Comparison of Outcomes for CoMInDS TAPD Provider Audiences

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Overview of the Project

CoMInDS is the College Mathematics Instructor Development Source, a suite of resources and activities that seek to enhance mathematics departments' capacity to provide high-quality, research-based, teaching-related professional development to graduate students serving as teaching assistants. It seeks to support both department-based Providers of TAPD and Researchers who study TAPD, and thus to serve TAs who teach undergraduate students themselves. The project interacts with these groups through a variety of short and long, virtual and face-to-face workshops and meetings, and is building an online resource suite of instructional materials and scholarly products related to TAPD, which is intended to provide a toolkit for these communities. The project is supported with funds from the National Science Foundation and practical support from the Mathematical Association of America.

Overview of this Report

This report compares quantitative survey data for two CoMInDS audiences of TAPD Providers:

- Providers who attended a residential, multi-day summer workshop and completed the "Follow-up" survey 0.5 to 1.5 years later (reported in detail in Laursen & Lynds, 2018b)
- Providers who participated in less intensive face-to-face and virtual activities and completed the "All-Comers" survey (reported in Laursen & Lynds, 2018a).

Because the survey items were the same, we organize the presentation of data to facilitate comparison, and to extract insights from these comparisons about the benefits and challenges of both sets of activities. Importantly, differences in reported outcomes do not mean that one type of activity is "better" than another. Rather, the results provide information about the relative importance of different issues or outcomes for different groups of people served by the project in different ways. They thus point to the range of needs, interests and outcomes that may be relevant to future planning for CoMInDS.

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Comparison of Outcomes for CoMInDS TAPD Provider Audiences

1. Study Methods

The study methods are described in the prior reports (Laursen & Lynds, 2018a,b). The overall survey samples are summarized in Table 1.1, and partial responses are included in the response rate. The number of respondents to particular questions may be fewer: some respondents did not respond to particular items, and the survey is tailored so that not all respondents are presented with all items. We do not report results when subgroups are too small to generalize.

Table 1.1: Summary of Study Populations and Samples

Participation	Study population	Opened survey email	Responses (response rate)
Summer workshop	67	57 (85%)	31 (46%)
Anything else (all-comers)	187	128 (68%)	31 (17%)

The response rate for summer workshop participants is reasonable for faculty samples, and sufficient to generalize about the workshop participants as a group. The response rate for the all-comers group is lower, which is typical for a group participating in events of lower intensity and duration.

2. Who Responded?

We asked respondents to self-identify as a TAPD Provider, Researcher, or both. The workshops targeted Providers and most were in that category (including former Providers and other teacher educators, whom we classified as Providers for this comparison).

Figure 2.1: Most participants were Providers.

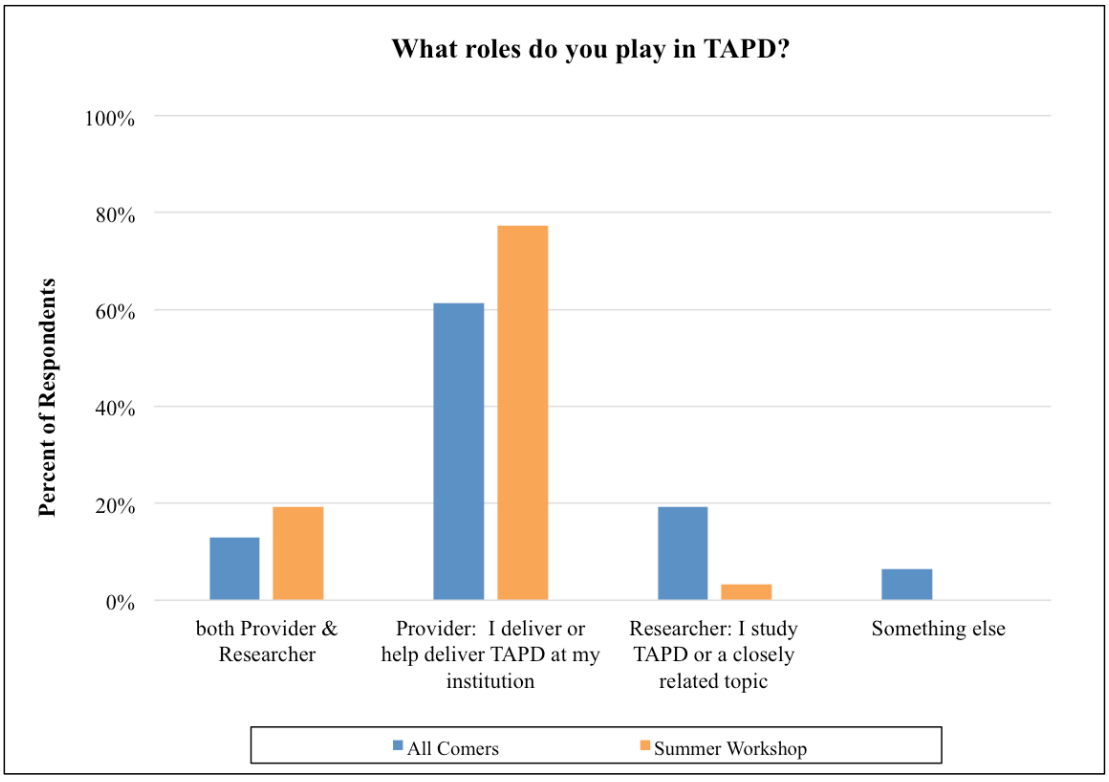


Table 2.1 summarizes the personal and institutional demographics of respondents. For the summer workshops, we can compare follow-up responses to data provided by workshop registrants before their workshop, to find that the survey respondents are demographically representative of those who attended.

The demographics are remarkably consistent between the summer workshop and all-comers survey groups. Among both survey groups, most participants are women, which is common in STEM education activities, and larger than their general representation among recent mathematics PhD recipients (29% in 2016; NSF, 2016) and mathematics faculty (25% in 2015; NSF, 2015). All samples reflect the low racial and ethnic diversity of PhD mathematicians in academe (NSF, 2015).

Doctoral institutions with TA preparation programs are strongly represented; they are the main target of CoMInDS' Provider activities. The summer 2018 workshop (not part of these samples) included more Providers from masters-granting institutions. The all-comers survey group includes Researchers who may come from a variety of types of institutions.

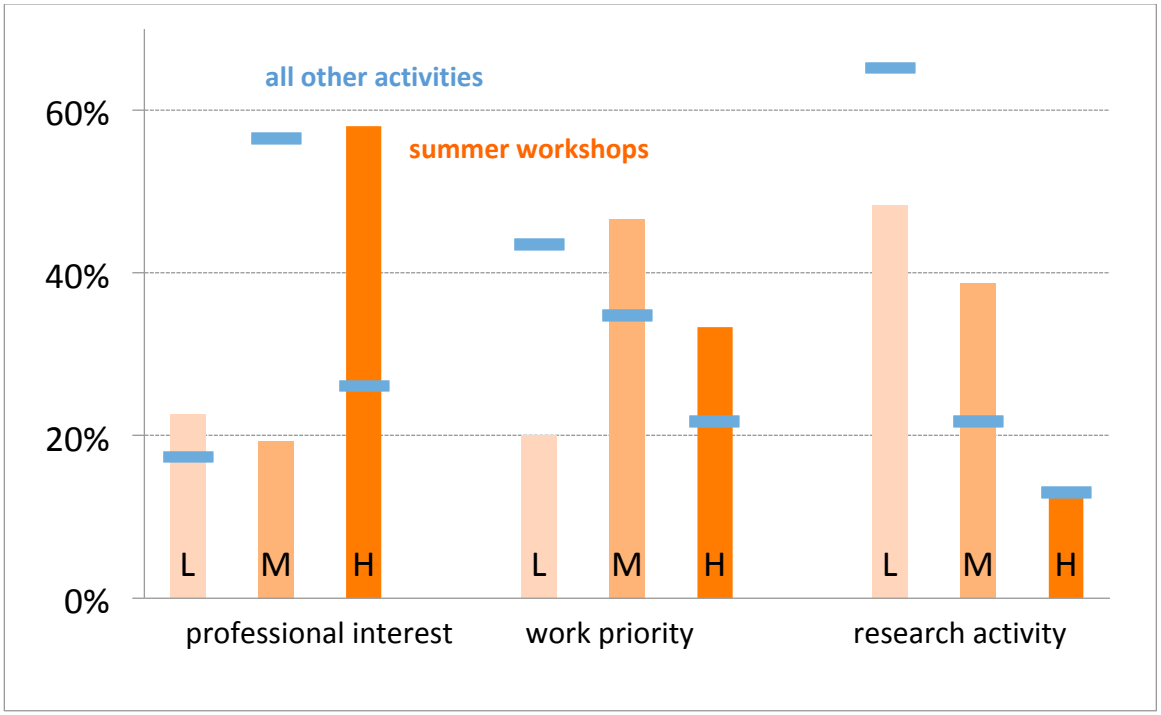
Table 2.1: Personal and Institutional Demographics of Respondents

	Summer workshop, from pre-survey (n=64)	**Summer workshop, from follow-up (n=31)**	**All-Comers (n=25)**
Gender	64% women, 30% men	65% women, 29% men	64% women, 28% men
Citizenship*	95% US 2% not US	100% US	96% US 4% not US
Ethnicity	80% not Hispanic/Latino 2% Hispanic/Latino	84% not Hispanic/Latino 0% Hispanic/Latino	76% not Hispanic/Latino 0% Hispanic/Latino
Race	83% White 0% Black/African Am. 2% biracial: Asian & White 3% biracial: Native American & White	87% White 0% Black/African Am. 0% Asian 0% Native American	72% White 0% Black/African Am. 8% Asian 4% biracial: Native American & White
Institutional type	95% PhD-granting 3% Masters-granting 2% BS/BA-granting	94% PhD-granting 3% Masters-granting 3% BS/BA-granting	77% PhD-granting 0% Masters-granting 23% BS/BA granting

Percentages may not add to 100%, because some people skipped the item or declined to respond.
*The response "US" includes US citizens, US nationals, and permanent residents.

The levels of respondents' focus on TAPD in the two study samples were interestingly different (Figure 2.2). On average, people who attended the summer workshops rated TAPD higher as a professional interest and work priority. The summer respondents were motivated to commit travel time and work time to attend an intensive workshop; people in All-Comers group includes people who engaged with CoMInDS but report TAPD as a less central interest and a lower work priority. This result suggests that a mix of more- and less-intensive activities may be important for reaching audiences who are interested but willing to invest time and effort to different degrees. Both groups rate their professional interest in TAPD higher than they rate it as a priority for their time—reflecting that these are busy people with many work duties of teaching, coordinating programs, advising students, administration and service, in addition to GTA PD.

Figure 2.2: TAPD is a stronger interest and work priority for summer workshop participants
(interest and priority are rated Low, Medium, High, and labeled L, M, H)



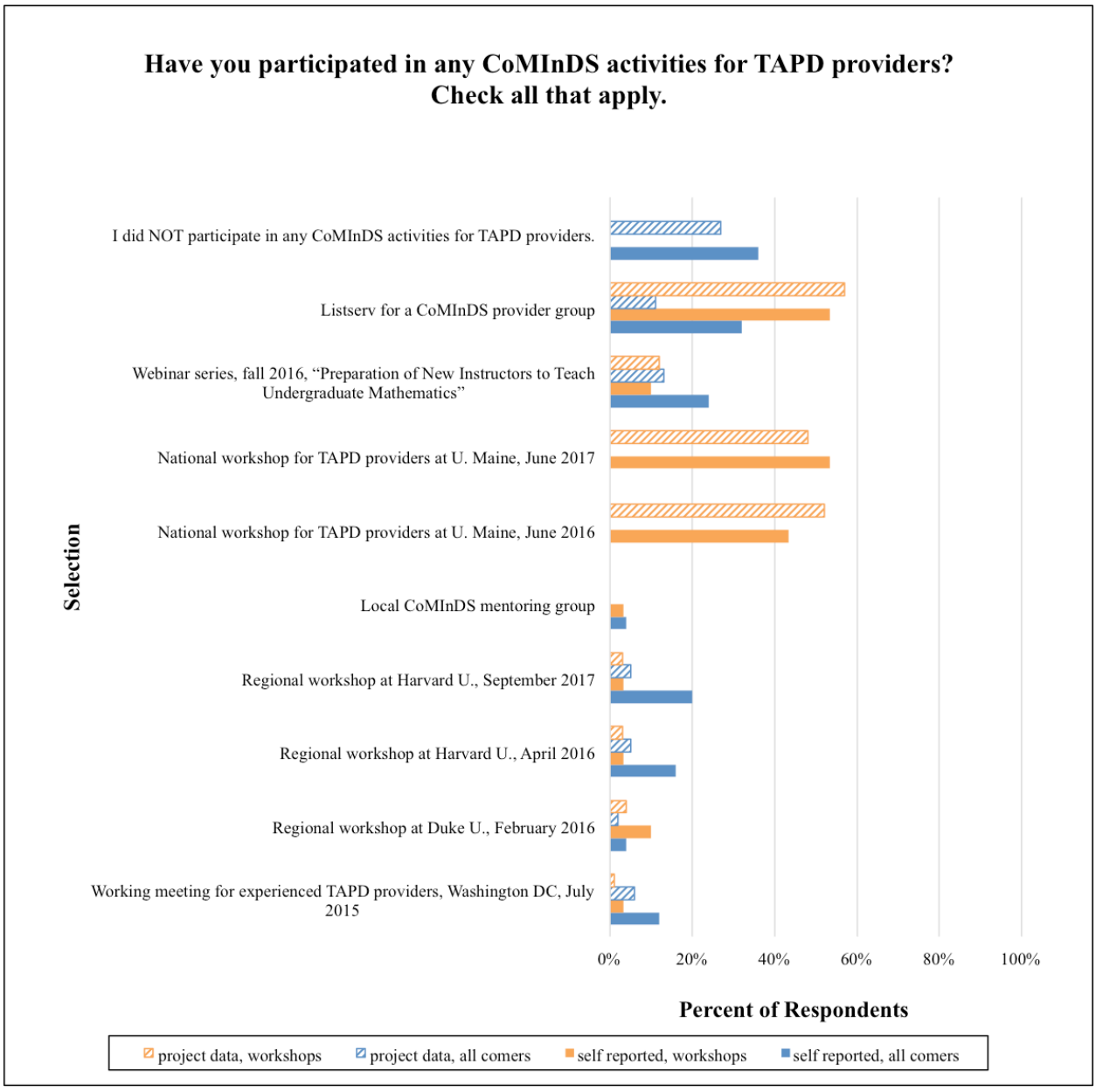
3. Participation by Providers

Because the majority of respondents in both survey groups were Providers, we compare the participation and outcomes for Providers only. The much smaller samples of Researchers do not support quantitative comparisons; their activities and outcomes are separately reported in the prior reports.

Figure 3.1 shows the Provider activities in which the two groups participated, comparing self-reported data from survey respondents (solid bars) to project records for all registered participants (striped bars). For the summer workshops (orange bars), the two data sources agree quite well, providing additional evidence that the survey sample is broadly representative of the workshop population.

For the all-comers group, the self-reported sample was somewhat more engaged in Provider activities than the overall population across all the activities included in this group. This is consistent with other evidence that Providers (or Provider-Researchers) were more likely to answer the survey than were Researchers. We speculate that Provider activities are more firmly attached to the CoMInDS "brand" than are the Researcher activities, which have built upon pre-existing activities connected to the College Mathematics Instructors (CMI) working group of the SIGMAA on RUME. As noted in the All-Comers Report, the Researcher response rate to the survey was low.

Figure 3.1: Participation in CoMInDS Provider Activities



4. Outcomes for Providers

In this section we compare outcomes of the CoMInDS activities for Providers. Respondents reported their gains within five broad clusters of possible outcomes that were identified from focus group discussions with the project leaders, and from workshop participants' qualitative survey comments. These clusters are conceptually related but have not been subjected to statistical tests to determine if they can be considered survey scales. The conceptual clusters are:

1. Thinking about TAPD – clarity and understanding about TAPD goals and important ideas that underlie effective TAPD (4 items)
2. Programming for TAPD – practical resources and ideas for local programs (3 items)
3. Approaches to improving TAPD – ideas for improvement or evaluation (4 items)
4. Connecting to others – meeting and understanding commonalities with other Providers (4 items)
5. Professionalism – sense of oneself as an effective educator working in a professional domain (4 items)

Ratings on the gains scales were converted to numerical means using a scale of zero (no gain) to 4 (great gain), and these means are summarized in Table 4.1. T-tests run on the means did not reveal any statistically significant differences, probably because the samples were too small. We thus make the following interpretations with some caution:

- For most items, the gains fall generally in the range of "some gain" (2 on the scale) to "good gain" (3 on the scale). In general, the CoMInDS interventions provided numerous benefits to participants.
- For both groups, gains in *connecting to others* stand out. Participants find value in interpersonal interactions (in person or online) to meet like-minded peers and exchange ideas with them.
- Gains captured in three items on *professionalism* are also strong. Based on open-ended comments, we see this as related to the sense of connection: Because many respondents described TAPD as hard and lonely work, connecting to others helped them to feel less isolated and see their work as important, a place to use their professional knowledge and develop it further among peers who also valued TAPD.
- Also strong are the gains captured in two items on *programming,* the specific activities and programming strategies for TAPD. This suggests that participants have gained concretely useful resources even though the Resource Suite is incomplete and not widely advertised.
- Item means for the summer workshop group are generally higher than for the all-comers group. This is likely due to the more intensive, longer duration program that they experienced, which included more opportunities for social time and informal conversation.
- Closer examination of the distribution of gains shows that the gains differ primarily in strength, not in nature (see Figure 4.1). That is, Providers in the all-comers group reported similar gains to those in the summer workshop group, but to a lesser extent. The All-Comers report details the gains for Researchers, which are distinct but are not discussed here because both groups of Researchers are too small to draw meaningful conclusions.

For data on individual items, the reader is referred to Figures 3.2-3.6 in the full-length All-Comers and Workshop Followup reports, which compare gains within each item cluster (Laursen & Lynds, 2018a,b).

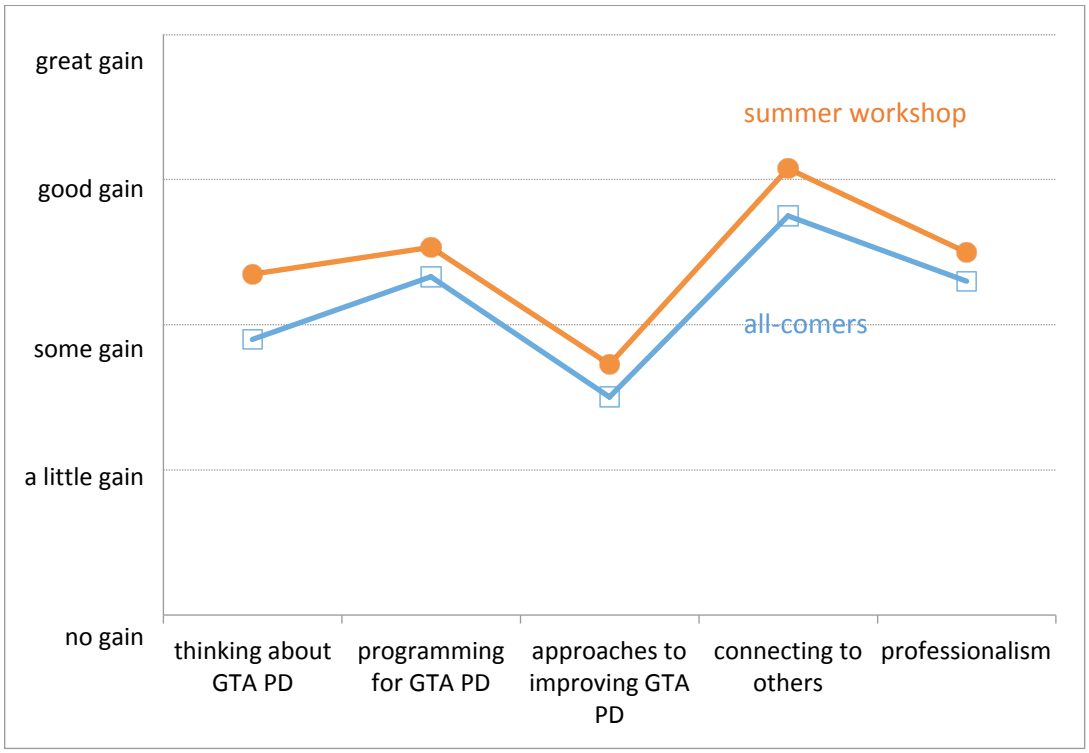
Table 4.1: Mean Gains for Providers, by Item and Item Group

		Mean, Summer Workshop (n=28-29)	Mean, All-Comers (n=10-12)
Gains in thinking about TAPD	Clarity about the goals of my institution's TAPD program	2.3	1.8
	Clarity about the vision of teaching and learning that my institution's TAPD program espouses	2.2	1.7
	Concepts or frameworks for thinking about my institution's TAPD program	2.6	2.3
	Concepts or frameworks for thinking about active learning and teaching	2.3	1.8
Gains in programming for TAPD	Understanding of the research base about teaching and learning*	2.2	1.8
	Specific activities or programming that I *have already used* in my TAPD program	2.6	2.4
	Specific activities or programming that I *plan to use* in my TAPD program	2.8	2.8
Gains in approaches to improving TAPD	Ideas or strategies for addressing specific challenges of my institution's TAPD program	2.1	2.3
	Ideas or strategies or improving other aspects of my institution's undergraduate math program	1.7	1.1
	Understanding of whether/when evaluating my institution's TAPD program may be useful	1.6	1.4
	Understanding of how to evaluate my institution's TAPD program	1.5	1.2
Gains in connecting to others	Awareness of shared interests and concerns with other TAPD providers	3.3	3.0
	Sense of community with other TAPD providers	3.1	2.8
	New connections with other individual TAPD providers	3.0	2.5
	Information by which to compare my own institution's TAPD program with other programs	2.9	2.7
Gains in professionalism	Ideas or strategies to improve my own undergraduate teaching*	2.0	2.0
	Confidence in my own work on TAPD	2.8	2.4
	A sense of myself as a professional working in TA professional development	2.6	2.5
	A sense of TA professional development as a practical activity grounded in scholarship	2.6	2.3

*Differences in the means suggest that these items may not statistically cluster with other gains in this group.

If we assume that the conceptual clusters grouped above form a scale (we do not have sufficient data to test that) and calculate means (assuming a linear scale), the gains can be compared graphically (Figure 4.1). This comparison highlights that the nature of Providers' gains is remarkably similar across more and less intensive programs, but the magnitude of gains is lower for the less intensive activities. The similarity of gains profiles suggests there is internal consistency among the programs offered by the project.

Figure 4.1: Provider gains are similar across programs, but stronger for participants in more intensive activities



5. Participants' TAPD Programs

To gain a sense of the diversity of TAPD programs represented in the data, we asked respondents to describe actual and perceived features of their own program. Figures 5.1-5.2 show the distribution of program age and size reported by respondents reflect that the programs are reaching generally similar populations. Differences in the size distribution of programs are probably not meaningful, given that the numbers of respondents to these items are modest (11-12 on the All-comers survey, 19-20 on the Follow-up survey).

Figure 5.1: CoMInDS reaches new and well-established TAPD programs

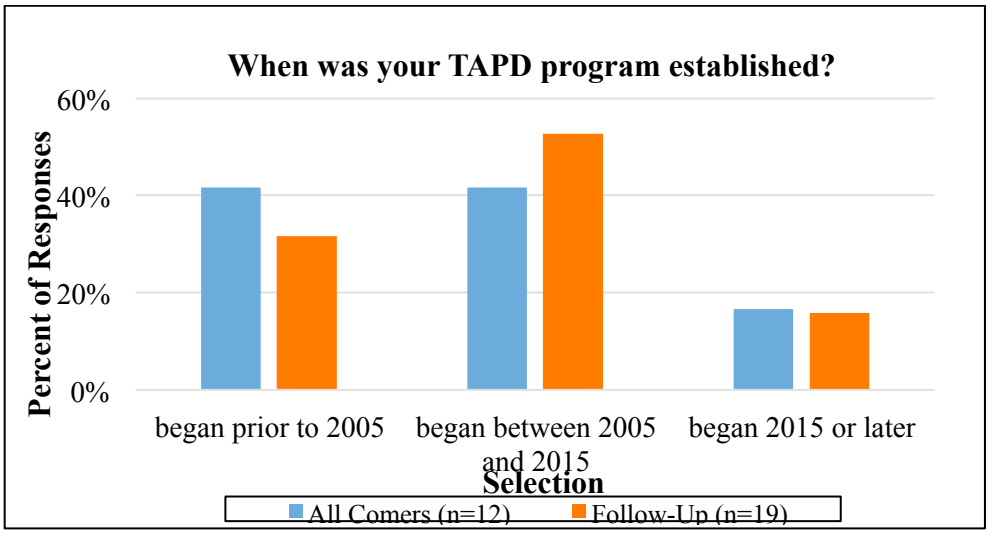
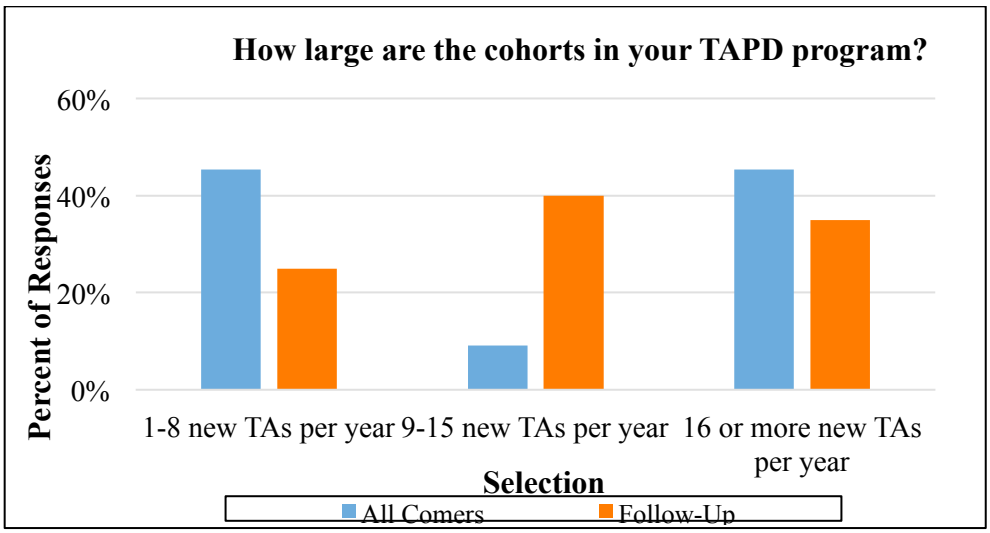
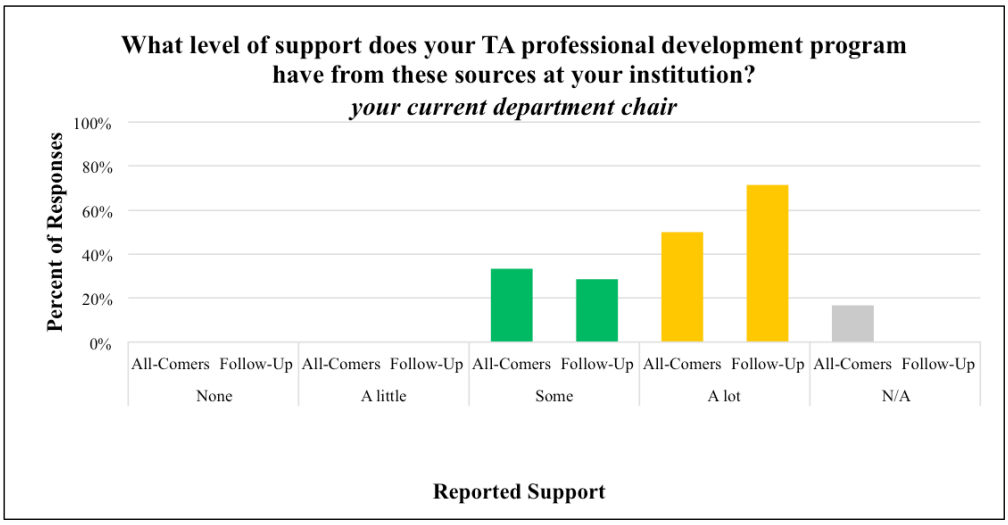


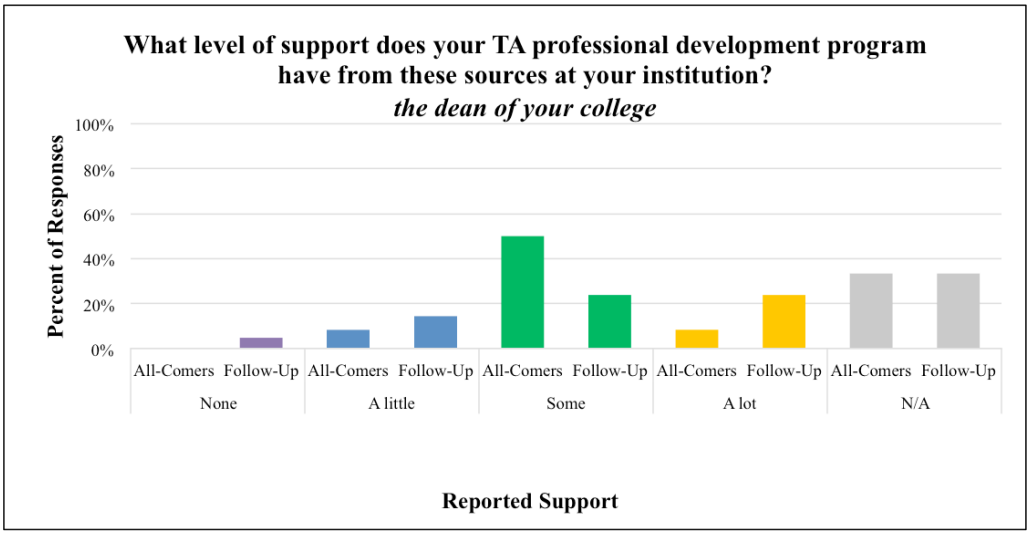
Figure 5.2: CoMInDS reaches providers of both small and large TAPD programs

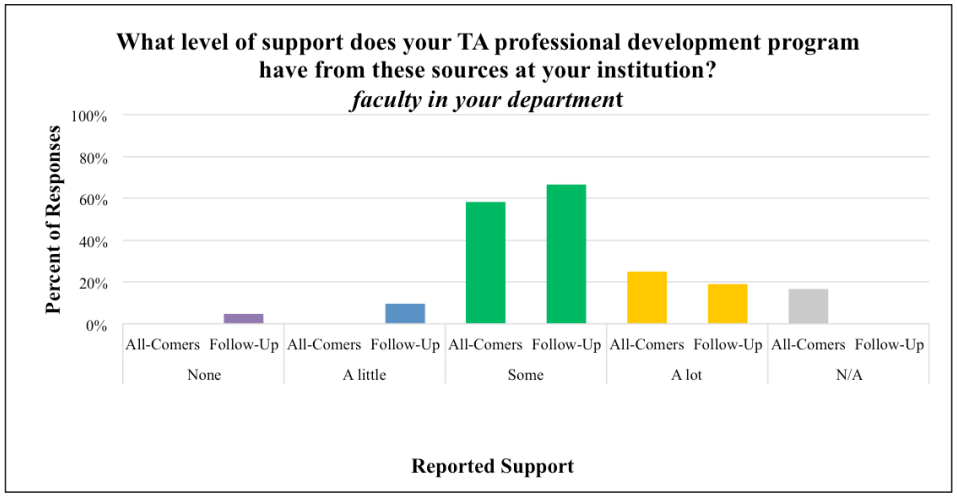


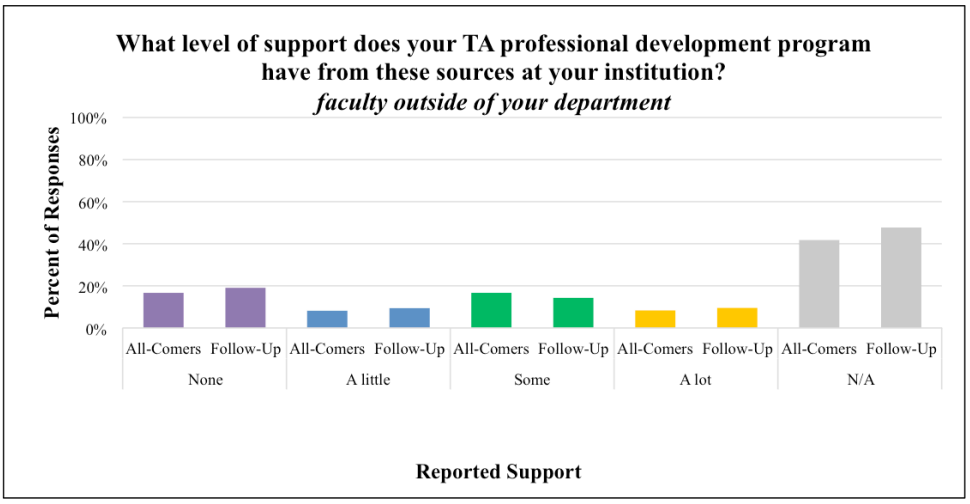
We asked respondents to describe the level of support for TAPD that they perceived from key stakeholders. Figure 5.3(a-3) shows the reported support from several stakeholder groups. Most respondents reported some to a lot of support from local stakeholders, with less support from faculty outside mathematics. The similarity of responses from both groups is striking and suggests that these may be general perceptions of where support lies for TAPD programs. The heightened support from department chairs and TAs themselves suggests the potential for a "squeeze" strategy, whereby explicit endorsement from the chair and from TAs might be used to persuade faculty (in the "middle" of the squeeze) that TAPD is a good investment.

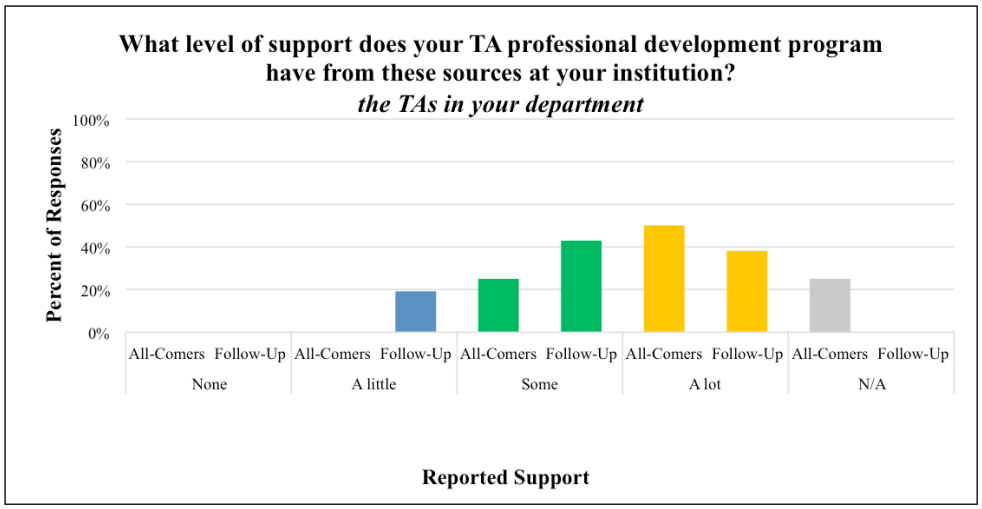
Figure 5.3 (a-e): TAPD programs are most supported inside the department





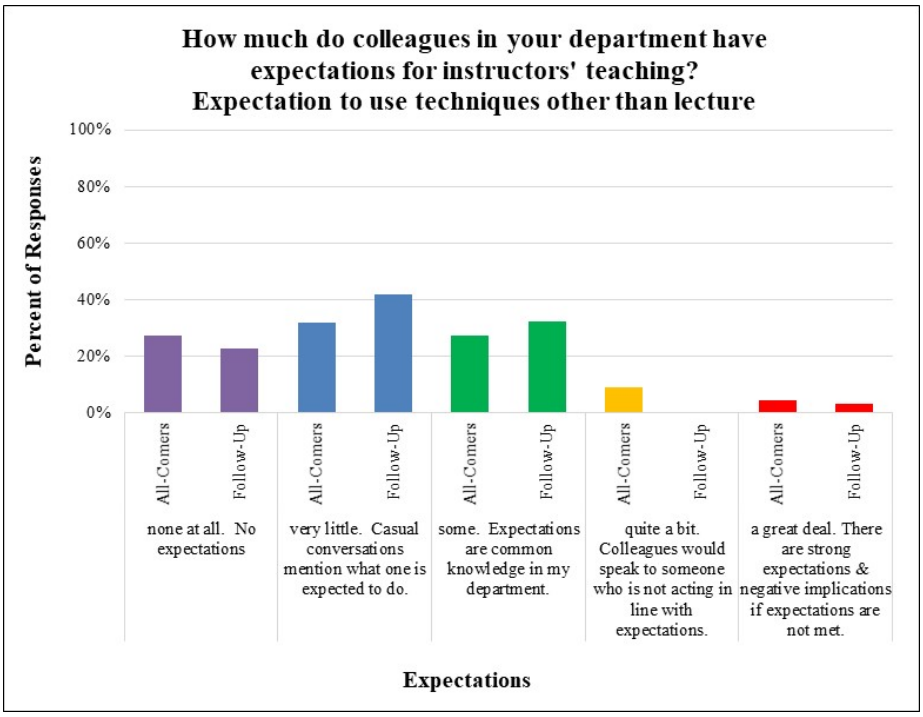


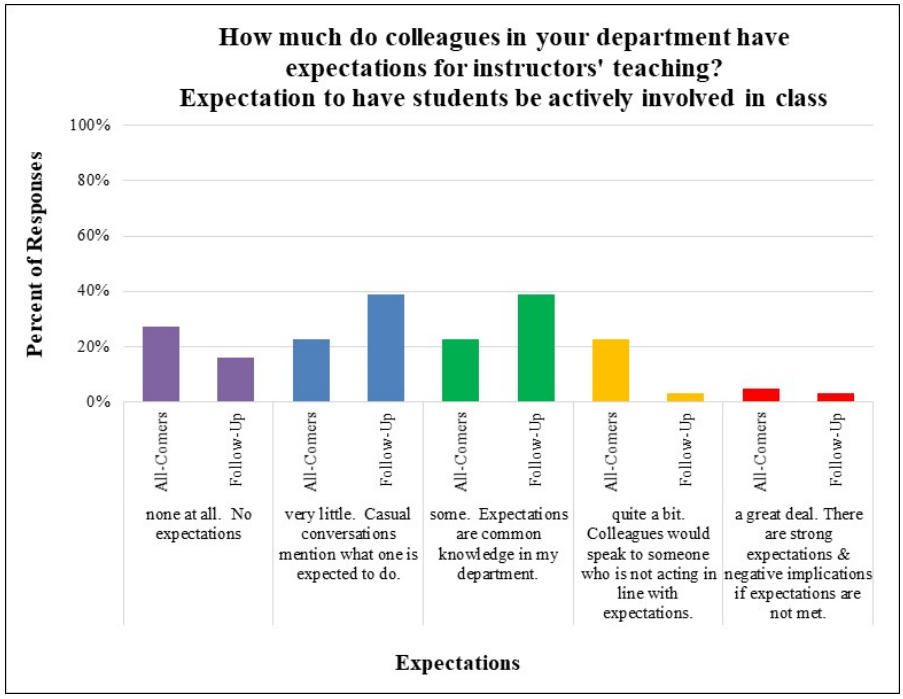


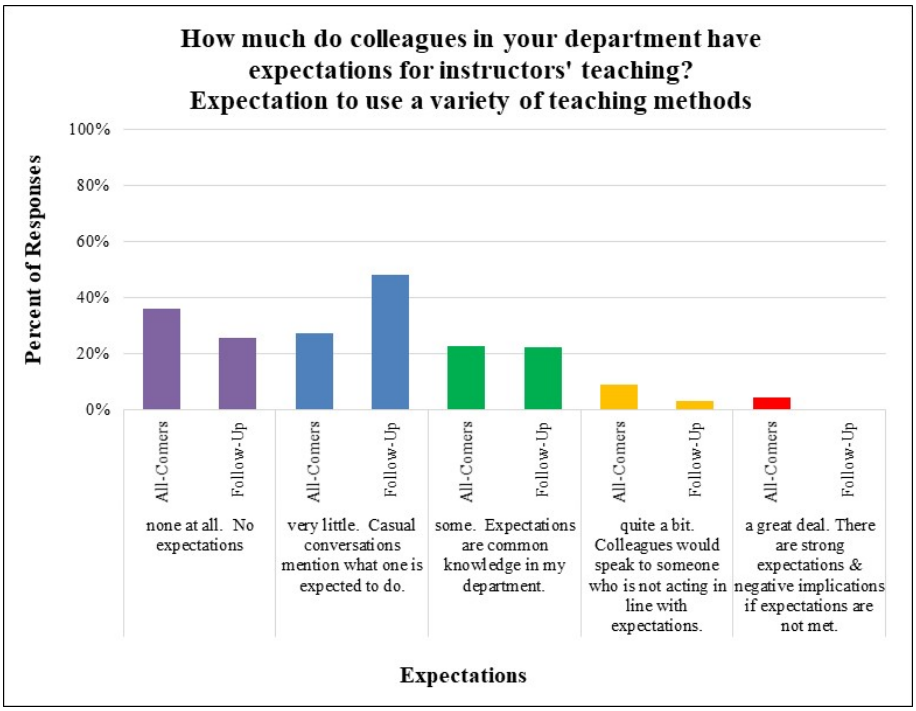


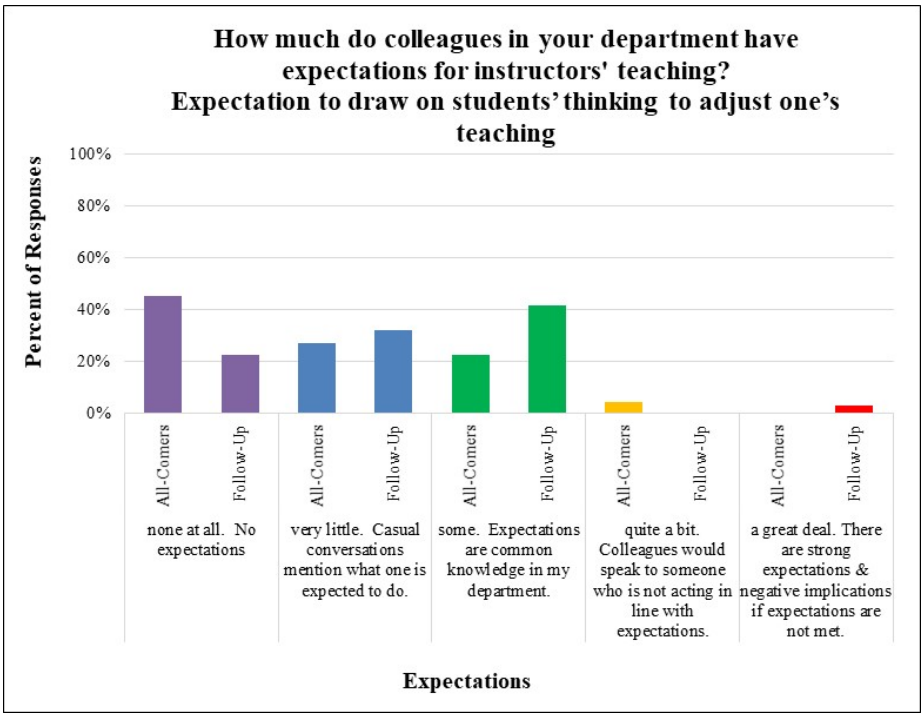
To measure local culture around teaching, we probed departmental norms around teaching as the respondent perceives them. Figure 5.4 shows the distribution of norms as perceived by both groups. Again, perceptions are remarkably similar between groups. The results reflect low general expectations for using active engagement teaching methods, thus continued opportunities to enhance mathematics educators' awareness and use of these methods. Anecdotally, we have encountered strong norms about autonomy in mathematics, relative to natural science disciplines, which may make it harder to establish norms around active engagement.

Figure 5.4 (a-d): Most departments do not have strong norms for teaching







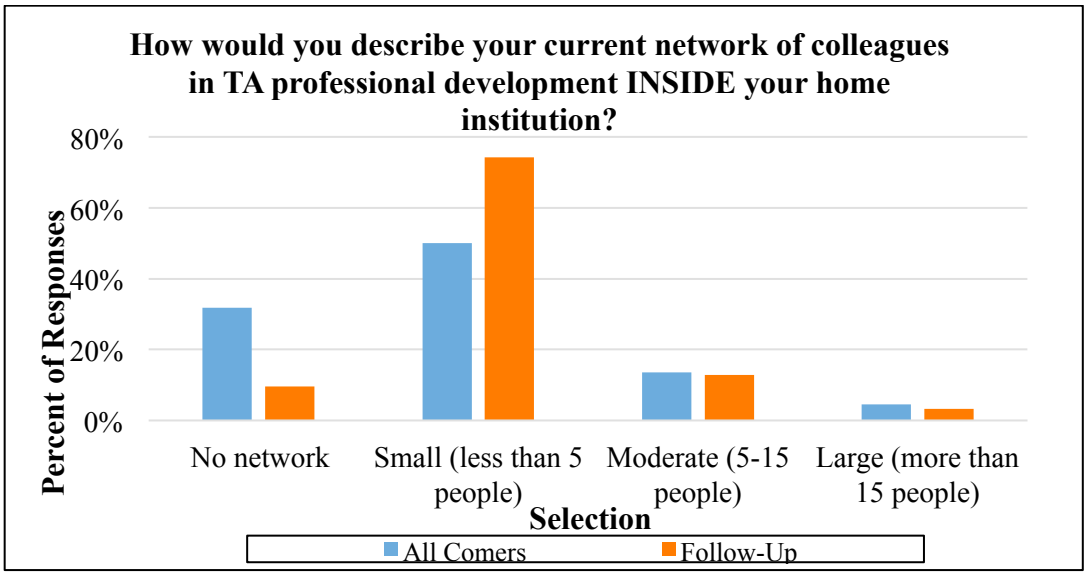


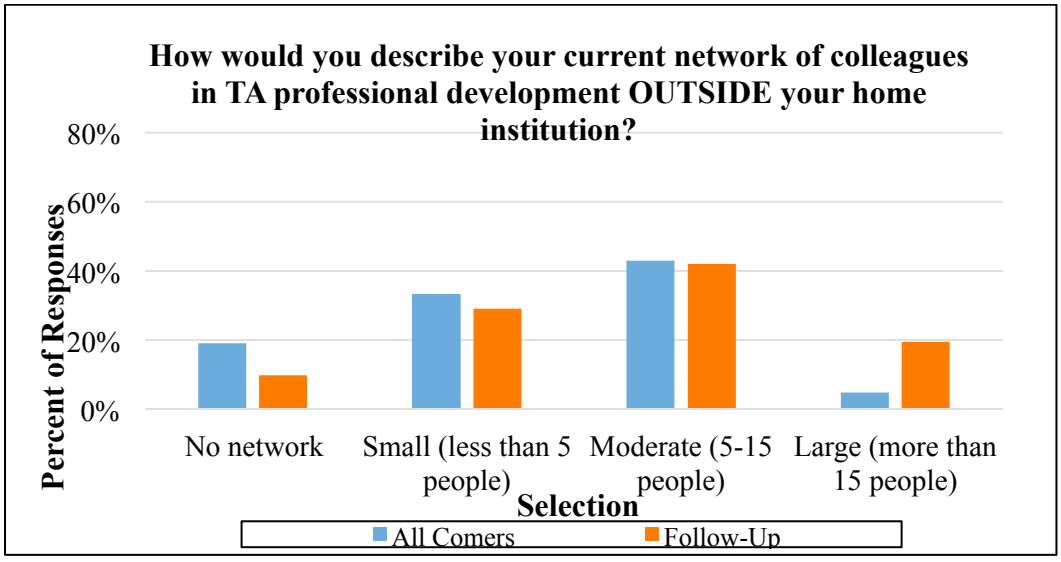
Responses to separate questions about their own teaching practices (section 2 in the prior reports) indicate that in general, these respondents make moderate use of active learning methods in their own teaching, combined with more instructor-driven methods including lecture and instructor problem-solving.

6. Participants' Professional Networks

Because CoMInDS explicitly sought to help participants make fruitful connections, we asked respondents to describe their professional networks inside and outside their own institutions (Figure 6). Most people reported fairly small networks, and external networks were slightly larger than internal networks for both groups of respondents. Most of those who did report a large network were Providers who attended a summer workshop. This may suggest that the summer workshops in particular helped people develop stronger networks, but also suggests that summer workshop participants do not perceive the whole cohort to be part of their network in TAPD. These results may thus serve as a useful benchmark for further network-building activities that the CoMInDS group might wish to undertake.

Figure 6 (a-b): TAPD Networks Inside and Outside the Home Institution

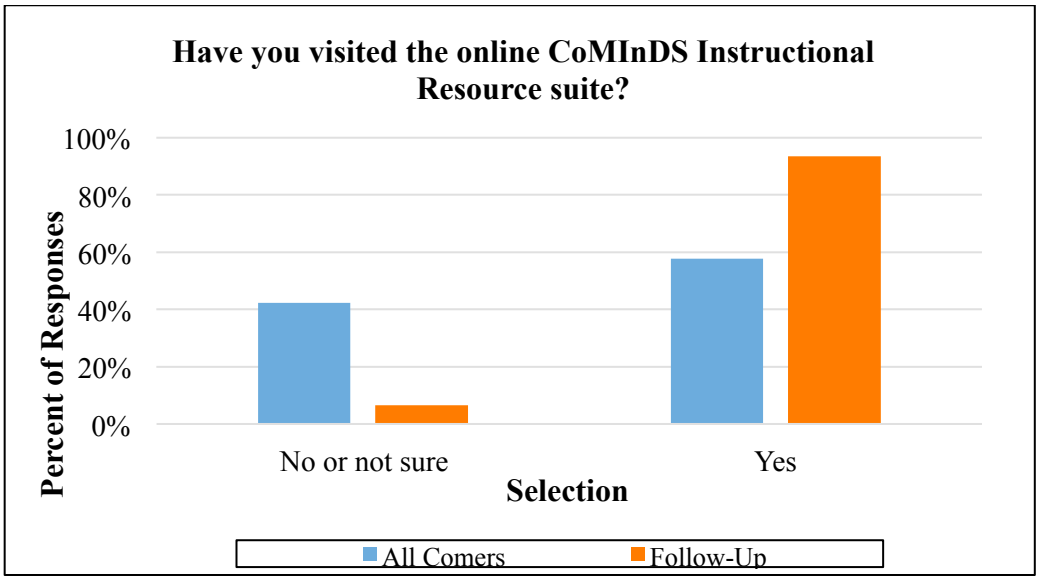


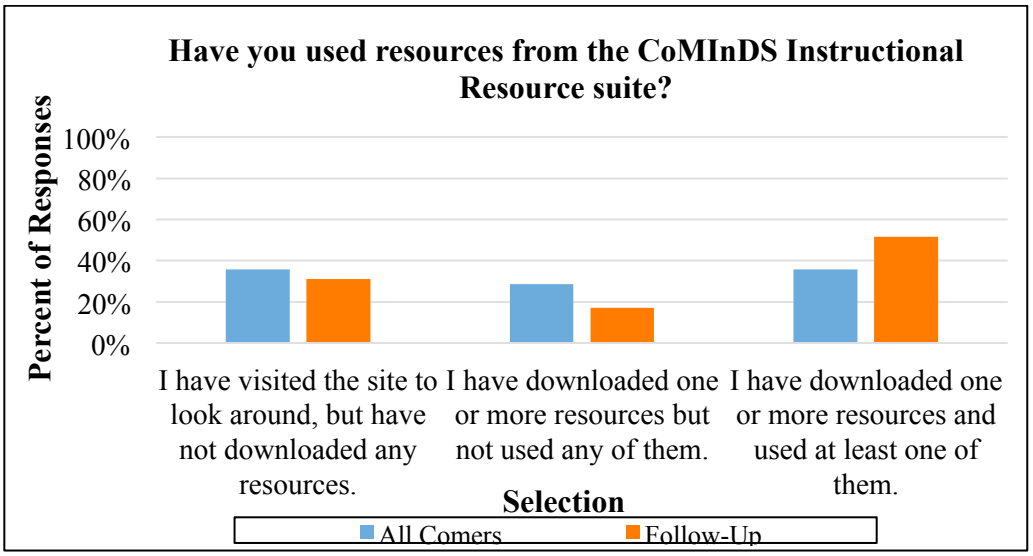


7. Use of the CoMInDS Resource Suite

The CoMInDS instructional resource suite is not fully developed and launched yet, but a pilot version is available. We asked people if they had visited the site and (if so) if they had used any resources from it. Summer workshop participants were rather more likely to have visited the site at all, and slightly more likely than other visitors to have downloaded and used a resource (Figure 7.1).

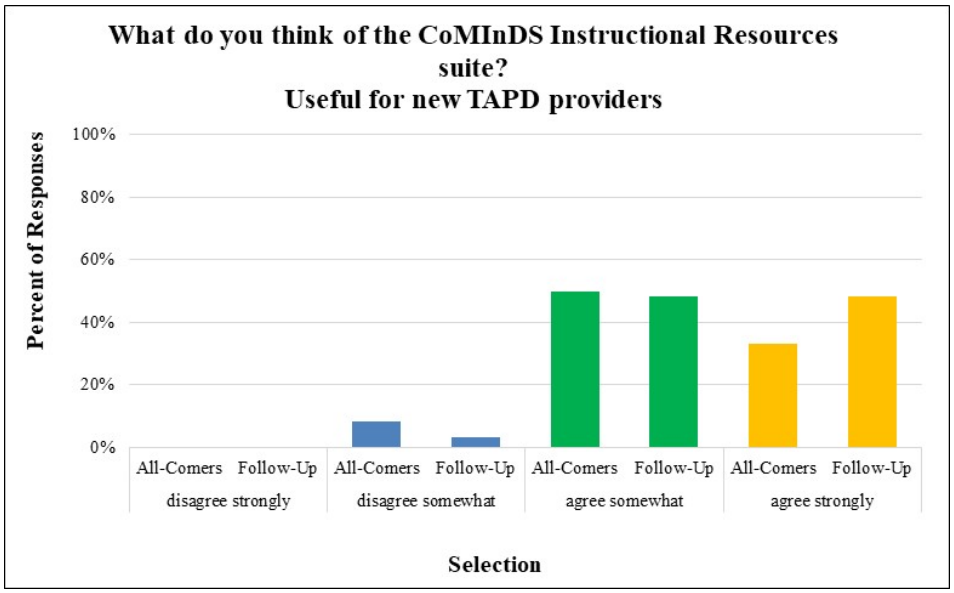
Figure 7.1 (a-b): Summer workshop participants were more familiar with the Resource Suite

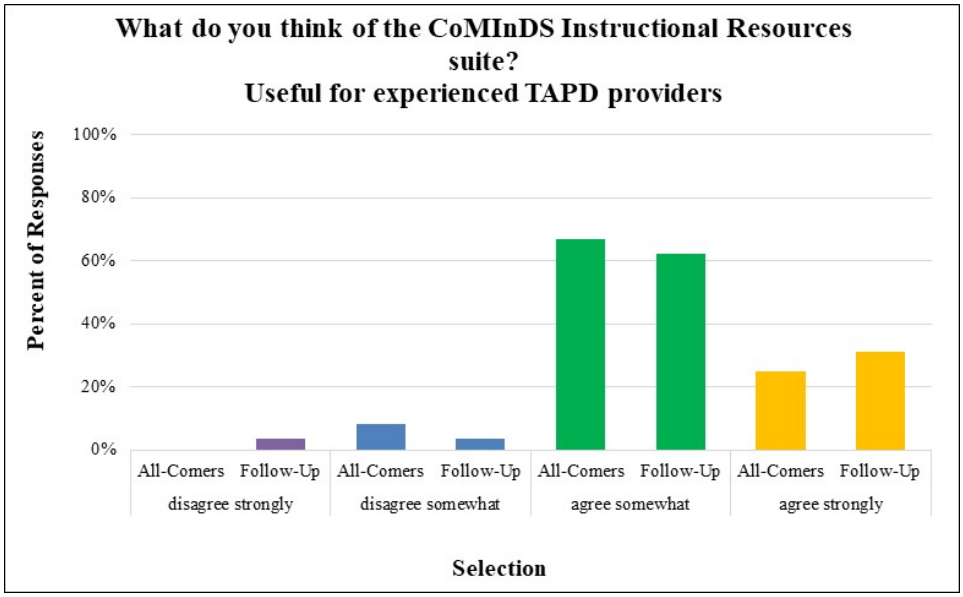


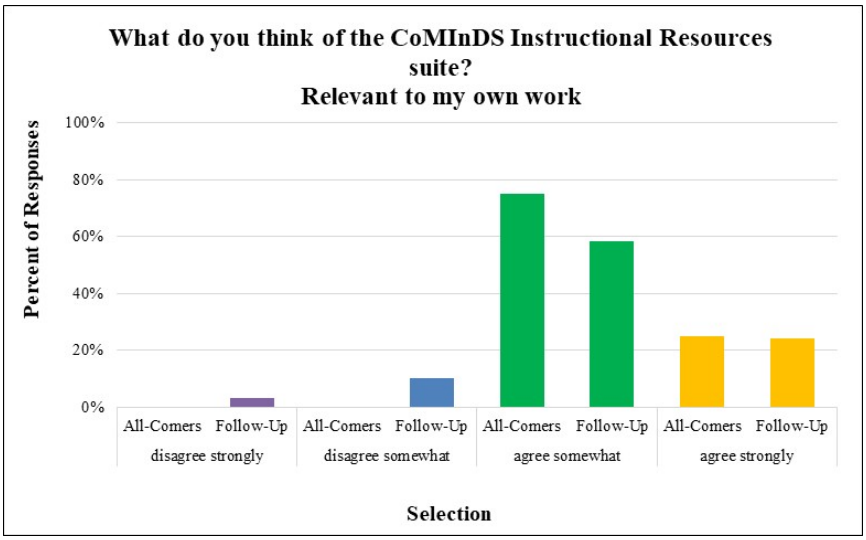


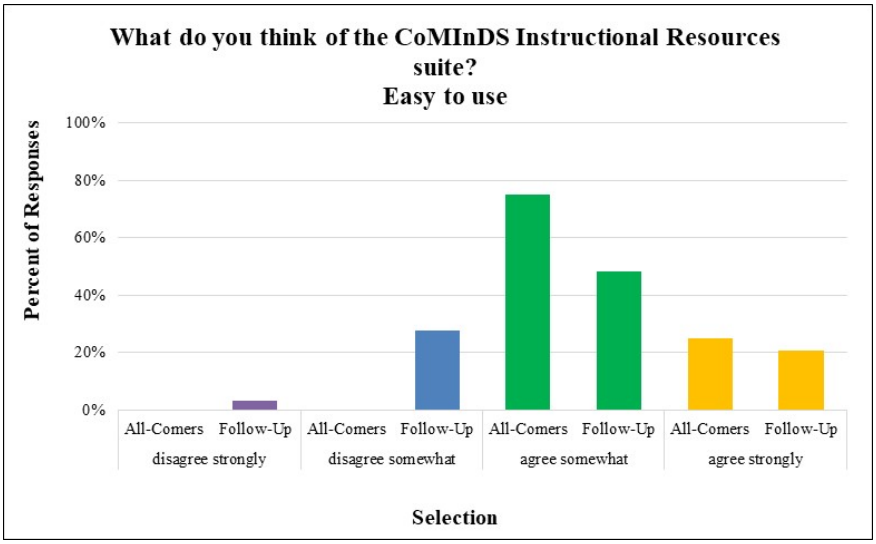
Most respondents who had visited the site to review or retrieve resources had moderately positive views of its utility and relevance. However, many did not feel it was easy to use. Summer workshop participants had more direct engagement with the resource suite and thus were slightly more likely to have tried it and to think well of it. These ratings (Figure 7.2) serve as a useful benchmark to see if experiences can be improved in future versions of the site.

Figure 7.2 (a-d): Visitors have moderately positive impressions of the Resource Suite









8. Conclusions and Implications

Overall, the populations of Providers reached by both types of CoMInDS activities are broadly similar The main difference in groups is their interest and engagement with TAPD in their work; it makes sense that people who choose to take part in multi-day summer intensive workshops are more interested in TAPD and see it as a higher work priority, compared to those who take part in less intensive activities. It also makes sense that summer participants report stronger gains—yet it is notable that the same types of gains, in the same relative importance, are reported from lighter-touch experiences. It may be important to continue offering a portfolio of ways for Providers to engage with CoMInDS; these data do not address whether less intensive activities serve as on-ramps leading people to engage more deeply later on.

Several survey indicators, combined with open-ended comments, help to build a picture of Providers' needs, interests and environments. The data reflect a mix in Providers' degrees of comfort and use of active learning teaching strategies in their own teaching and in their department. It should not be assumed that all can or will advocate that TAs use such strategies; some have a clear image of the instruction they would like to see TAs use, and some do not. Likewise, Providers have a mix of views as to the goals of TAPD: for instance, is the primary goal to improve undergraduate instruction, or to help TAs' job

prospects after graduation? Some are enthusiastic volunteers to the role of TAPD leader in their own institution, but others are not. Thus providing professional development for this group must address these mixed needs and degrees of readiness.

Finally, Providers are people with many commitments. The data are corroborated by practical project experience that suggests that they will take part in programs offered to them but, at present, are not likely to initiate or sustain an informal community. Some do not feel well supported by their home institution. As a group, Providers tend to hold lower-status academic positions and may not have the positional power or informal influence needed to implement major changes to their TAPD programs; it is no coincidence that most are also women. But they are interested in further professional development and in help navigating their institutional challenges. Thus attention to building Providers' leadership and advocacy skill sets, while recognizing their institutional positionality, could be a fruitful element of future work, in addition to efforts to build skills and knowledge needed to set learning goals, design and lead TAPD programs.

9. References Cited

Laursen, S., & Lynds, S. (2018a, April). *Medium-Term Outcomes of CoMInDS Project Activities: Results from the 'All-Comers' Survey*. [Report to CoMInDS] Boulder, CO: Ethnography & Evaluation Research.

Laursen, S., & Lynds, S. (2018b, April). *Medium-Term Outcomes from the CoMInDS Intensive Workshops: Results from the Follow-up Surve*y. [Report to CoMInDS] Boulder, CO: Ethnography & Evaluation Research.

National Science Foundation (2016). National Center for Science and Engineering Statistics, Survey of Earned Doctorates. Table 16. Doctorate recipients, by subfield of study and sex: 2016.

National Science Foundation (2015). National Center for Science and Engineering Statistics, Survey of Doctorate Recipients. Table 17: U.S. residing employed doctoral scientists and engineers in 4-year educational institutions, by broad field of doctorate, sex, and faculty rank: 2015. Table 19. U.S. residing employed doctoral scientists and engineers in 4-year educational institutions, by broad field of doctorate, ethnicity, race, and faculty rank: 2015.