Adding points of synchronization to asynchronous content delivery.

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Computer Science

CSC 110 – Introduction to programming

- required for CS Honours and Majors as well as combined CS programs and minors
- service course required by other programs (ie. Math)
- fullfills CSC 100 level course requirement for many degrees in Science, Social Science, Economics, etc.
- wide range of students
- Summer offering
  - started with ~140 students
  - ended with ~90 students

Course component weighting

Course Work	Number across the term	Weight
Pre-Lecture Quizzes	~20	10%
Labs	10	15%
Assignments	10	30%
Midterm Exams	3	45%

Asynchronous materials

Pre-Lecture Videos/Slides
- minimal set of slides
- ~5 min videos introducing a concept
- 10-30 minutes per pre-lecture

Pre-Lecture Quizzes
- 5 to 20 questions
- unlimited tries

Lab material
- specification document
- opportunity for clarification (forum)

Assignment material
- specification document
- opportunity for clarification (forum)

Lecture recordings
- post these for those with connectivity issues

adding points of synchronization

a typical week…

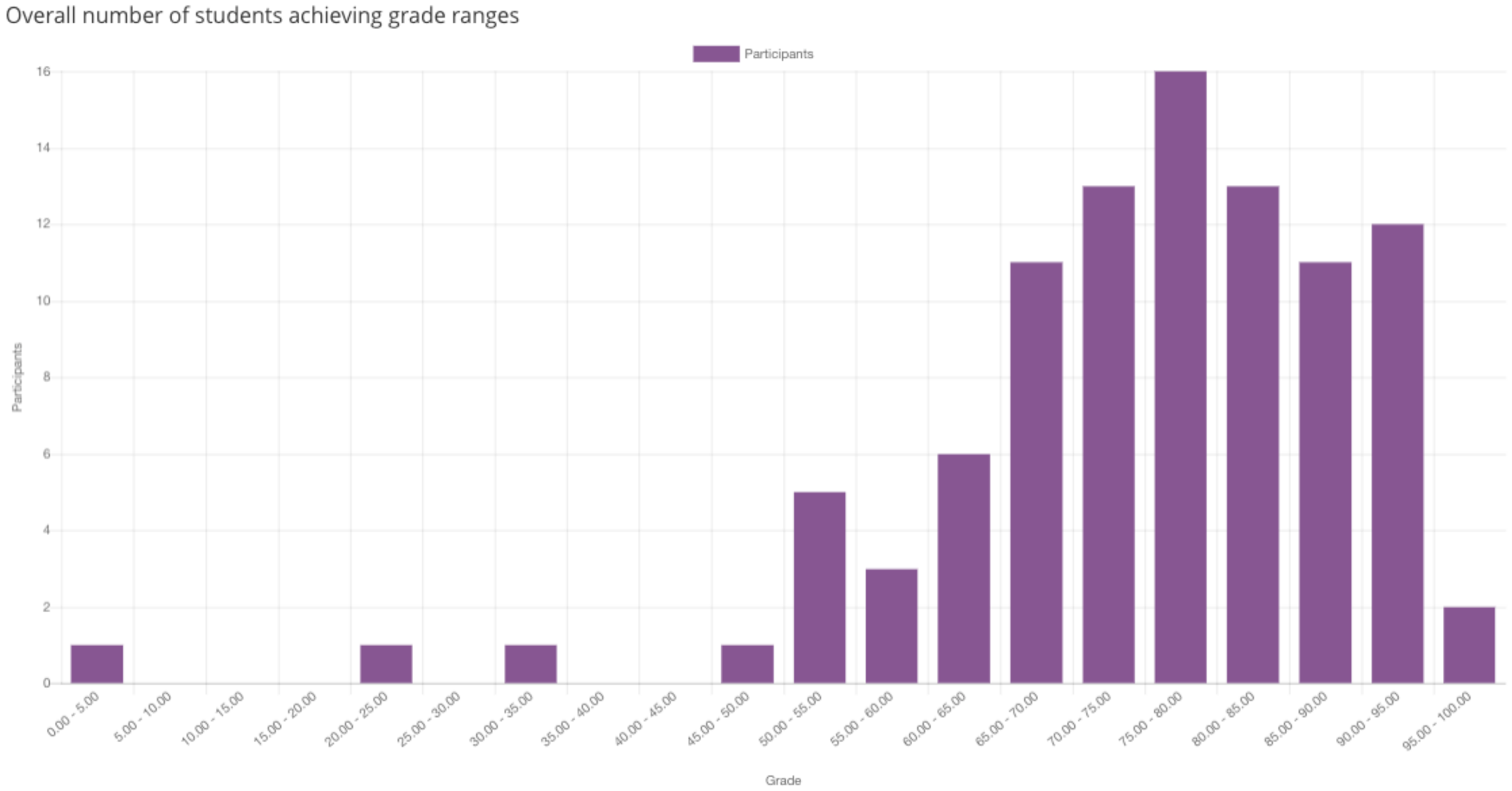
	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Videos	to be watched before quiz			to be watched before quiz			
Quizzes	due before lecture			due before lecture			
Lecture	problem solving students given a chance to ***try/ask questions*** solution is demoed			problem solving students given a chance to ***try/ask questions*** solution is demoed			
Lab	released	**optional** help in registered labs		due by end of day			
Assignment	released						due by end of day

Ensuring Academic Integrity

- unlimited opportunities on pre-lecture quizzes (up to deadline)
- assignment/lab submissions
  - run Moss (turnitin for code)
    - 18 cases reported to CSC Academic Integrity Committee
    - monitor Chegg (homework solution site)
      - have had them remove >6 copies of assignments/solutions
- Midterm – strict constraints
  - academic integrity pledge
  - time limited – less time than I would give for a written exam
  - randomization of order students see questions
  - cannot go back and forth between questions
  - multiple versions (4-6) of each question
  - graders flag students who answer questions they did not see
  - course outline states: “Exam performance can be verified using an oral exam component if the instructor deems necessary.”

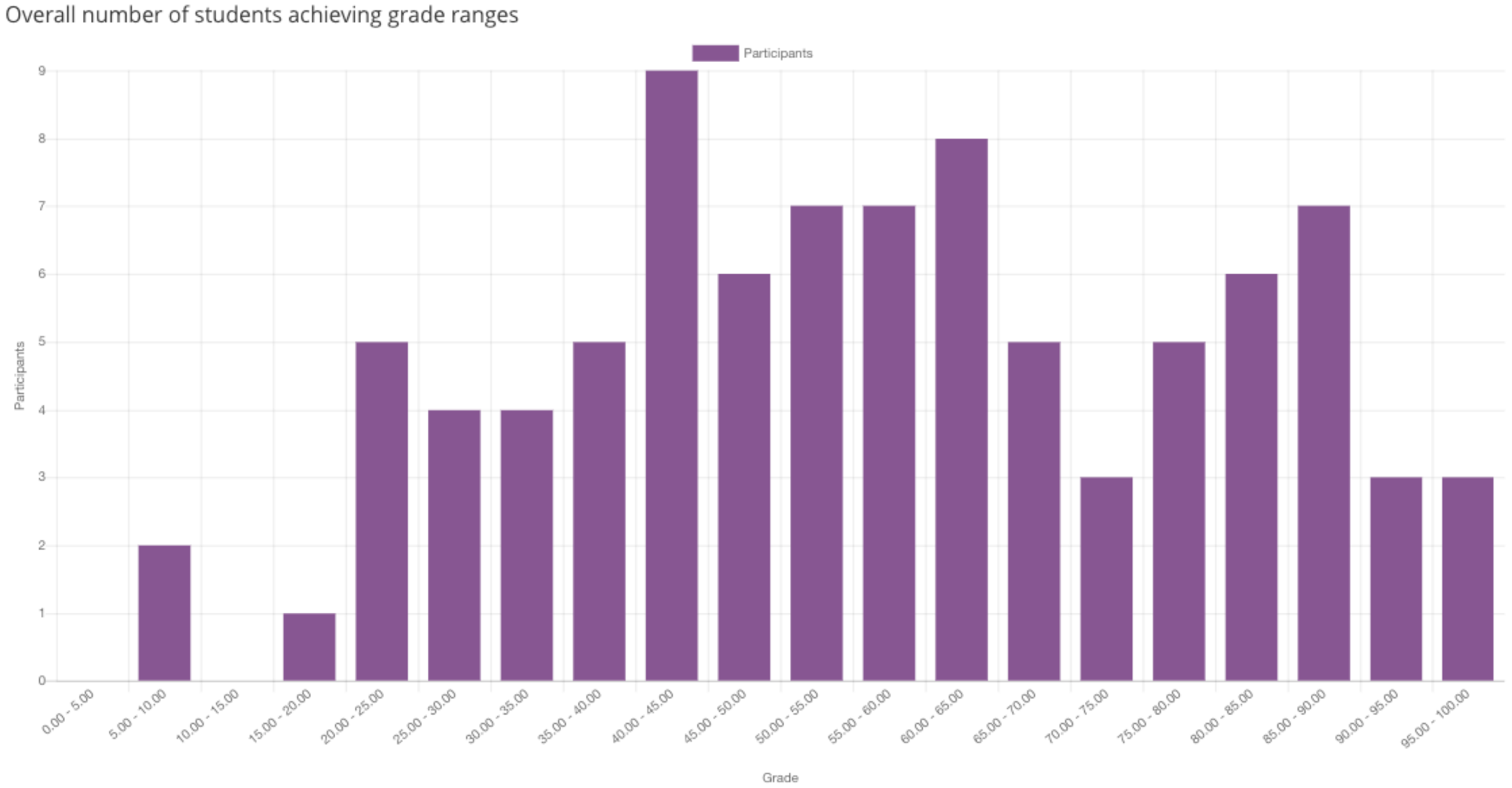
Midterm 1 results

average: 75%
median: 77%



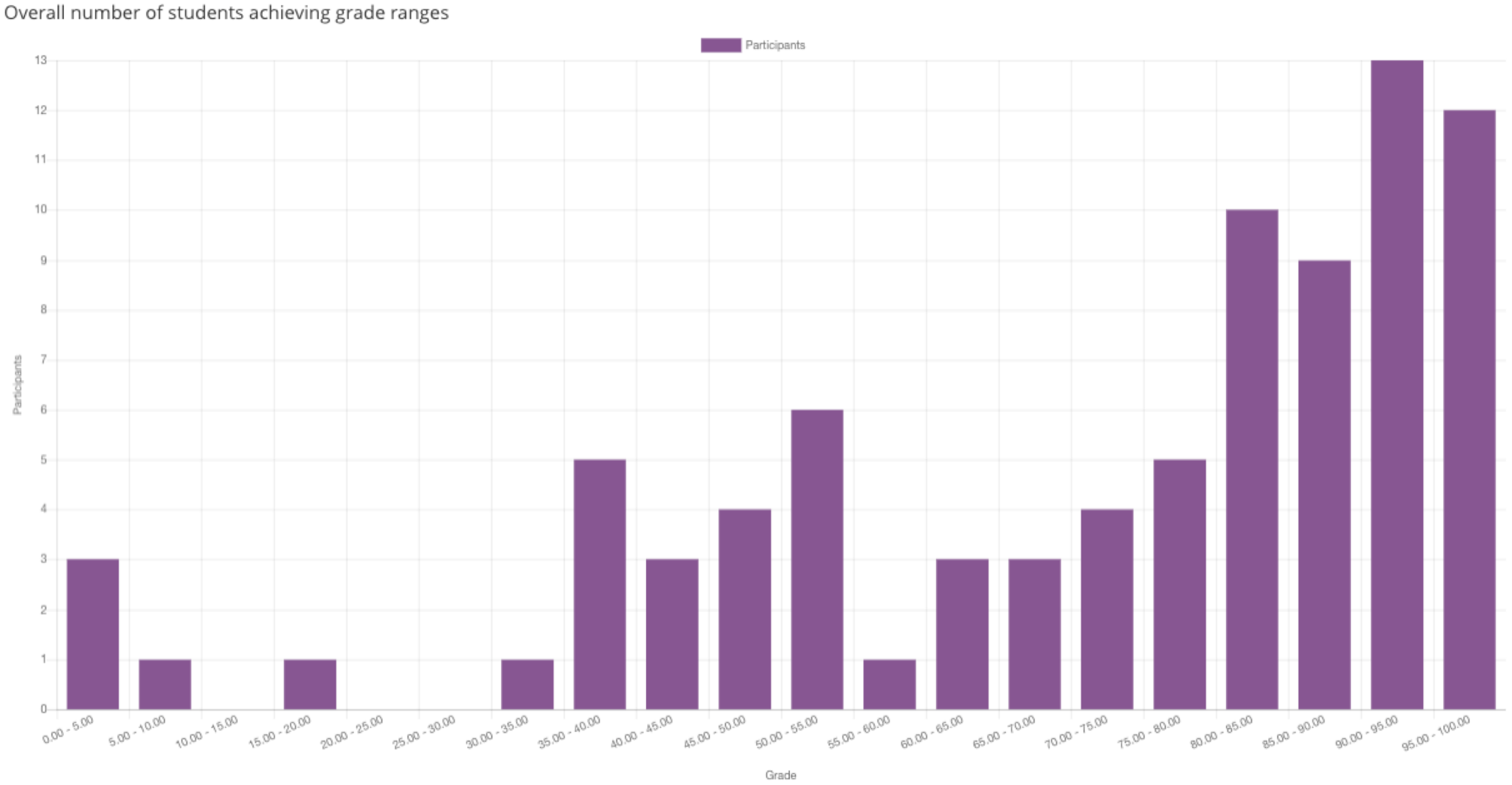
Midterm 2 results

average: 57%
median: 55%



Midterm 3 results

average: 71%
median: 80%



Midterm challenges for students

- difficult for students to budget their time not knowing how easy/hard they will find the future questions
- if they need time to think about a question, no opportunity to comeback to it
- student may encounter the ‘hardest’ question first, sets the tone for their performance on the remainder of the exam
- strict constraints have detrimental impact on those with exam anxiety and/or lack confidence in their knowledge

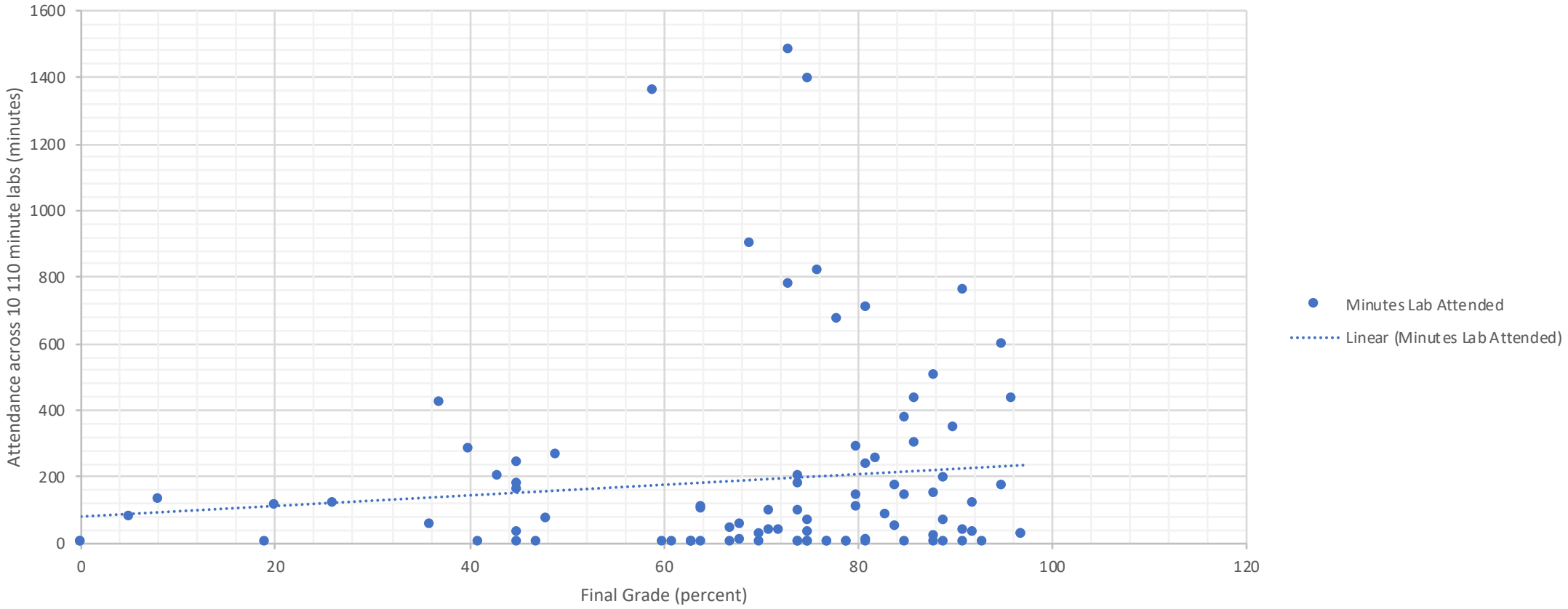
Midterm structural support

- get a TA to write the exam for time to establish fair time limits
- provide a “dummy” exam to allow them to experiment with the interface before their first exam
- provide an overview of the question topic/weight to allow students to budget their time based on knowledge (did this on midterm 3)
- assign time weighted marks to questions ~1 mark/minute
- give 10 minutes on top of mark/minute
  - account for connectivity issues
  - flex time to use on questions they deem hard
- no recall/tracing questions
  - all require analysis and application of concepts
  - given a solution, identify error (challenging for students, quick to grade)
- give everyone warm-up question first (easiest) and randomize the order of the remaining questions (have not tried this yet)
- manual grading to allow for partial marks

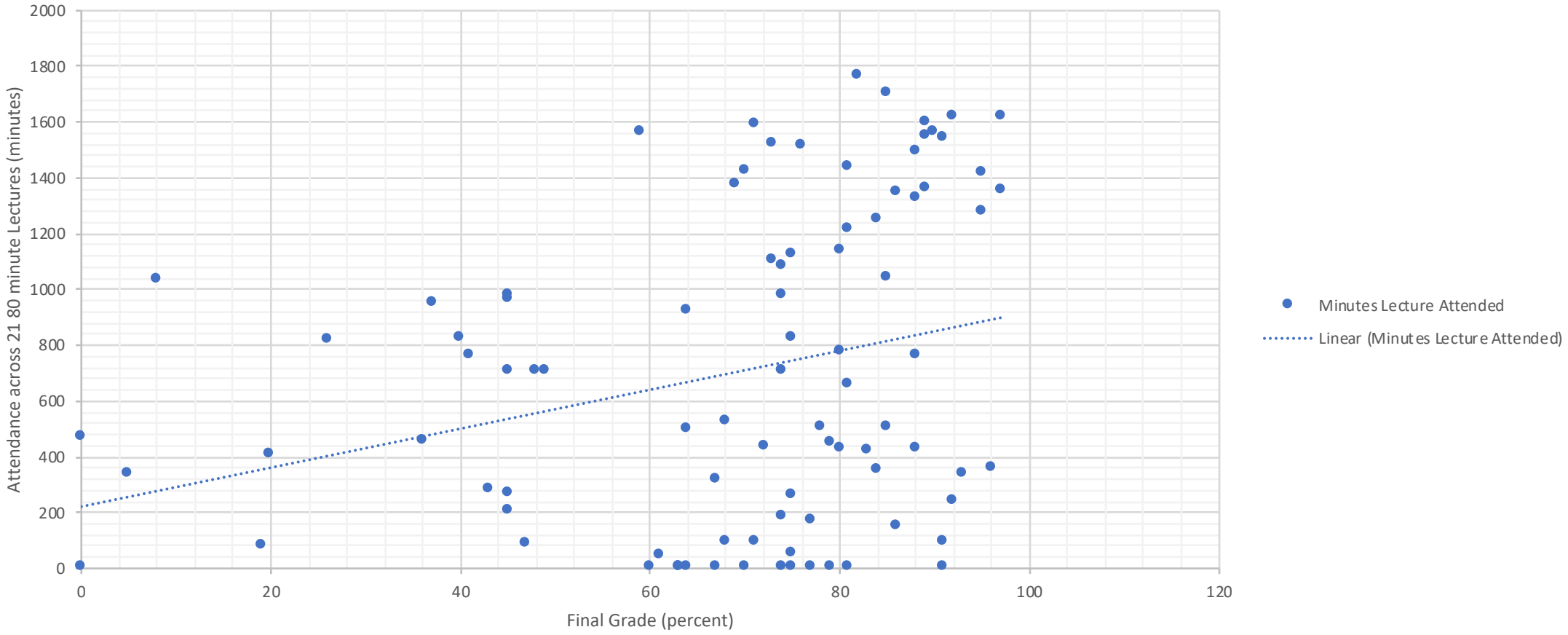
Reflection and Analysis

- students that have gamified progress are struggling when put under time constraints
  - don’t watch videos and reattempt the quiz until they get 100% (forming/strengthening misconceptions)
  - trial-and-error programming
- students using course materials as intended are becoming proficient
- TA support in Labs was under utilized
- attendance dropping off at a more rapid rate than face-to-face
- data, data, data – how do we get answers from it?
  - number of quiz attempts
  - video views (when, how long, how many times)
  - attendance in lecture/labs
  - preliminary analysis…

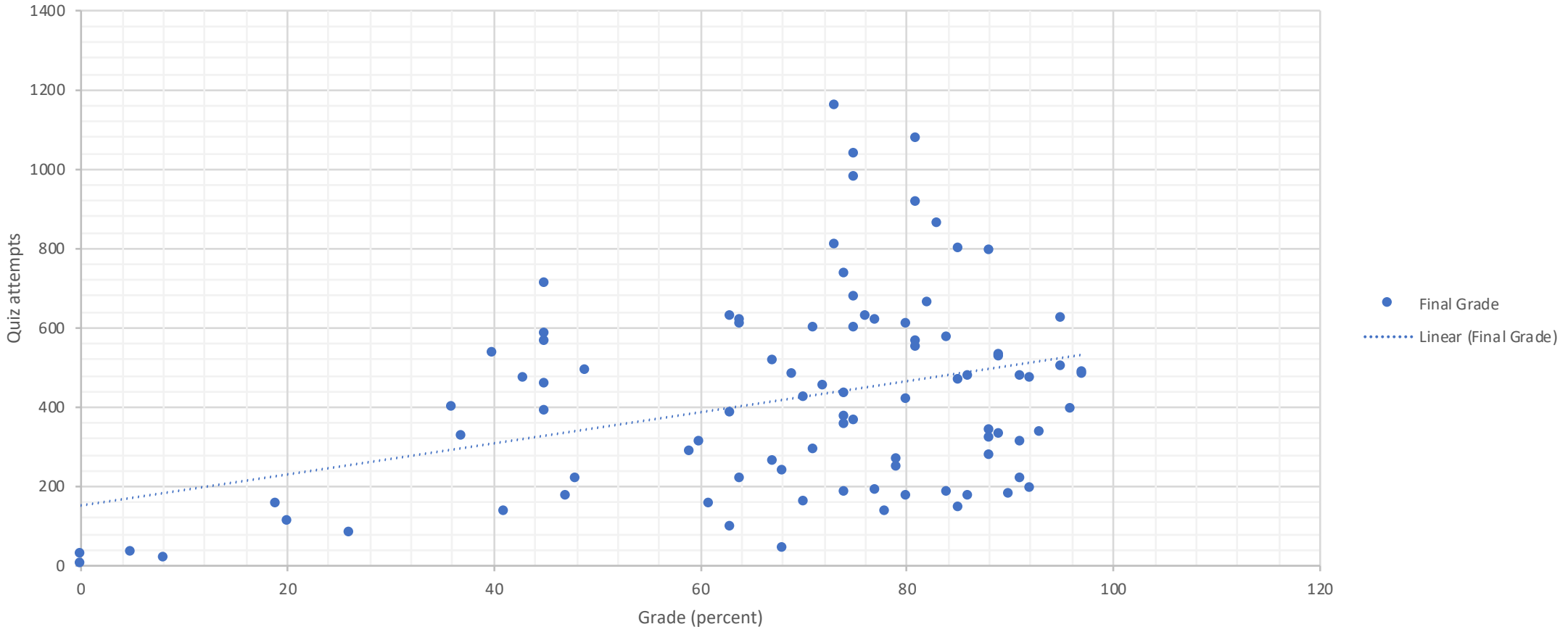
Minutes spent in Lab to Final Grade (correlation: 0.117)



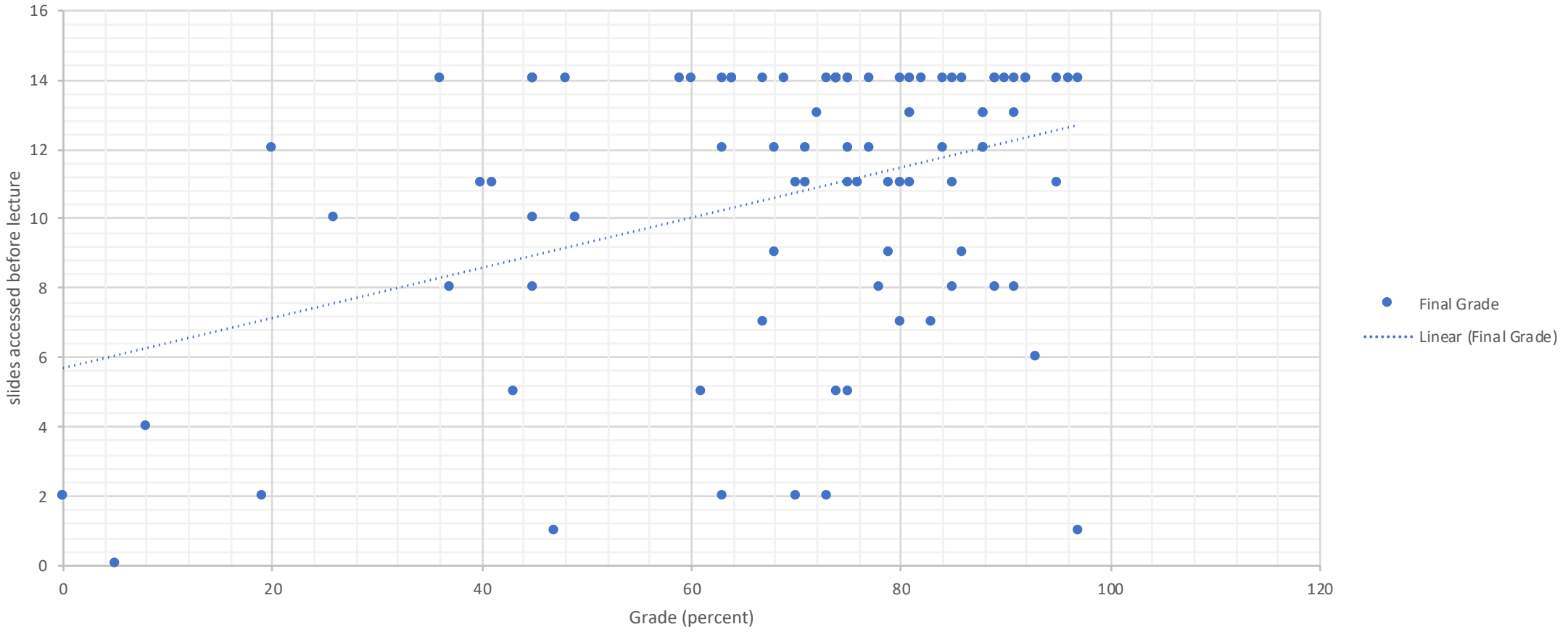
Minutes spent in Lecture to Final Grade (correlation: 0.281)



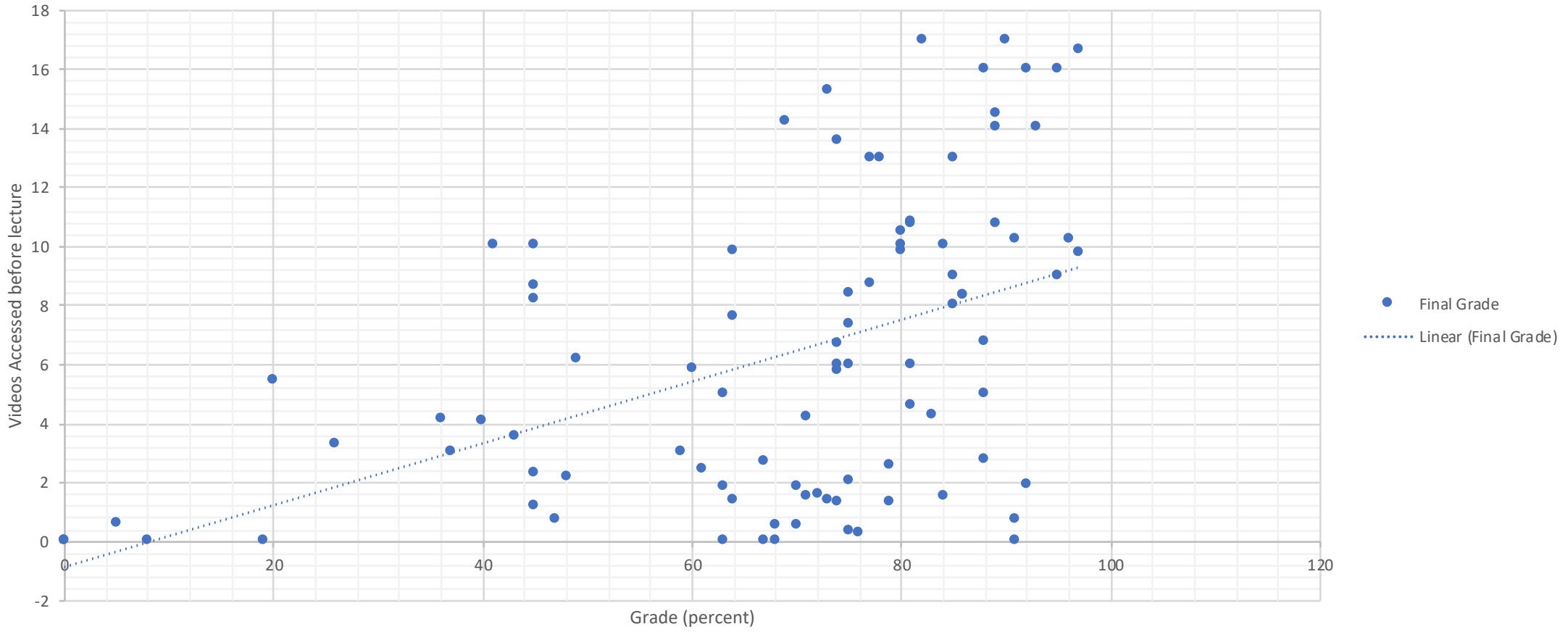
Quiz Attempts to Final Grade (correlation: 0.354)



slides viewed before lecture to Final Grade (correlation: 0.405)



videos viewed before lecture to Final Grade (correlation: 0.467)



Thoughts for next time…

- introduce evaluation within Labs
- limit quiz attempts
- introduce restriction require video access before quiz attempt
- provide solutions to practice problems in the form of videos as opposed to static text files