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Course Coordinator Orientations Toward their Work

Antonio Martinez¹, Jessica Gehrtz², [Chris Rasmussen](mailto:crasmussen@sdsu.edu)³, Talia LaTona-Tequida, and Kristen Vroom⁵

¹San Diego State University, United States; ²University of Georgia, United States;

³San Diego State University, United States, crasmussen@sdsu.edu; ⁴San Diego State University, United States; ⁵Portland State University, United States

One of the ways in which university mathematics departments across the United States are making efforts to improve their introductory mathematics courses is by implementing or increasing the level of course coordination. This not only entails creating uniform course elements across different sections but also includes efforts to build a community among the instructors of the course. While many coordinators have the common goal of improving student success, we explore what guides their actions to see this accomplished, what we refer to as their orientation toward coordination. In this paper we introduce and elaborate on two orientations toward coordination that arose from interviews with course coordinators from a variety of institutions across the country. We also discuss the importance of both orientations as they relate to drivers of change.

Keywords: Course coordinators, leadership, teachers' and students' practices at university level, preparation and training of university mathematics teachers

INTRODUCTION

Course coordination for multi-section introductory mathematics courses such as precalculus and calculus is one way in which universities across the country are attempting to improve instruction and the consistency and quality of students' learning experiences (and hence improve student learning outcomes). Because multi-section introductory mathematics courses are often taught by a range of instructors (including graduate students, career line faculty, and ladder rank faculty), course coordination can help mitigate against uneven student experiences that can disadvantage students in different sections of the same course. Such uneven experiences include different content emphasis or coverage, different grading schemes, and different quality enactments of active learning. Active learning as it is used here refers to a wide range of instructional approaches that invite students to engage in challenging mathematics and to share their reasoning with their peers. These differences in learning experiences are potentially problematic because they offer different opportunities for students to learn the intended content, and hence be adequately prepared for subsequent courses. As such, course coordination can be an important contributor to student success.

One of the first studies of course coordination in mathematics departments investigated the *coordination system* at five mathematics departments identified as having relatively more successful Calculus 1 programs (Rasmussen & Ellis, 2015). The phrase coordination system is used to evoke the image of coordination that goes beyond

surface features of uniform course components (e.g. syllabus, textbook, homework, exams) to include efforts to build a community of instructors working together to create rigorous courses and high-quality learning experiences for students. In this study the authors identified concrete actions that the course coordinators took to provide both logistical support that promotes greater course uniformity and hence more equitable student experiences as well as just-in-time professional development support for teaching difficult topics, implementing active learning, pacing, etc. Rasmussen and Ellis (2015) liken the role of course coordinator to that of a *choice architect*, which comes from the work of Thaler and Sunstein's (2008) work in behavioral economics. A choice architect is someone who is able to structure choices for others in ways that can "nudge" them to make particular choices while still maintaining the feeling of independence. For example, one of the things that course coordinators at the five mathematics departments, studied by Rasmussen and Ellis, did was to make instructors' lives easier by providing a range of default options, including homework sets, class activities that actively engage students, pacing guides, etc. Instructors had leeway in how they made use of these options and thus maintained pedagogical autonomy. They further argue that this framing of a coordination system is consistent with effective change strategies identified by Henderson, Beach, and Finkelstein (2011).

In ongoing work at a different set of mathematics departments, Rasmussen et al. (2019) conducted five case studies of mathematics departments that have successfully initiated and sustained active learning in their Precalculus to Calculus 2 (P2C2) curricula. These researchers highlight the different ways that coordinators across the five sites make instructors' lives easier and build community among instructors. Williams et al. (2019) further analyzed these five sites to highlight the ways that coordinators can function as change agents by leveraging the following three key drivers for change: providing materials and tools, encouraging collaboration and communication, and encouraging (and providing) professional development. An important contribution of the work by Williams and colleagues is the strong connection between ongoing mathematics department change efforts and the substantive and growing literature focused on change in higher education (e.g., Shadle, Marker, & Earl, 2017).

One thing that is common (and abundantly clear) from this prior work is the critical role of the course coordinator in a coordination system. Hence, a better understanding of what values, beliefs, dispositions, etc. coordinators take toward their role is needed. In conceptualizing these aspects of coordinators, we are inspired by the work of Thompson, Philipp, Thompson, and Boyd (1994), who examined the influence that teachers' conceptions have on their implementation of innovative curricula. In particular, they identified two contrasting orientations toward mathematics teaching: calculational orientation and a conceptual orientation. They illustrated how these different orientations have significant consequences for how teachers interact with students and content and hence offer different opportunities for learning. Similarly, we

were curious to better understand coordinators' conceptions toward coordination because such beliefs and understandings profoundly influence how they interact with their colleagues and the consequent opportunities for professional growth. Thus, the research question that drives the analysis presented here is: *What orientations do course coordinators take toward their work?*

The potential contribution of this analysis is both pragmatic and theoretical. Pragmatically, a deeper understanding of the orientations of course coordinators offers mathematics departments a language for thinking about what their goals of coordination are and who, either in their department or new hires, would have the perspective on coordination that is likely to be able to enact their goals. Theoretically, this work contributes to conceptualizing the role of coordinators and coordination systems more generally.

THEORETICAL BACKGROUND

To frame course coordinator orientations we draw on Philipp's (2007) comprehensive review of mathematics teachers' beliefs and affect, where beliefs are described as the "lenses through which one looks when interpreting the world," and affect is thought of as "a disposition or tendency one takes toward some aspect of his or her world" (p. 258). Our use of the term "orientation" encompasses both beliefs and affect as described by Philipp. In his chapter, Philipp attends to the differences and similarities between a teacher's affect, beliefs, belief systems, conceptions, identity, knowledge and values as these terms are inconsistently used in the literature. Each has a unique impact on the way a teacher interacts with their classroom and can provide researchers with new perspectives on how to measure teacher development. While these terms require a localized focus, Philipp also steps back to discuss the existence of a teacher's orientation as it encapsulates a variety of the localized terminology and requires a broader focus from a researcher's perspective to better understand teacher impact in the classroom.

As described in Thompson et al.'s (1994) paper, varying teacher orientations can produce markedly different discussions in the classroom due to what the teacher considers valuable information. For example, a teacher with a calculational orientation will consider a procedural answer to the question, "How did you get that answer?" as all that is needed, whereas a teacher with a conceptual orientation is more interested in how the student is thinking about the quantities that are used and the relationships between them (Philipp, 2007; Thompson et al., 1994). The orientation of a teacher emphasizes the goals and intentions of the teacher as enacted through their actions and discourse in the classroom. We draw a parallel between the orientations of a teacher and the orientations that a coordinator may have, as their goals and intentions for how the course should be run are enacted through their actions and influenced by their beliefs, knowledge and values.

METHODS

This study is part of a larger national study investigating Precalculus through Calculus 2 (P2C2) programs and student supports at the post-secondary level. As part of this larger study a census survey was conducted of all mathematics departments that offer a graduate degree in mathematics (Rasmussen, et al., 2019) and twelve institutions were selected as case study sites based on what the research team viewed as noteworthy or otherwise interesting features of their P2C2 programs. These features included ones previously identified as being associated with successful Calculus 1 programs, one of which being course coordination (Hagman, 2019; Rasmussen, Ellis & Zazkis, 2014). After the project team's initial site visits and data collection, seven sites were identified as leveraging a coordination system that went beyond simply implementing uniform course elements (e.g., syllabus, textbook) to also include intentional efforts to build a community among instructors. In order to answer our research question, we conducted 13 interviews (2018-2019 academic year) with 19 P2C2 coordinators across the seven sites. We conducted 10 individual interviews and three group interviews that included two or more coordinators. Interview questions included probes such as what one likes most (and least) about being part of a coordinated course, level of autonomy, and characteristics of what makes for a "good" coordinator.

Interviews were audio-recorded and transcribed for analysis. We conducted a thematic analysis (Braun & Clark, 2006) to identify orientations coordinators take towards their work. Each researcher open coded the transcripts for three sites, with at least two researchers coding the same site and comparing codes to reach consensus. The research team met to discuss and revise codes and group them by theme, reaching consensus on the grouping and descriptions of the categories. This phase of analysis resulted in 11 categories (henceforth referred to as themes) that shed light on these coordinators' approach to their role. Each theme consists of three or more codes from the first round of coding. The research team then engaged in further axial coding and identified two orientations towards coordination that encapsulated 10 of our 11 themes (with the theme of Personal Qualities not fitting into either orientation).

FINDINGS AND RESULTS

Our analysis of the coordinator interviews resulted in identification of two distinct orientations to coordination. We refer to these two orientations as a Humanistic-Growth Orientation and a Knowledge-Managerial Orientation. We next illustrate each of these orientations, using interview excerpts that were selected to be representative of each respective theme within the orientation.

Humanistic-Growth Orientation

Five themes were identified during analysis that we later grouped to define the broader category that we call Humanistic-Growth Orientation toward coordination. These five themes are: a) intentional instructor support, b) interested in relationships, c) community builder, d) attends to student experience, and e) flexible. Together, these themes describe the orientation of a coordinator that incorporates humanistic values

and a belief in the potential for professional growth of the instructors under their purview. For the purposes of this proposal we highlight three of these themes: intentional instructor support, community builder, and flexible.

Intentional instructor support. This theme goes beyond providing resources and materials for the instructors of the course to make their lives easier (which aligns more with a Knowledge-Managerial Orientation). All of the actions categorized under this theme are deliberately made by the coordinator to support instructors' improvement of their teaching. One example of this is exhibited by a coordinator describing their goals and intentions for coordination:

The coordination is to try to get them [instructors] up to speed for thinking about how students learn math, how to help students be successful, how to help students connect to the ideas that are being taught in this specific class, but also for them to think a little bit more carefully about how they present things.

This coordinator is not only attending to student experiences from a content perspective, but is addressing the ways in which they can intentionally help instructors think about how to provide a more thoughtful and enriching experience for the students in the classroom. The following quote describes the level of intentionality of a coordinator that provides this type of support:

But to the extent that I have been effective as a coordinator... I think it's been as a result of my intentions to influence instruction and influence the instructors' confidence with respect to teaching. I don't think that that view of coordinating is shared amongst others necessarily. I think the others really do view their role as being not only including, but limited to the managerial aspects. And that is very much secondary in my view.

While these quotes describe just two aspects of intentional instructor support, we noticed other actions of the coordinators that reflect this theme such as providing professional development opportunities, observing instructors' classes and giving feedback, supporting instructors to be reflective practitioners, as well as willing to be the "scapegoat" (as opposed to letting the instructor take the heat) when students are upset with how the course is being run.

Community builder. There was evidence of various community building efforts in all 13 interviews. Some of the actions that we identified to build community were: valuing contributions and feedback, getting people to work as a team, getting instructors excited about the course, and generating buy-in for the philosophy of the course. Some of these efforts are characterized well by a coordinator that had the following to say about coordination, "Coordination is not autonomy. It's about a team effort and setting up best practices that everyone follows." Many of the coordinators from our interviews reflected similar beliefs and viewed the coordination practices as a collective effort. A related aspect of community building was an intentional effort by the coordinator to distribute power amongst the instructors of the course. For example, a coordinator at a large research university reflected on their own work as coordinator:

I do my best to structure those meetings to give the impression, not entirely artificial, that we're kind of engaged in a collective enterprise to improve all of our students' learning. So, I truly try to position myself as a co-participant in that process. Not somebody who's necessarily dictating to everyone else, you know, what to do or how to teach, but, you know, I'll pose particular questions or issues and invite people to offer their own perspectives and that sort of thing. And again, I'm sort of trying to nudge things along in particular directions and buy things in particular ways. But, I want individual instructors to feel like they have some agency over the direction of the course for everybody. And I think that this would result in kind of a sense of, at the very least, sort of codependence amongst the instructors where they are all like, we'll have lunch together, that sort of thing.

The efforts to build community vary from coordinator to coordinator, but the goal to establish a community is central to this theme.

Flexible. Most coordinators lead nonhomogeneous groups of instructors. In many circumstances, the heterogeneity of the instructors exists in the experience that they have teaching the course or teaching in general. As a means to provide the necessary support for the instructors as a collective, we saw that some coordinators would adhere to varying levels of coordination practices as described by a coordinator when asked about instructor autonomy:

The degree of autonomy that instructors want when they're teaching the course is directly related to how many times they've taught the course or their experience with the course. The [graduate] student that's teaching Calc 2 for the very first time doesn't want any autonomy. They want to come in and they want to talk to me about here's what I'm doing next. 'How do you do this? What are the things that you emphasize?'... so, usually the greener the teacher, the less autonomy they want. Whereas the person that's taught the course over and over again has got- they have a good handle on it and they tend to not [need extensive advice], they just have it down.

By incorporating a flexible approach to coordinating, the coordinator is able to provide a tailored experience for each instructor that has the potential to generate more buy-in from the instructors and foster a collaborative team environment.

Knowledge-Managerial Orientation

The themes from this analysis that shed light on a Knowledge-Managerial Orientation to coordination include the following aspects of coordination: a) course content and curriculum, b) organizing and attending to the details of the course, c) communication, d) knowledge of the course history (including department and university structure), and e) knowledge of teaching the course. While every coordinator described performing actions of one form or another from this orientation, in this proposal we only detail the themes of course historians and communication.

Course historian. Coordinators who discussed their role as a course historian demonstrated a rich knowledge of both the coordination structure and history as well as knowledge of the larger departmental and university system in which coordination

is embedded. Notably, coordinators leveraged this knowledge to work towards sustaining and facilitating change because they knew what worked well and what has been met with resistance. For example, one coordinator said:

We don't give ... a common exam. And I was sort of toying with the idea of maybe we should give a common exam, and I was told ... that would require a departmental vote. Only because it's calculus and people care about what calculus is... Because I will have tenured faculty teaching, often there is ... a limit that's been made, not explicit, but implicitly clear to me about like you can't just take total control of this course. ... It's not like it [a common exam] would never happen, but it would not be as simple thing that I could just decree that that's going to happen. So, it would take a lot of work.

This excerpt highlights an understanding of some of the departmental barriers to change and includes an understanding of ways to work within the system to facilitate changes for a course. Being a course historian also requires a continuous involvement within the coordination structures so that one's understanding and knowledge remains current and relevant. A participant highlighted this when they said a coordinator must be embedded within the department and ask, “Hey, how are you? How are things going? Do you want to teach again?” or like, “What are you doing now?” Like you have to be able to be part of the social network of the department in a way.” The coordinator's involvement within the department is integral to their effectiveness. In addition to the importance of having this knowledge of the course history to make content or policy changes, coordinators that demonstrate a Knowledge-Managerial Orientation to coordination also draw on this knowledge when communicating department and university policies to instructors who are likely less familiar with this information.

Communication. The communication aspect of the Knowledge-Managerial Orientation to coordination includes both communicating important content and logistics about the course to instructors and being responsive to student and instructor emails. Some coordinators created a document or a set of examples to communicate important content, saying things like:

We have these 62-page documents that are the expected learning outcomes for our calculus course that I developed. And it was so I can just be like, ‘Hey grad student, this is the course, and it's a lot of high-level things. Students should be able to do blank... all organized in some hierarchical way. And that took a lot of experience to write that thing and now it, it's a lot of detail and it's all organized, and then it's communicated and disseminated.

Other coordinators communicated key content by drawing attention to it during formal or informal meetings/discussions with instructors. One coordinator acknowledged that he likes to allow room for instructors to have agency in the course in addition to clearly communicating important content, saying:

If there's a certain thing that I really, really want to test students on ... I might, like say to them, ‘Hey, try to implement something in your class, try to do something like problem

number 25 on page 381.’ Yeah, I might say something like that, but I try not to, I try not to overstep that with other people.

All of the themes encapsulated by the Knowledge-Managerial Orientation to coordination illuminate an approach that allows for the coordination structure to be implemented in an organized way, clearly communicating the coordinated elements and expectations to instructors. Coordinators who embrace this orientation leverage their knowledge of the students and their experience teaching the course to create appropriate resources and coordinated elements. Additionally, this approach allows for a coordination system that is well-informed by the course history, and departmental culture/policy surrounding it.

DISCUSSION

All of the coordinators in our study demonstrated aspects of Knowledge-Managerial Orientation to coordination, highlighting the importance of being familiar with the course they are coordinating as well as creating and sharing resources with instructors teaching the course. This is not surprising since uniform course elements are a key component of coordination. Approximately half of the coordinators also demonstrated a Humanistic-Growth orientation. Moreover, when this subset of coordinators discussed managerial or resource aspects of their work, they tended to frame their actions from a Humanistic-Growth Orientation. For example, providing instructional materials was done in the spirit of supporting instructors to excel in their teaching. It is important to note that while not every coordinator demonstrated a Humanistic-Growth Orientation toward their coordination work, those that did were deliberate and prioritized personal and professional growth to improve the quality and effectiveness of their P2C2 courses.

We see a similar level of intention from the coordinators in the study by Williams et al. (2019) as various coordinators deliberately take action to improve student success by acting on three drivers of change to implement and sustain more active learning in their P2C2 sequences. These drivers, providing materials and tools, encouraging collaboration and communication, and encouraging (and providing) professional development nicely align with the two orientations presented in this proposal. Providing materials and tools is an action taken by coordinators with a Knowledge-Managerial Orientation while encouraging collaboration and professional development are two actions taken by coordinators that approach their work with a Humanistic-Growth Orientation. Thus, by encouraging coordinators to initiate change through an approach to coordination that incorporates both the Humanistic-Growth and Knowledge-Managerial Orientations, mathematics departments across the country could reap the potential benefits of increased active learning in P2C2 classes.

By attending to these drivers and orientations, mathematics departments now have the language and research evidence to support their goals of improving or implementing active learning and coordination. Drawing on the data from a census survey sent to all

Ph.D. and master's granting institutions across the country, we know that there is a need for the improvement of professional development support as well active learning practices in the classroom (Rasmussen, et al., 2019). Math departments reported valuing active learning and professional development, but also reported not being very successful at each. In fact, 44% of mathematics departments saw active learning as very important, 47% saw it as somewhat important and 9% did not see it being important. However, when asked about how successful they were at implementing active learning, only 15% of the 199 mathematics departments reported that their program was very successful. Similarly, with graduate teaching assistant (GTA) professional development, 50% and 32% of the mathematics departments saw it as very and somewhat important (respectively), while only 29% of the respondents reported being very successful at it. Clearly, mathematics departments across the country are looking for ways to improve their active learning and professional development efforts, and effective course coordination is one opportunity to achieve this goal.

Our hope is that by bringing awareness to coordinators' orientation(s) we are not only supporting mathematics departments in search of coordinators but are also encouraging coordinators themselves to reflect on how they approach their role and how they can act on the available drivers for change at their institutions. By providing this perspective towards coordination, we also hope that this empowers mathematics departments across the country to improve their active learning and professional development efforts. The next step in our work surrounding P2C2 coordinators' orientations will be to analyze the instructor and GTA interviews to compare and contrast what is valued in terms of effective coordination. A future study might also analyze the work of coordinators in science and engineering departments and then compare this to the orientations identified here. Such research may lead to even greater significance of our findings as it might identify related or expanded efforts to improve instruction in a range of introductory courses typically required for mathematics, science, and engineering students.

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