion from a department to a community of stakeholders in higher education that collectively define a culture of continuous improvement of course design across disciplines and universities. The question becomes, "How can we work to enlarge our impact and learn from one another to continuously improve teaching and learning in higher education?" Included in this category, faculty development programs within institutions and professional societies are viewed as essential to what it means to design a course.

The results of this research show hierarchical conceptualizations of course design that parallel the results in previous, also mostly phenomenographic, studies on how faculty view teaching[11,21] and their development as teachers[13,14]. Designing courses is central to how instructors view teaching

and development as a teacher (to the extent that they adjust their design over time). How faculty conceptualize course design is also central to facilitating instructional-change processes[26,27]. Collectively, this body of research points to the importance of the instructor as an individual, as the member of a department, and as part of a larger community within and beyond campus.

Our findings build upon Akerlind[13], who found instructors develop on a continuum from becoming more familiar with what to teach; to becoming more familiar with how to teach; and to finding out which teaching strategies do and don't work for the teacher and for students, in order to become more effective in facilitating student learning. McKenzie[14] discusses reflection both in the context of her work and a review of previous papers with a focus on the difference between teachers reflecting on themselves, their teaching, and students' reactions to teaching versus reflecting on student learning; those become central to her view of teacher-centered versus student-centered teaching. Our Category 3 includes reflection across this whole spectrum. This conceptualization of course design ties into views that changes in teaching, particularly to more learner-centered approaches, require reflective practice[26,28].

Most importantly, our results extend beyond individual instructors developing courses to a broader conception of course design that entails collective sharing of knowledge among communities of instructors who work together to develop courses, and to supporting structures across and beyond institutions. The strength of this broader, collective concept of course design by the study participants contrasts with views that collectivism is contrary to the culture of higher education[29], although it is consistent with Boelryk & Amundsen's[25] conclusion that social, as well as individual, factors affect faculty learning about teaching. By moving toward broader conceptions of design as a collective activity, instructors' preference for personal evidence rather than empirical evidence is leveraged[30,31].

Ultimately, this study points to refining the culture of teaching and learning as a continuous individual *and* collective process of improvement in departments, across disciplines, and expanding from university to university. Administrators, including deans and chairs, are important players in shaping the culture[32], but ultimately it requires energy from stakeholders at all levels, from students to instructors, to staff and to administrators[33]. The work of faculty-development centers to spark and support course redesign should move beyond traditional programming to nurture co-participation that is central to sociocultural models of workplace learning in non-academic settings[34]. Those interested in catalyzing change to broaden the conception of course design as a collective endeavor should work toward promoting a shared vision[33]; nurturing communities of practice[35,36] (specifically with knowledgeable opinion leaders[37]); establishing faculty learning communities[38]; participating in action research projects[15,39]; and valuing SoTL[40,41], all of which can include a focus on course design.

The primary limitation of this study arises from the relatively small sample of STEM participants from a research-intensive institution, all of whom participated in a faculty-development program for course redesign. Phenomenography seeks to identify all of the ways that a subject relates to an object. STEM instructors from other institutions, particularly those with more focused teaching missions and smaller class sizes, may conceptualize course design differently from the participants in this study. Likewise, references during the interviews to experiences in the STEM course redesign initiative indicates that conceptualizations of what it means to design a course include participation in, and learning from, faculty development programs, which are not true for all faculty. Finally, outcomes may have differed if participants came from outside of the STEM field.

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TOTAL WORD COUNT FOR ALL 4 SECTIONS (MAX 2000 WORDS):	1801

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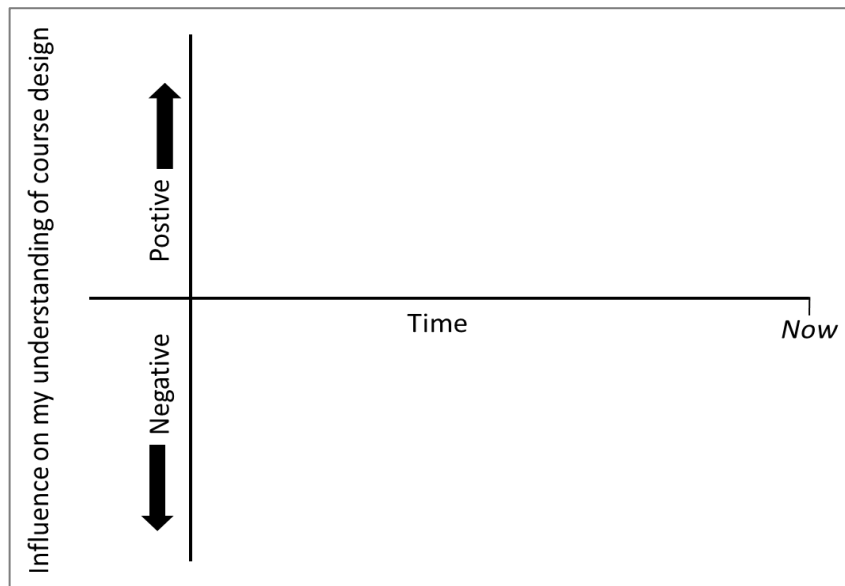
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Appendix A. Interview Questions

There is a lot of discussion in higher education about the design of STEM courses. I am participating in a study to find out about what perceptions teachers have about the appropriate design of their courses. As a reminder from the consent form that you signed, your transcribed responses to my questions will not be associated with your real identity and the audio recording will be destroyed after transcription. There are no wrong answers in this interview - I am predominantly interested in exploring your ideas and experiences. I want you to feel that I am the learner here and you are the expert regarding your own practice. I will try to be like a blank slate – I want you to do all the talking and I'll do the listening. I just want you to tell me about your experiences with course design, and dig down into your understanding and practice of course design. OK?

1. Tell me, what does it mean to you to design a course?
2. How do you go about designing or redesigning a course? Why do you do it this way?
3. Have you always done it this way? If not, how has your experience changed during your career? Why has your approach changed?
4. Let's establish an understanding of how you've developed your understanding of course design over your teaching career. This schematic graph that you will draw has time on the horizontal axis. On this axis, I'd like you to mark, and label, events of any duration that have influenced your understanding of what course design is and how do to it. For each of these points on the timeline, place a dot, above or below the axis, to show whether this event had a positive (above the line) or negative (below the line) influence on how you have come to understand course design and indicate, by the distance from the timeline axis the significance of this influence.

5. Tell me about how other people have influenced your conceptualization of course design in a negative, positive, or neutral way. Why was this the case?
6. In your experience, what processes enhance the successful design or redesign of a course?

7. In your experience, what processes impede the successful design or redesign of a course?
8. What department do you teach in at UNM?
9. How many years have you been teaching at the college level?

Typical follow-up questions within the phenomenographic interview context included:
   a) Could you tell me a bit more about that?
   b) Can you give me a concrete example of something you do/have done [to illustrate the phenomenon]?
   c) What do you mean by that?
   d) Why did you do it that way? What were you hoping to achieve?
   e) Why was that important to you?

Appendix B – Example interview utterances defining the outcomes space

The outcomes space defines the phenomenon as captured in the words of the interviewed participants. Five qualitatively distinct concepts of course design are hierarchically related and ordered in terms of comprehensiveness and complexity indicated by an increasing breadth of awareness of the phenomenon experienced. Each category is further described below with *selected* verbatim utterances from participant transcripts.

1. Course design/re-design is *based on what to teach*; a primarily individual action to determine course content based on topical priorities and/or stated learning outcomes.

At the most basic conception of course design a single instructor simply chooses what content needs to be taught and how much time to allocate to each topic. As one instructor put it:

> *"Yeah for me, to design a course you've got to come with the content of course initially in terms of the material you want students to learn. And, sometimes it stops there, you know what I mean?"* (Participant F)

This topical content might be a perception of what is "traditionally" accepted in the discipline, how the course has been taught traditionally, or what is featured in a textbook; for example:

> *"There's a pretty traditional set of, you know, topics like this is what you need to cover"* (A)

> *"Okay where's the textbook? How many [chapters] do I have to cover? … What's the content that they're supposed to know?"* (B)

Based on this topical list, the design process also includes determining how much time to spend on each topic; for example:

> *"So I've got a time frame and I know that my classes are going to meet once a week for a certain amount of time. So I come up with my list of topics, [and] then, [determine] what can be accomplished in said time period."* (C)

Student learning outcomes, rather than topical content, may determine what should be in a course and these outcomes are an essential part of the phenomenon of course design. In this context, instructors referred to the concept of backwards design). An example utterance is featured below:

> *"I think about what the end goals are, what are the outcomes that my students are supposed to take away… and then work backwards from there." (B)*

Some instructors indicated that, over time, they shifted their content focus from topics to outcomes. This change in defining course content was best described by *G*:

> *"So my previous approach always started from what I want to teach them. And now, what I practice is very different, and I start with what's the goal of the course and what are the objectives of the course, and I start to think about what kind of outcomes I'd like my students to have after they complete a course; so that's the student learning outcomes. So I just I start from the objectives and student learning outcomes."*

2. Course design/re-design is *based on how to teach*; a primarily individual action to determine the strategies and tools for instruction and assessment.

Category two addresses how to teach. Instructors consider course design in terms of the question, *"… how do I deliver this to the students?"* (A). This conceptualization of the phenomenon of course design can follow consideration of content or learning outcomes.

> *"Most of the time … to design a course is just putting down the information you want to get across... and then you think about how are they going to do it, and what are they going to do?* (F)

> *"From [determining student learning outcomes] I start to think what was the best format and activities that can allow the students to accomplish those outcomes."* (G)

Where learning occurs is also part of deciding how to teach. The learning activity sequence - which takes consideration of learning before class, learning in class, and learning after class - was mentioned when describing thought processes for choosing how and when to facilitate learning; for example:

> *"I think about three spaces in terms of learning. So I think about what students can learn before class time to prepare for the class. I think about what students are going to do in the class. And then I think about what students have to do after the class to sort of practice and kind of cement that piece."* (I)

Some instructors mention a wide variety of teaching strategies and tools as they discuss what it means to design a course. The inclusive listing of these specific elements includes preparing lecture videos for online access, interactive lectures, students working in groups, instructor writing on a chalkboard or whiteboard, use of audience-response systems, writing to learn, completing homework assignments, conducting laboratory experiments, collecting data, incorporating real-world examples, and sparse mention of formative and summative assessment.

Notably, although use of lecture was implicit in most conversations, none of the interviewed instructors talked specifically about creating lectures as a part of their concept of course design. Instead, instructors gravitate towards active learning and constructivist theories of learning.

> *"… because I wanted to interact with the students more. I wanted to do more than just stand there and lecture …"* (F)

> *"And you start realizing: 'Oh, okay, so there are ways to engage your students. Oh, there are different kinds of active learning techniques you can actually try and they work.'"* (B)

Lastly, the instructional choices in course design may change over time as illustrated by these statements:

> *"I started with the teacher-centered course design and [now] I'm more toward the student-centered course design."* (G)

> *"Well, that's what I thought teaching was, because I think … when you first start teaching, you think 'okay so what did my teachers do?' And so, you're like 'okay, so I'm going to model my teacher and so then they [the students] will model me'; the cycle of life shall continue. But, then after a while you realize this is no replacement for them [students] doing it, you know. They have to do something, not just watch me."* (A)

3. Course design/redesign is *based on the individual reflection* on data, experiences, and/or beliefs to adjust teaching and learning.

Category 3 is defined by instructors' reflection to use the lessons they learn from teaching. For example:

"What happened here? Why? You know, did I do something wrong? You know…So I have a tendency to think about myself first, and I, and then, this is almost always as a result of that thinking or reflection, I started to think about how to modify it."(G)

"Okay, I went to the point where I would do testing. I would collect data to see if it would work. Is it really working? And, so I was basically doing classroom action research. In my classroom … found that they were providing positive results. And, therefore I was able to… keep doing it" (B)

Participants reflected upon their own past experience as a learner to inform course design decisions they were making**.** They considered the aspects that they liked and disliked about the how they were taught to help guide their design and redesign process. For example:

"So one of the first things you think about when you've been tasked to teach a class you think, "So when I took that class what did it look like?"(I)

Participants reflected upon previous experiences with a course to inform adjustments in their course design. After teaching the course even once, some instructors focused on revamping and reworking the content and pedagogy rather than scrapping the design for an entirely new approach; however other instructors felt it necessary to throw out old material that was not working in favor of fresh ideas and material to test in the classroom. For example:

"It's all about what did I do last year and then just revising to make improvements."(1)

"So, I try to give the benefit of the doubt, and when it comes to a lab, I never would scrap it after the first semester, because you got to give it a chance … when you're actually launching a brand new lab exercise, so many things that could go wrong, and it could just be, interpretation of the notes by the prep-team, you know, they weren't interpreted correctly, or we didn't realize how much material we actually needed to make this happen, or the kids, or the students needed this particular material in a way that we weren't prepared for. Or, you know, a whole bunch of things … and so, running it and giving it another chance, you know it may be a great lab. We learned so much from that, and we'll make adjustments, and we'll give it another shot, and then, I'll see, really whether it is worth it, and continuing." (C)

"Okay I got three weeks to do this assignment am I going to do it or not do it? Part of it is; wow! It was such a failure last time. Do I really have to do it? … So then you ask yourself do you fix it or do you throw it away? And you start again. So some that aren't so terrible you fix it and there are some that you literally throw away. This isn't working; this isn't well integrated; this isn't what we wanted; this just doesn't satisfy the outcomes." (C)

Many participants viewed students as an important source of data to inform changes; whether through private conversations, patterns in assessment questions missed by multiple students, watching students and seeing what topics cause struggle, or student evaluations of teaching.

"Today I had little time because it was before our interview so there was this one little thing on the worksheet, which you know a lot of students were confused about and so this is a typical, but I went and fixed it right away, right after class. Those are "short term" fixes for particular assignments, exercises whatever. If a student complains about something we're doing online, about the way a question was worded. I respond to them I explain to them what the issue is. I jot down a note that I will fix that for the next version." (A)

"When you get asked the same questions … 20 times; you know that there's something systemic there." (A)

"So, the biggest shocking thing is … could be I'm teaching a class and have maybe forty percent of the students get a failing grade. That can't all be the students. There's gotta be something else going on or I don't know what is going on."(F)

"Or, you can say as a teacher what is it I can do?… that will help me be a better teacher so that they learn it more effectively? It was really partially internally driven because, after you are at a couple of courses you get the same student responses 'I really studied this'; 'I really understood this'; 'I've just got an F on this test.' So when you get a few of those, as a teacher you begin to reflect on yourself, you start to think, 'WOW! What am I doing wrong?'(laughing). 'Why isn't this working?' 'How come everybody isn't getting it?' (B)

"So feedback like ... I mean the feedback tells me what I need to change basically. (I)

Course redesign is a continuous process of implementing and evaluating what, and is not, working. Even after developing a track record, instructors continue to collect pertinent data and refine the course using analyses from their classroom-action research.

"Okay, you have this idea in mind that you keep progressing because you're redesigning while you're in progress. You cannot fix the problems at the front end because you're busy trying to get the week's event going. What happens then is you start jotting down notes. Okay, so then you start again at the next semester, now you have an entire list of notes that weren't working. If there are so many of those then what you do is you either fix the lower hanging fruit or you say, 'Look, I have to work on the harder ones and let the lower hanging ones go because they were tolerable and sure there were some little mistakes but we'll fix those along the way.' So it's just every semester it becomes easier; there's less to fix, there's less trial and error. And, then when you get to the point where you're pretty happy then you start to re-evaluate again."(C)

4. Course Design/Redesign *is based on cooperative and collaborative efforts* to synchronize and improve teaching across sections and/or courses within a department.

While Categories 1 through 3 focus on primarily individual conceptions of course design/redesign (from picking what to teach, to how to teach, to how to improve teaching by utilizing data and reflective practices), a transition occurs to Category 4, as instructors' conceptions of course redesign move from "Me" to "We".

"So if you're teaching 'X' course and there's more than one of you teaching that, there's five faculty that are teaching that. Then the "five" faculty should get together and decide what the outcomes are."(D)

"We had a team. About 5-6 people, and they were faculty, a couple full time, some adjunct faculty … so we just had some kind of collaboration" (K)

Course redesign is fueled by the collective energy of people wanting to engage with their colleagues in their department. Motivation for redesign is linked to others' motivations for redesign. Participants point to colleagues, graduate students, and administrators within the department as creating an ecosystem for teaching and learning, and learning from teaching. Category 4 is distinct in that it focuses course design on people within a single department working to collaboratively synchronize instruction across course sections, or cooperatively integrate courses within the department the curriculum. By having the social support of peers in the department, instructors feel empowered to redesign the courses and to sustain those efforts. For example:

"The thing that attracted me the most was probably the willingness of the people involved to do something about it... There's always the thought in the back your head that this is not going to change, I can't do anything by myself, and you have to get enough people that care about it to actually do something... It's like there's a problem that you always know about, and then finally somebody says, we're going to do something about it and then you get excited to be a part of that." *(E)*

One collaborative approach is instructors sharing resources and meeting to share insights from teaching, and problems they experience. The collective wisdom spreads around the department between advanced and novice instructors and becomes part of what it means to design a course.

"We had weekly meetings amongst all the teachers who were teaching general chemistry and so that was a place where we would talk about problems we were having, especially because the year I started teaching there were also a couple of other (instructors), I believe two other instructors, who were either new to teaching that class or new to using the active learning techniques that we were using, and so they kind of had to be persuaded to join the new redesign, so a lot of that." (I)

"I was a part of a cohort of instructors where we discussed things through and I was the junior most in that cohort so I - you know we all contributed to that - but being the one with not much experience in teaching general chemistry it was very much a learning experience for me and in a lot of ways I drew from their collective wisdom that they had worked on." (K)

However, just because resources are shared, does not necessarily mean that everyone teaches the exact same things, the exact same way. While there is a tendency to share resources and knowledge, no one is forced to teach in a specific manner, thus instructors remain autonomous in their work. People in a team who redesign a course together, despite varying experience, are regarded as valuable members with expertise in areas that draw from and add to the collective wisdom of the group.

"We meet as a group of instructors to set certain common core questions. So we don't always set the same exam, although quite a lot in Gen-Chem II, we end up sitting the same exam. But Gen-Chem I, they tend to be like, you know, two different camps in terms of, you know, somebody likes it really conceptual, somebody couldn't care about the conceptual but wants the really hard math problems. But, we can all agree ... four or five questions that we think are really important for the students to know that link to our outcomes." (I)

" I told one of the new faculty coming in, I warned him, that we're doing a lot of strange things here, and I told him that, don't worry, we don't expect you to do anything this semester. But, I shared with him my story. So I say you just need to have open mind, and just take a look. Nobody forces you to do this, but take a look. He did and then in the middle of the semester, he came back to me and he said, '(name omitted), I think I want to do the small group discussions ... I really want to give our students a chance to try it out'. And, I say, 'okay go for it.'"(G)

"But I think that it's being part of the team that you trust to not let you go too far off track, but still gives you the freedom to explore, that is interested in hearing your ideas, and not just 'this is what we're going to do, this is how we're going to do it, this is when it's going to get done.' I think that the team, I don't know if it's because I might be closer in age to some of them, but I felt like I was a more, I felt like they took my opinions, seriously, which was, you know, very helpful in getting me to actually say something. I felt comfortable approaching everybody on the team about something that I thought was an issue, and that was a very important thing for me."(E)

5. Course design/redesign *is based on a culture of innovating teaching and learning* by collective engagement with others across disciplines and universities.

The most inclusive and encompassing conception of course redesign was when course redesign was conceptualized as an activity expanding beyond the department to other disciplines and campuses. In category 5, redesign entails people working together to define a culture of teaching and learning across higher education as a whole. The collective culture of continuous improvement and sharing of teaching and learning that is supported by multiple stakeholders in education administrators, faculty members, and students. For example:

> *"I really think that redesigning needs to be a culture. So, if you just treat it as a project and once the project's finished, it stops. We need to work on redesigning toward a change of culture."(G)*

> *"It was a sense of it not just being a community in chemistry, but the entire campus and not just between the faculty but also between the students and the faculty, the students and the students"(K)*

One way of expanding out of a department involved instructors communicating across disciplines. Instructors would consider other courses students encounter along their pursuit of a degree and connect with faculty from different departments to discuss how to best share teaching and learning practices across courses.

> *"For example this summer, I [math faculty] have come to meet with a couple of chemistry faculty and we are going to try and come up with a math 121 (course). Some kind of curriculum that is really going to help incoming chemistry students. (Mentions names) are awesome, and so just for example, that department is so into collaboration, and so innovative. And earth and planetary science is, with (mentions name), we've had so many good conversations when we all get together, I just learned so much from each other, from sharing" (D)*

> *"We have to talk to people from the engineering department, so we really have the support of the chair; to the people in the physics department, and we sent them some of the topics we were covering and asked them if they felt that was appropriate for students going into physics for example, and they felt, I hope that, we were just trying to make sure that, that we are helping to prepare their students as well, and wanting to work with them on constructing the syllabus. So, they gave us suggestions on lectures for example, for a course that we did."(D)*

Participants point to getting involved in an ecosystem of on-campus support centers. Libraries, tutoring centers, and faculty-development centers were local sources for catalyzing and reinforcing a culture for course redesign that spread over disciplinary boundaries. These networks were viewed as resources that engage and develop participants so that they have the connections and competencies needed for course redesign.

> *"Connections. Connections are so important, I have established great rapport with the library, and when I told them I wanted to start having my classes come over to the library, they were like chomping at the bit."(C)*

> *"It's great that we have (mentions the faculty development center) here on campus because that has been an awesome resource and I have done some training with them, and I have participated in the (mentions STEM professional development program) redesign, actually a three-timer."(C)*

> *"Because we have such great, we have such good resources here, we've got (mentions support service), we've got the library, we've got (mentions faculty development center), we've got (mentions STEM professional development program) …I can't do everything myself (laughs) and we*

have these great resources, and I would go to them." (C)

"At the end of that semester I found (mentions the faculty development center) at the time and I think I went to designing effective multiple-choice tests workshop. And, then I kind of realized that there were people who actually knew about how people learn, and there are people who had studied as much as I studied Chemistry and the sort of best practices and structure and then large class instruction. And, so I went to the course-design institute and basically was really inspired and jumped in and redesigned my course." (I)

Expanding beyond the department includes reaching off campus to work with branch campuses and neighboring institutions to synchronize courses. Participants speak to the advantages of working with neighboring institutions for congruency and for the students' benefit. Instructors also looked to other institutions and people from other campuses for models of best practices in teaching and learning.

"We have the faculty from (a neighbor 2-year institution) teach for us, and that is for many, multi-purposes. For example, they can bring our practice back to (the neighbor institution), and that's what I like to see." (G)

"There was so much precedence, so many schools, state schools like (mentions another institution), schools like (mentions institution), so ... just across the board it was very successful, and so we thought we could look at those things, and just model it based on that, and it's been running. The pass rates have been higher in both classes."(D)

"We brought in (mentions someone's name) from Oklahoma ... his specialty was on teaching inquiry based learning... we got some good pointers from him." (F)

"He comes back with all these different ideas and I think that definitely he's been a major influence on my wanting to collaborate with other departments, other people at other universities, that kind of thing because you never know, you know, if you keep blinders on when you're studying." (E)

Multiple sources, within and beyond the institution, diffused innovations. Sources influencing course redesign included professional-development conferences and workshops and research literature, including scholarship of teaching and learning.

"I started to be interested in educational research. So I read a lot of literature. (Mentions name) invited me to give a presentation in (mentions a conference) to a couple friends and, and since then I started to attend almost all the workshop I can attend, and so that change is a gradual change."(G)

"Can I start reading up? Can I start going to conferences where they would have education venues? Um, what is it that they're doing? What is it that they're trying?" (B)