Colorado Math Pathways Task Force Retreat
May 18-19, 2015

NOTES

Monday, May 18, 10:00am – 5:00pm

Time	Topic
10:00 - 10:30	Brief History and Tour of the Grant-Humphrey's Mansion (Lindsey McCutchan, History Colorado)
10:30 – 12:00	Lingering questions to be addressed by the full math task force: ○ Should the recommendation for CalcPath include a position on the structure of prerequisite courses? ○ Should the recommendation for the StatPath include a position regarding a college-level prerequisite for statistics? ○ Discussion on the coherence of the QuanThink Path: • What is the purpose (in terms of programs served) of modeling vs. "math for liberal arts" courses? • How will programs distinguish between different options in this pathway? • Will diversity of courses in the pathway lead to problems for students in applying math credits to programs of study, especially when transferring between institutions? 1. CalcPath ▪ Recommendation is to have students who intend to take Calculus I do so in their first year. It's highly recommended that students who intend to complete a major requiring calculus in four years complete Calculus I within their first 30 credit hours. ➢ May not work for every student ➢ Recommend that institutions develop structures that support students to meet the goal of completing Calculus I within their first 30 credits. ▪ Existing Options: 1) Go right into Calculus I 2) Take Pre-Calculus and then Calculus I 3) Follow the current sequence of College Algebra, Trigonometry, and Calculus I Potential Options could include, but are not limited to: ○ Co-requisite instruction/support ○ Stretch courses (the risk here is transferring before completing the entire course) ○ Online support modules ○ Compressed/accelerated modules 2. StatPath ▪ Use the existing Intro to Statistics content ▪ Encouraging a modeling approach as well ▪ Students should be able to take Intro to Stats, without a credit-bearing pre-requisite, if they are college ready (that is, have completed remedial if needed, like MAT 050: Quantitative Literacy) ▪ For future examination/discussion: Address if CCCS should allow MAT 135: Intro to Stats to fulfill general AS degree requirements with the caveat that students be

Time	Topic
	strongly advised that the course may not apply to all STEM majors and that the student may need an upper-division statistics course with the same name (Intro to Stats) for their baccalaureate program. ▪ Should make the lower-division syllabi/content and names of the courses significantly distinct from the upper-division courses, such as Statistical Thinking vs. Introduction to Statistical Methods). 3. QuanThinkingPath o Courses include, but are not limited to, a new algebra-based modeling course and/or the existing Liberal Arts course o Existing Liberal Arts course to be repackaged ➢ Emphasize using modeling and the topics currently on CCCNS site ➢ Less emphasis on appreciation of mathematics topics ➢ Working group consider: ▪ MAT 050 as the developmental education path ▪ Meets the gtPathways/core gen ed requirement ▪ Generally is a terminal math course ▪ Include some modeling? ▪ How to ensure rigor? Ideals for the bulk of "Math for the Liberal Arts" type of courses: Students, who are afraid of math, say "I learned something I can use." Financial literacy, better consumers. Understanding numbers in the real world (like percents). Keep in mind instructors are selected at the last minute many times and have math background but may not have specific background in teaching math to students who usually are not strong in it. Amy's summary of the 3 pathways: Recommendation is that the Quanthink courses are designed to be rigorous, support problem solving and numerical and reasoning skills, and address the state competencies. Recommend content on statistics, algebraic modeling and reasoning, financial literacy. Additional topics may be included but recommend depth over breadth. In some cases courses may need to be designed for specific program needs. The 3 pathways do not preclude some unique paths based on intended major. The course(s) should be based on specific, content-related learning outcomes. For example: ➢ Integrated Math I&II for ECE and EL ED path (e.g., MAT 155&156) ➢ Architecture ➢ Business
12:00 - 12:30	Get lunch
12:30 – 1:30	Continue previous discussion if needed. Plan for vetting: assign responsibilities, discuss presentation delivery
1:30 – 3:00	Small groups work on refining recommendations; preparing powerpoints; practicing presentation

Time	Topic
3:15 – 5:00	Looking ahead at next phase: • Finalizing report • Next stages of work • On-going role of task force
5:00 - ?	Gather at Ian's for social hour • Governor's Place condos, 800 Pearl St. Apt. 406. (1/2 block north of GH Mansion). Dial #033 in lobby to get buzzed in. Dinner at Racine's (on your dime) • 650 Sherman St, Denver, CO 80203 (walkable from Ian's. Leave your car at GH Mansion.)

Tuesday, May 19, 9:00am – 4:00pm

Time	Topic
6:00 – 8:30	Free breakfast at the hotel or on your own
9:00 – 11:45	Transitioning to a state action plan • Working groups (recruit membership purposefully; Task Force members start thinking about who to invite to these; want key leaders we know will carry this forward; maybe Task Force members could chair and co-chair?) • **QuanThink Path Group:** 1. **Modeling Course** – start with Georgia's and Mesa's models for the course (need faculty designers who understand the needs of the students who'll be taking this course) 2. **Math for the Liberal Arts -** content and competencies • **Statistics** – can we differentiate the content between lower-div and upper-div stats so students aren't repeating same material? [would require collaboration with faculty in departments that teach stats, if not math dept.) • **Calculus Pathway**– what's the best way to get students through Calc I within their first 30 credits? (co-req dev ed, SAI, accelerated model?) • **Supporting Instruction & Learning** – providing high quality, long term, sustainable professional development (based on best practices) to ensure appropriate instruction and active learning; identifying and (re)training appropriate instructors to teach the gateway courses; alternative structures to support pathways (SAI, accelerated, stretch, co-enrollment); resources and training for statistics staffing • **Policy & Transfer Issues –** might not need to be a group, it could be up to CDHE to implement; Integrative Math I&II for ECE and ElEd teacher candidates; inconsistencies in transfer; DwD math courses; CCHE Remedial Policy; examine if CCCS should allow Stats for math requirement in AS degree; ensure lower-div and upper-div stats are different enough from one another, clarify content/pre-reqs • **Advising** – find details on where/how/why advising is working or not working; mix advisors with faculty to ensure good decisions; get in on CCCS' annual advisor summits and 2- to 4- year advisor summits; CDHE Student Affairs summit; address structural issues; develop meta majors • **Partner Discipline Collaboration** – regular program review for appropriate math

	course in the major; (provost-type people [Academic Council?] weigh in on how this is/could be done); • **Communication** – canned PowerPoints and other informational resources; see Amy's pdf; • • **Ongoing Roll of Task Force:** 1. TF should monitor and serve as a resource for the working groups. 2. If any of the working groups come up with questions – Ian/Dean will collect those and give them to the TF to make the decision and give a qualified response. The TF is a "mostly" math faculty group who will look at the issues holistically instead of just to faculty at a particular institution. And the TF will make the executive decision about whatever this issue is. The TF role is also to review the proposed plans from the working groups and be able to give feedback from the more "big picture" perspective. 3. The TF should meet in Sept and Jan ish meetings and in Jan make a decision about need for more engagement. 4. Want the institutional diversity on the TF. We like having representation from the different schools. If anyone wants to step down we will find another rep from your college to take the place. 5. Keeping a number of us on the TF gives us the opportunity to have the big picture perspective and we already know what the goals are.
11:45 - 12:45	Lunch and final prep
Time	**Topic**
1:00 – 1:10	Introduction, context for math task force work nationally
1:10 – 1:25	Background on Colorado work: process, key findings
1:25 – 2:00	Presentation of 3 recommendations (approx. 6 minutes each, additional time for interspersed questions) **Questions during opening presentation:** • Regarding the community college data: question about which students were represented in the data – AAS, AS, etc. • There are science disciplines that need algebra and trig for chemistry and physics. Will the modeling course address those needs? • What about business? • Why is the CalcPath called that instead of the STEMPath? • What about students who aren't ready for the gateways courses? • Some programs such as nursing require algebra skills and statistics so it doesn't seem that one pathway will work. • We need to keep in mind that the ACT gateway cut score does not apply to every gateway course. I see that as a problem for getting students into the gateway courses. • Both ACT and high school GPA are high "horsepower" tests that aren't good indicators for content. • Regarding DwD – some have high math requirements because some programs require. Example given about Econ. • How will this articulate with K12?

	• Glad to see the differentiation of instructor skills for statistics and other math courses.

2:00 – 2:45	Targeted questions for the vetters – will be planned on May 18:
	Breakout Groups:
	1. <u>Advisors and K12 folks Breakout Group</u>
	Praise:
	• I love a lot of this by the way. Taking the algebra prerequisite out of statistics—That's huge.
	Questions:
	• "Nursing students need a full algebra and a full statistics; so I thought it fit in calculus/trig and maybe you'd sub, but what would you do for a student that needs both algebra and statistics?"
	• What is the difference between statistics and quant thinking? ("I want to know more about the distinction between statistics and QuanThink…")
	Advice:
	Communication between K12 and Higher Ed is key
	• Students get into institutions and they're told [credits] are no longer applicable
	  • i.e. At the district level, there was no communication that 050 leads to college math courses other than algebra.
	• High school counselors are just now thinking about different pathways
	Clarity is key
	• Clarity is key - college advisors, but also high school advisors
	• It's important for them to know, "This is what you need for this, this is what you need for that…"
	Q: Would a fact sheet or FAQ sheet help?
	  • Students are connecting their ICAPS to their career cluster
	  • Don't add another piece of paper, integrate into what's already there
	  • Advise the math instructors at the high schools as well
	Advisors need better data to help support this updated way of thinking about advising students into pathways instead of college algebra
	• One of the things that would help out advisors is data - data on student success rates
	  • This comment was made in response to the data shared by a task force member that only 1/10 algebra students takes calculus 1
	For K12, put "college" in front of the course name
	• This may be sufficient to make it clear that students should take it as a college level course
	  ○ Related to concurrent enrollment
	  ○ i.e. "College Stats"
	Comments:
	Flexibility is a key reason why college algebra is often advised
	• So many levels of statistics that are different in different majors, statistics - I hope that works for what you end up with - so true that algebra counts for every single major so that's why you want to give them the most flexibility
	• 2/3 are undeclared or they change - you want to do what most flexible
	On student "indecision"
	• When you talking to incoming freshmen, how do we get them to pin down the broad meta-major as opposed to having them cavalierly pick college algebra
	• Unfortunately younger students don't distribute themselves nicely, the conversations about what you're entering into going are all over the board. Inter. In a number of different majors at that point
	• We do want them to get into math early; college algebra can be the safest path even if its not the most appropriate one
	• Its challenging to get advisors to think to not take the received wisdom that algebra is the safe course - so we need to get that message to advisors but know that they're not going to take it at first

- even though a student doesn't know what they want – the student would have a sense of that - whether they're working toward calculus
- We have students that jump around a lot; I was looking at a list of students and 40/60 changed their majors - from our perspective keeping options as open as possible is what benefits our pop.;
- Sometimes they've taken algebra so long ago in 8th grade and all they need is a boost to review the algebra and they're there; we have a lot of those that don't pass into algebra but they do have the skills for calculus; what makes you choose this pathway instead of others; its tough to say no
- You don't say no. you can you give them options - you want to be realistic

On the need for communication between math departments and client/partner disciplines

- What you see as needs or gaps - we wish we had a course that did this or that
- If client disciplines were on board with curriculum in math, then that would be important
- Business program anecdote - we want you to talk about it and when you come back let us know what you want, let us know. Before that conversation maybe half of them thought they needed a different course

On concurrent enrollment

- Teachers themselves - concurrent enrollment offers a unique opportunity. Traditional HS teachers have that understanding of what the expectations for that next level are; spreading the info across more people than just those 3 advisors understanding that there are different pathways
    - Also having HS teachers teaching those courses is a powerful way to do that
    - We want an AP calculus teacher, shopping around what the requirements are….how do math teachers become partners in this expansion of concurrent enrollment?

Specific institutional comments

- Its more complex at CSU than at other places - clarify how 300 level is different from 100 level
- Dean and his designees talk to each student so math talks to each incoming student and they do an interview and they make the math recommendations based on what they know about the student's interests and the conversation with the students
- Arapahoe CC analyzed our major switching and there's not as much as you'd think so were in a position to make those decisions earlier

Nontraditional students

- When you're not using math, going in and jumping in to algebra is different, they need something to bring them up to speed. Not necessarily taking a remedial math course…corequisite math course

On Math for Liberal Arts

- Big struggle is to provide support for math for liberal arts. As many faculty members that are teaching it, that's a whole other course. The more courses taught, the more different types of content; so tutoring is difficult for those courses.
- However, is it realistic to make people stick to an approved curriculum? Variation in instructional quality could be from the adjunct instructors
- Actually its more tenured faculty who stray from the syllabus, the adjuncts tend to stick to the syllabus.

Idea for GE Council

- What if you took the gateway entry level, then developed a rubric and back-mapped it?

We need to have this discussion regularly, what do y'all think of that?

- Yes, that's important.
- During program review

Transferability

- At individual institutions, it is important to have that conversation with partner disciplines, but how do you map that out again for transferability?
- Even if you have the same name for a different class, it's still transferable

- The aim is not to create 55 different courses—the aim is to have the departments that use math as a service, to realize what their needs are. The more they go away from math, there are some historically entrenched departments, they might be under the wrong idea about what the course is. Some of them think that, 40 years ago, they took algebra so that's what today's students should do too.

On the training of K12 advisors

- There are some people that get it but with the turnover, there's a constant retraining, must have something super clear, super user-friendly

On the difficulty of keeping up with changes in higher ed enrollment requirements

- Denver Public Schools has 3 concurrent enrollment advisors that work across 35 high schools, 9 different partners, each one of them has different cut scores, we're trying to keep up with semester to semester change
- Accuplacer cut scores for all - how do we use summative assessments? Could we use weighted HS GPAs in that content area?

Concern about how AP credits fit into all of this

- Clear communication about whether they take the AP, but they don't need it
- Someone who wants to get into a really good university, that's what they're being asked to do

More people need to be educated about pathways than just advisors

- At community colleges, there are so many students and so few advisors, students can enter, do their assessments, and then never talk to an advisor again
- Educate students about whether this is the right math choice for you

Is there a group of advisors that meets regularly?

- Our institution has faculty advising vs. others that do ir
- If you could recommend it during program review bet client disciplines, then also engage advisors during that conversation
- Listservs that are a conduit for info out
- Local
- NACADA
- HS counseling Colorado State Counseling A…
- The concurrent enrollment advisory board
- Concurrent enrollment K12
- Messaging to CO school counselor corps as well? Yes.
- Very few go to ACADA or NACADA
- If there were regional convenings, people might go, but it would depend on the directors
- CSU has an advising office in each college - mostly prof advisors in a centralized office

2. Curriculum Breakout Group

1) Clarify: Can the elementary education path stay put? YES

2) Concern about meta major concept/STEM disciplines - example of chemistry students switching to biology because of the math
Dean - meta majors are a bit messy, there will be some problems and gray area and differences at the institutional level, but we think they will help many students
John - clarifying that the concern is with the metamajors inside of STEM

3) Concern with any sort of movement - can we streamline and keep disciplines happy
Shelly - it is not about content at this time, but about getting students on the right path - not about cutting material out of a course
Dean - emphasis that for calculus, we still encourage other options, but if students hope to graduate with STEM degree in 4 years, they should finish calc I in the first year/30 credits
John - There is a component in having the faculty advisors and discipline faculty advise and

get students into basics in the first 30 credits.

4) Chris M - What is the level of conversation between math departments and partner disciplines regarding gateway courses?
Shelly - not enough
Dean - varies by institution and even by school/college at the institutions
Community Colleges - we have to work with all schools' partner disciplines, but that is why we have the articulation agreements (and they need some work).

5) We have many students undeclared, so we need a default course if college algebra is not the default. Folks like the idea of choosing gateway courses based on the competencies/content. The default of college algebra does not serve students.

6) Anthropology, Psychology, etc can cross departmental areas - physical and social sciences. If there are scenarios where only one or two schools have different requirements, those can be asterisked out of the transfer agreement. (GE Council discussion)

7) Creating classes that students will sign up for. More degrees require stats now so that's helping with Stats, but Liberal Arts is still a concern.

8) Challenge of the end user (student or discipline) - Students may be undeclared even by the time they reach the 4 year and they really think algebra is more flexible

9) Andrea - Who are these recommendations being brought to and will they impact policy?
Dean - written report available in the fall, working groups will be meeting, implement some changes by fall 2016. John - likes the idea to use Faculty to Faculty, maybe an additional, similar get together not hosted by CDHE

10) Mary - Not only does she see no red flags, but she also thinks it is an exciting time for us, and she can help us find K-12 folks when we need them. Marsha - In P20, they had trouble getting high school folks involved. Mary - we could present at CCTM - Sep 25 & 26 - if we want to solicit folks.

11) John - points out that we have the different statistics courses in the different disciplines, and why? Shelly talks about the disconnect between 1st year and 3rd year stats.

12) Carol - Discipline conversations - asking folks which competencies they want, but also which are missing that they might want.

3. Administrators Breakout Group

- Concern: 70% of students change majors. Is there a way to allow students to change pathways without retaking a full course?
    - Many pre-nursing students who won't make it into the nursing program. Math is a barrier for students who need to change into another program.
    - "False negative" – some students may want to take and benefit from Calculus even if it is not required for their majors. Don't want to misinform those students.
    - Bruce: Intention of gtPathways is to identify most likely pathway, but there are other possibilities.
    - Maybe there are two issues: pathway defines what is best for most students and still allow institutional flexibility for making exceptions for individual

	students. ○ This creates an opportunity to discuss what programs really want their students to know – good conversations between disciplines. • Program Review ○ Really like the idea (all participants) ○ One concern is the demand on math faculty to be involved in all of these reviews. ○ Who is the appropriate people to talk to: Director of Assessment, Associate Provost/Director of Instructional Research. Will vary a little, ask who does the program reviews. • QuanThink ○ Like the inclusion of financial literacy ○ Depth versus breadth is good • Options for funding faculty professional development ○ Regional events, distance learning ○ Connect to regional math association meetings or other gatherings ○ Institutions might be able to support reassigned time for a course leader ○ Need to think about adjuncts – professional learning is not part of their contract ○ More likely to get institutional support for activities around the science of learning, clearly defined outcomes ○ Connect to centers for teaching and learning ○ Tie to scholarship and research • Question: Pass rates in Calc I are not good either. How much have you thought about improving success in Calculus. ○ Institutions will be encouraged to experiment with different structures that might improve student success ○ Getting right students into pathway may help student success • Challenges: ○ Level of complexity of doing anything at the state level ○ Institutional governing boards ○ Connect to HLC, accreditation • Disseminate information: ○ Academic Council • Concurrent enrollment: increasing rapidly, students usually want the highest level colleges – need to be communicated with K12 ○ How do AP and IB credits map onto this? ○ Connect to P20 alignment work • Model for statistics training: STEM symposium, day-long meeting once a year, externally funded by foundations. Next year held on Western Slope. (Suggestion from Ellen Gregg)
2:45 – 3:00	Looking ahead at next year and wrap-up
3:15 – 4:00	Debrief of vetting; next steps, wrap-up Advising • Advisors need brief, clear information and explanation to help students make choices. • Advisors don't want to say "no" to students and limit their options but recognize

	the need to be honest about chances for success in a particular path. • They default to algebra because everyone accepts it. • High school students choose College Algebra, in part, because of "college" in the title. Re-name Stats to College Statistics and Math for Lib Arts to College Quantitative Thinking. • Lib arts courses vary from instructor to instructor and institution to institution. Professional Development & Support • Piggy back on conferences. Build a repository specific to Colorado. Regional workshops for faculty. • Where do AP and IB fit in with all this? • Liked idea of partner disciplines coordinating with math dept. Math faculty might request release time for doing this work. Curriculum • Deans from non-science colleges were interested in having the conversation about ensuring partner disciplines have appropriate math and learning outcomes. • DwD's might be difficult to change math. Math courses set at highest common denominator. Need to explore these. • Mary Pittman can find K12 folks to get involved. • Suggestion to ask partner disciplines if there are competencies or topics they want in a math course that are not currently offered. • CCs can't figure out why more students aren't taking Math for the Liberal Arts and Stats. • Point that we haven't addressed: alignment with career pathways.