

Teacher Action Research Project

Teacher Names: Gabe Jenkins & Fay Pisciotta

School Name: Edna Brewer Middle School

Project Title: Layered Curriculum: Two Classes' Experiences

Question

“Does implementing a layered curriculum lead to higher student achievement?”

Before we address the methodology, we think it's important to describe the rationale for introducing the layered curriculum approach in our classrooms.

At our school, our students are organized into small learning communities (which we call families), and the students' four core academic teachers loop with the students (stay with the same group of students through both their 7th and 8th grade years). While we both felt that our classroom instruction was effective with the students in their 7th grade years, there were a few aspects we wanted to improve upon.

“I had to work harder to get an A this year.”—from a student survey

First, we felt that our curriculum was not providing enough of a challenge to students whose academic literacy and critical thinking skills were highly developed. For these students, we wanted to provide a classroom structure that required these students to stretch: essentially, we wanted them to have to work harder to get an “A.”

“I liked that I knew exactly what I had to do to pass.”—from a student survey

Second, we were unhappy with the level of engagement among those students whose skills were less developed. For these students, we wanted to provide a curriculum that made the requirements for academic success completely transparent, in the hope that these students would engage more once it became apparent to them what they had to do to earn the results they wanted.

For both groups of students, we believed that a layered curriculum approach could help. For those teachers who are unfamiliar with the layered curriculum approach, students are offered a range of assignments, and allowed to choose for themselves which assignments they want to take on. Students who choose to do more and/or more difficult assignments are rewarded with higher grades; students who choose to do fewer and/or less difficult assignments are not. While this is, in some ways, not so very different from a traditional curriculum (in that students get rewarded for doing more and more difficult work), it does lay bare the requirements and effort required to earn whatever grade the student wants to earn. Additionally, layered curriculum assignments offer students the ability to choose assignments across a range of modalities, thereby widening their choices, and allowing them to approach the work in ways that work best for them. In this way, students gain a sense of control and agency; with this newfound sense of control and agency, it is hoped, students will come to gain a

sense of ownership over their academic effort and outcomes, and will therefore put in the effort needed to excel.

Students were taught how to evaluate the requirements of assignments, choose assignments, budget their time, and seek out help, both from the teachers and from their peers in appropriate ways. These skills were explicitly taught and practiced in an effort to ensure that students felt completely empowered to take control over their academic outcomes. *As a student noted in an end-of-year survey, "I think it helped me a bit because it's preparing me for high school."* In addition, teachers very regularly updated students' grades in an online grading system, which students were taught to monitor regularly, so that they always knew exactly how the completion of even one assignment affected their grade.

In the end, what we wanted to find out was, "Does implementing a layered curriculum approach lead to higher student achievement?" In order to measure this, we wanted to look at 1) **the level of student effort & motivation**, both among the highest skilled and the lowest skilled students, to see if students actually did MORE work than they had in a traditional curriculum approach; 2) **the degree of student sense of "ownership"** to see if students completed a higher percentage of assignments ; and 3) **student mastery of content**, to see if students actually performed better on assessments.

Methodology

Implementing the layered curriculum, and teaching the students how to approach it, required a significant initial investment of classroom instructional time. Classroom time was devoted to 1) introducing the concept, discussing with the students the reasoning behind it, delving into their expectations and concerns regarding the new approach, and helping them to get excited about it; 2) explicitly teaching time management skills; 3) re-instructing the students when they were given their first several set of choices when it came to specific assignments; 4) reviewing the effectiveness of students' decisions with the students, in order to build on early successes and, in some cases, evaluate why students' poorer-than-expected results occurred.

In addition to this initial up-front investment of time and effort, we chose to reinforce, at the beginning of every unit, the notion that increased effort leads directly to better results. Thus, on the first day of every unit, we would describe the various layered curriculum assignments, as well as the likely level of effort and time needed to complete each one, so that students could accurately budget their time.

Finally, we devoted significant classroom instructional time to "independent work" time, in which students were given time and support (from their teacher and from their peers) to complete layered curriculum assignments. Students were allowed to work at their own pace, and according to their own inclinations. All students were encouraged to do as many assignments as they could, but none were forced. If students chose to use this time to finish assignments, teachers immediately checked their work, quickly assessed whether or not the student learned the key ideas of the assignment, and then instructed the student to move on to the next one.

Structurally students were required to complete some number of “C” level assignments from a range of options (e.g., they had to complete perhaps 3 out of 6 possible “C” level assignments). Once these “C” level assignments were completed, students were required to take a basic content mastery quiz which assessed their knowledge of all the key standards-based learning objectives of the unit. If they got a perfect score, they were allowed to move on to “B” level work; if they missed questions, they were required to complete specific assignments tailored to shore up their knowledge of the content they missed before re-taking the quiz. Once they achieved a perfect score on the test, they were allowed to proceed to higher level work. As a result of this process, it was hoped, students would at minimum know the basic content and skills expected of them for the unit.

Students who completed the “C” level work and the quiz were encouraged to proceed to “B” level work, assignments which usually involved applying the knowledge learned from their work in the “C” level assignments. Students who completed the “B” level assignments were encouraged to proceed to “A” level work, which typically asked students to creatively use the information gained from “C” and “B” level assignments to solve more complicated problems. Finally, students who completed all these assignments were encouraged to be peer tutors, and help other students to master the content.

Both teachers diligently entered information into the online grading system, to provide students and their parents with immediate updates on their progress.

All of this took a significant investment of time. The initial explanation and scaffolding took roughly 4 full days of classroom instructional time. Explanations of layered curriculum assignments required around one half of a day at the beginning of each unit. Finally, we allowed students 3-4 days of “independent work” time during each unit. In total, we believe that our implementation of a layered curriculum required 22-24 total classroom days dedicated to one aspect or another of this project.

In addition, the development of actual layered curriculum assignments required a significant amount of out-of-classroom time: in total, we believe that we invested roughly 15-20 *incremental* hours developing assignments that required varying amounts of time, effort, modalities employed, and academic skills to complete.

The assessment of this layered curriculum project has also taken some investment of time and effort. In order to assess the effectiveness of our implementation of a layered curriculum, we gathered examples of student work, solicited and obtained students’ opinions regarding the layered curriculum, and cleaned and analyzed data over 2 years of assignments in order to compare student academic outcomes.

Data

In order to assess the effectiveness of our implementation of a layered curriculum, we have access to student response data from which we’ve drawn representative student opinions, samples of student work, and, most important, a detailed, longitudinal database of student grades, including grades on every assignment and test for the last two years.

A quick, but important, caveat: in an effort to enable us to look at longitudinal data, we have excluded data from students who either left our school after 7th grade, or were new to our school in the 8th grade. While this allows us to perform apples-to-apples comparisons on the *included* students longitudinally, it unfortunately artificially inflates all results, including assignment completion data and average test score data, as many of these students who were excluded were lower-performing academically.

Utilizing this database, we are able to analyze the number of assignments students have completed, the average grade per assignment, the number and percentage of students who completed all assignments, and test scores. Given that this database includes data from two years for the same group of students (our students loop with the same teachers for grades 7 and 8), we are able to compare these metrics over a time span that both predates and includes the layered curriculum data.

Results

Figure 1: Summary of Gabe Jenkins' Class Data

Unit	# of Basic Assignments Completed	% of Basic Assignments Completed Correctly*	# of Total Assignments Completed	% of Total Assignments Completed Correctly*	Extra Assignments Completed per student	Avg. Unit Test Score
2006-07 Avg.	7.0	82%	7.0	82%	---	75%
Intro	6.8	86%	6.8	86%	---	66%
Density	8.1	74%	8.1	74%	---	75%
States Of Matter	8.0	89%	9.4	86%	1.47	75%
Atom	8.5	94%	10.2	78%	1.71	74%
Periodic Table	8.5	95%	11.0	85%	2.44	78%
Chemical Reactions	12.0	86%	12.0	86%	---	73%
Motion	14.2	95%	16.1	85%	1.91	82%

* These columns also could be interpreted correctly as "Average Grade per Assignment"

Bold red units were taught using a layered curriculum

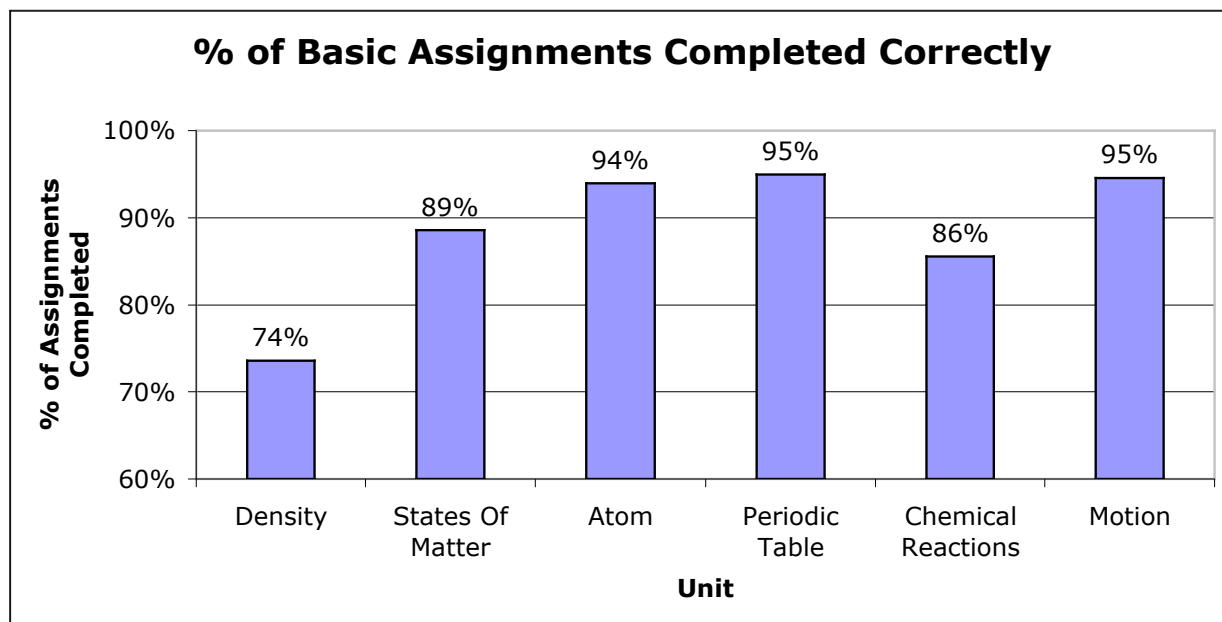
Figure 2: Summary of Fay Pisciotta's Class Data

Unit	# of Basic Assignments Completed	% of Basic Assignments Completed Correctly*	# of Total Assignments Completed	% of Total Assignments Completed Correctly*	Extra Assignments Completed per student	Avg. Unit Test Score
2006-07 Avg.	11.7	87%	11.7	87%	---	85%
Intro	6.8	84%	6.8	84%	---	76%
Density	18.3	87%	19.3	84%	1.03	83%
States Of Matter	10.2	85%	11.4	82%	1.19	79%
Atom	10.5	87%	11.7	83%	1.19	75%
Periodic Table	9.3	93%	10.4	87%	1.15	82%
Chemical Reactions	14.4	84%	14.4	84%	---	73%
Motion	15.7	92%	16.8	88%	1.09	87%

* These columns also could be interpreted correctly as "Average Grade per Assignment"

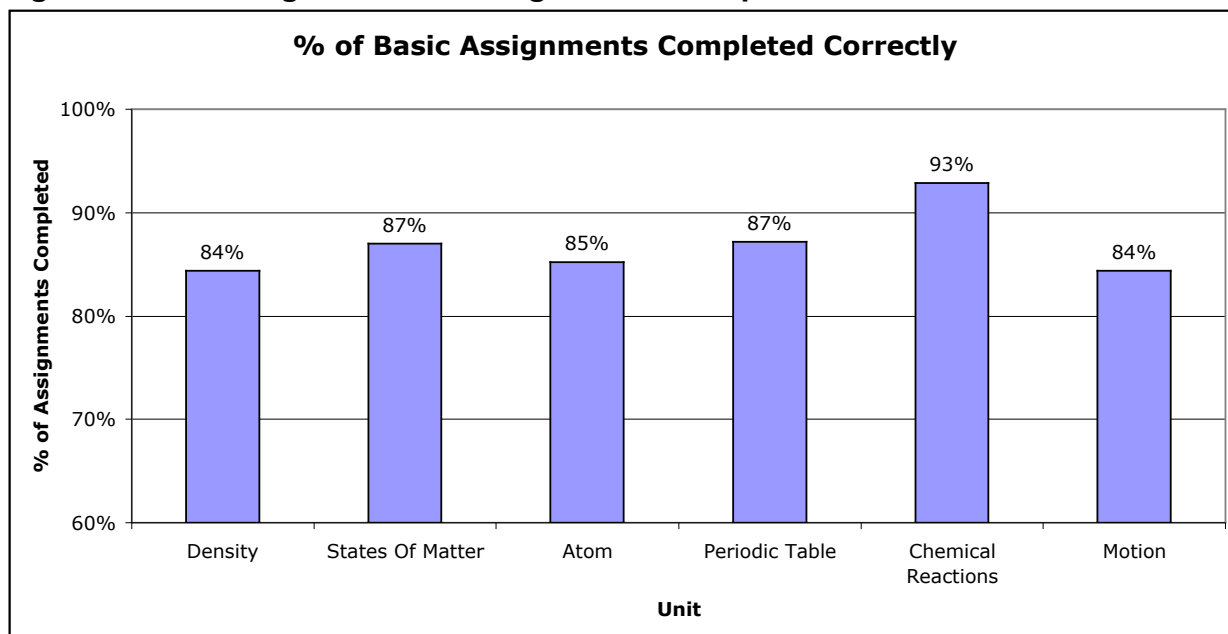
Bold red units were taught using a layered curriculum

Figure 3: Percentage of Basic Assignments Completed: Jenkins' Class



Note: Density and Chemical Reactions units were taught without layered curriculum assignments.

Figure 4: Percentage of Basic Assignments Completed: Pisciotta's Class



Note: Chemical Reactions units were taught without layered curriculum assignments.

Figure 5: # of Basic Assignments Completed: Jenkins' Class

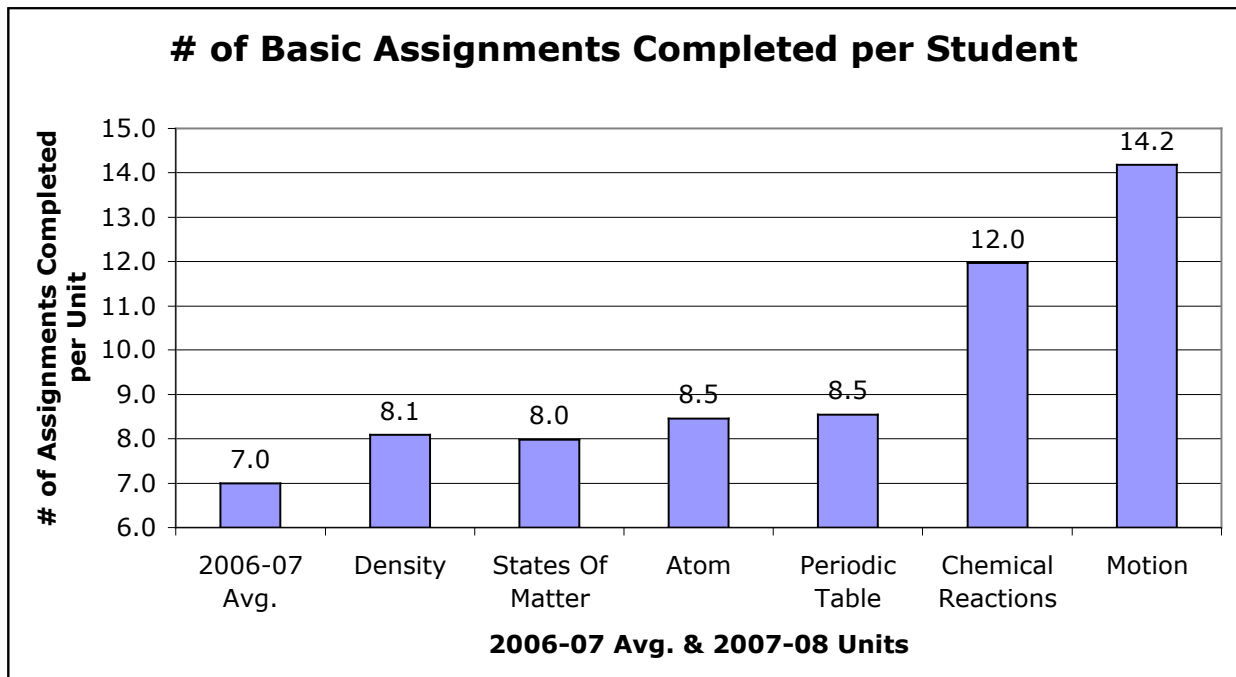


Figure 6: # of Basic Assignments Completed: Pisciotta's Class

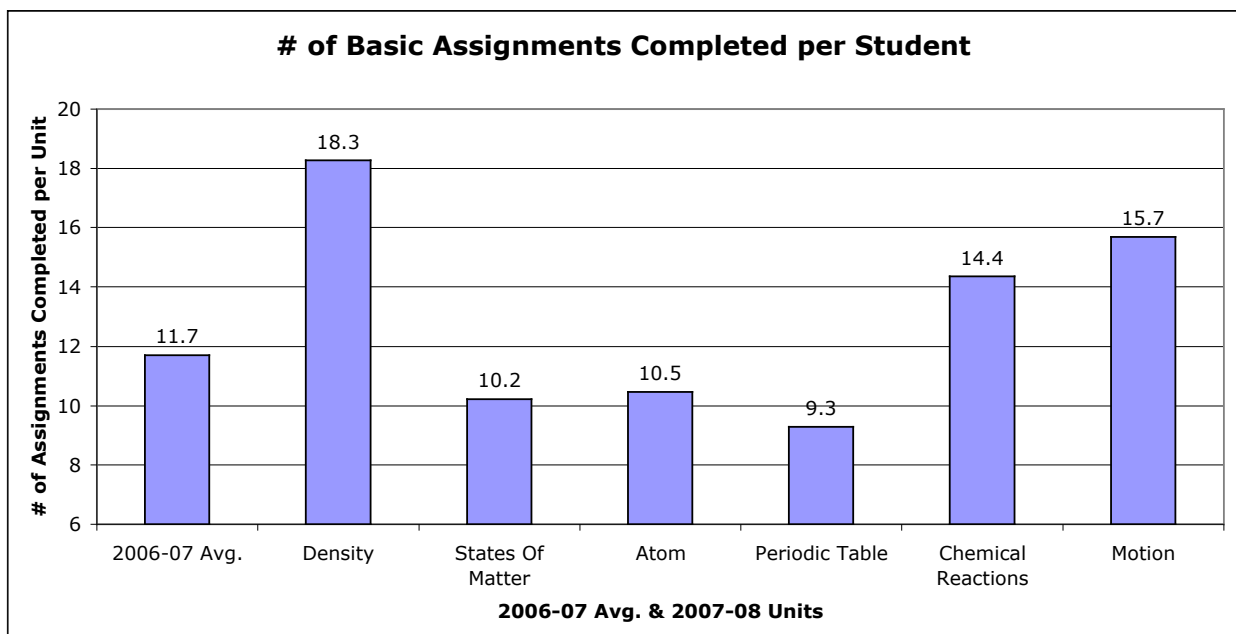


Figure 7: # of Total Assignments Completed: Jenkins' Class

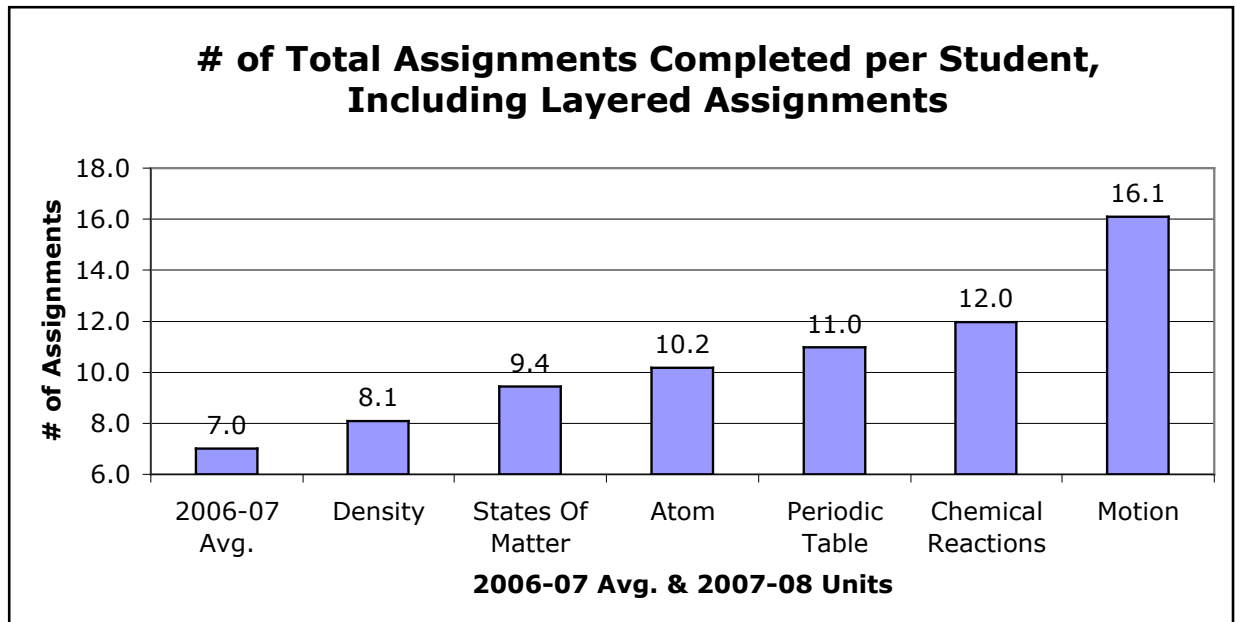


Figure 8: # of Total Assignments Completed: Pisciotta's Class

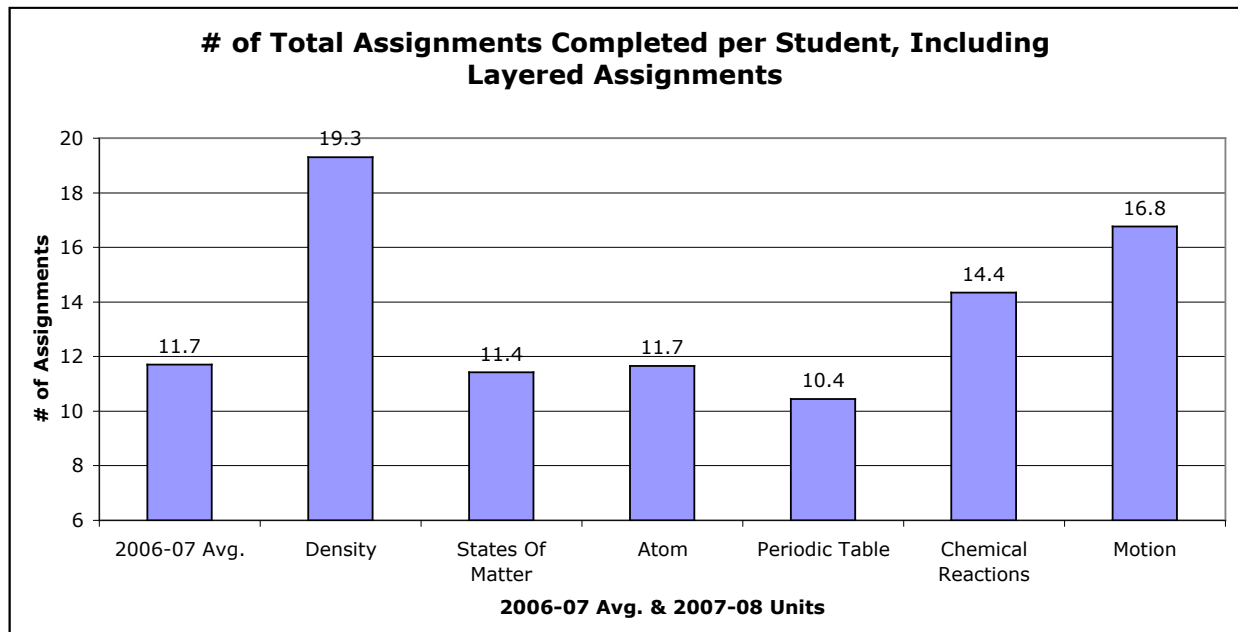
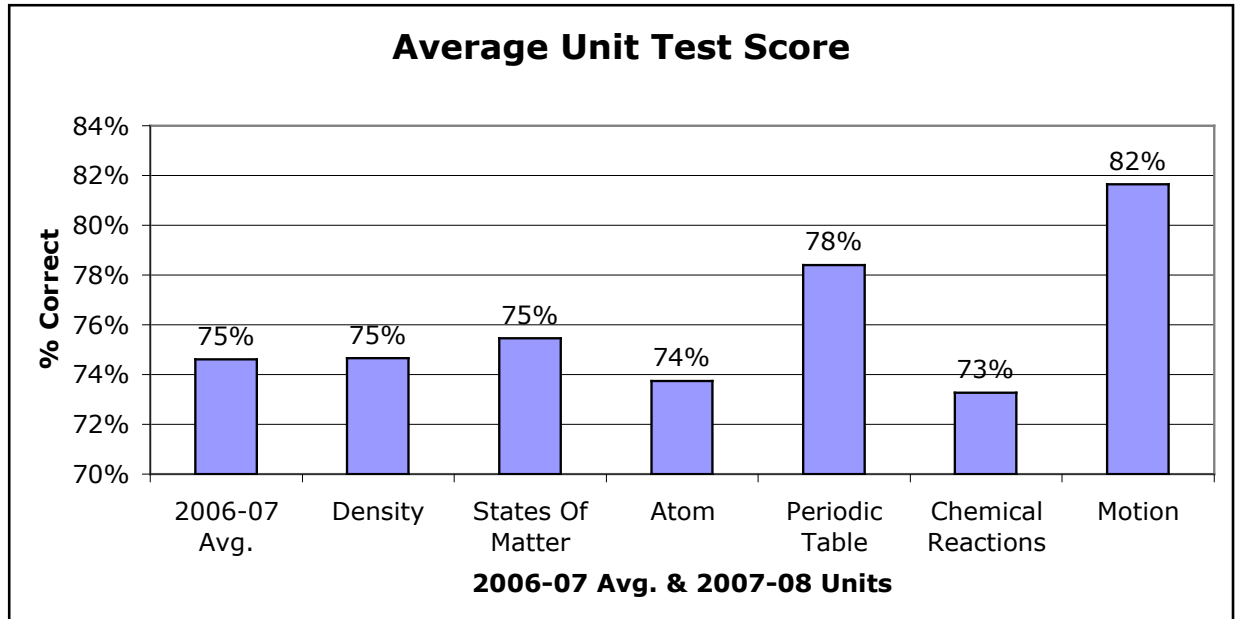
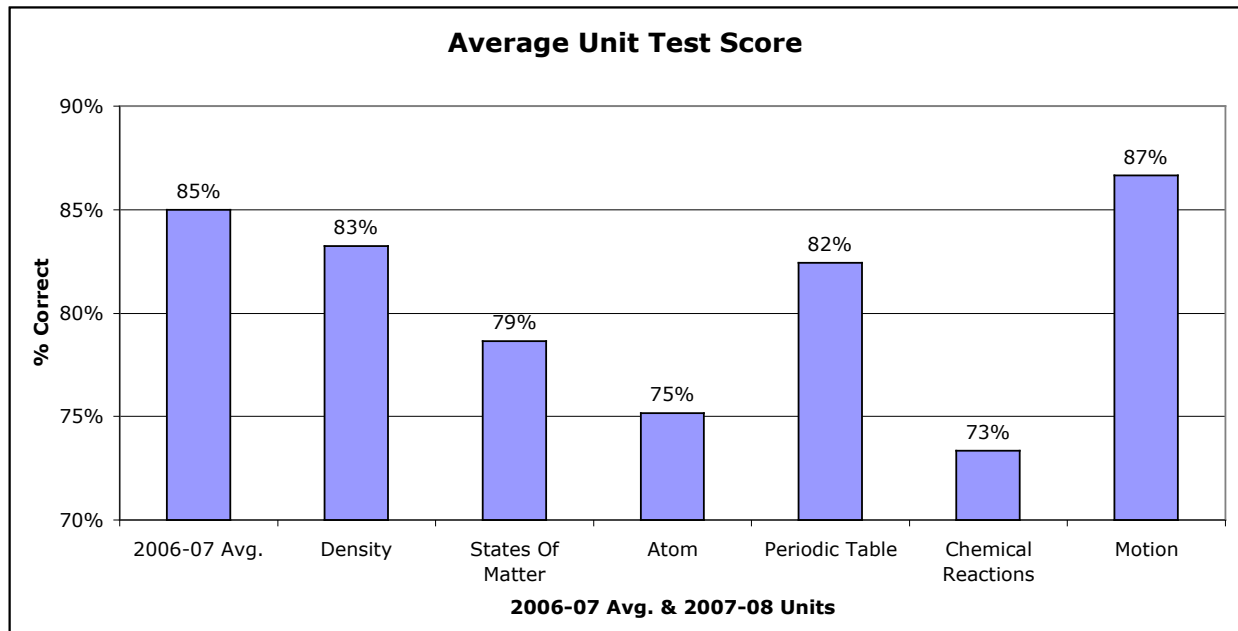


Figure 9: Unit Test Scores: Jenkins' Class



Note: All of the 2006-07 academic year and the 2007-08 Density and Chemical Reactions units were taught without layered curriculum assignments.

Figure 10: Unit Test Scores: Pisciotta's Class



Note: All of the 2006-07 academic year and the 2007-08 Chemical Reactions unit were taught without layered curriculum assignments.

Analysis and Conclusion

Looking at the data from the units where we implemented a layered curriculum approach, and comparing these data with last year's data and with units where we taught using a non-layered curriculum approach, several trends are apparent.

- First, **students, on average, correctly completed significantly more work per unit with the layered curriculum** approach than they did with a traditional, non-layered approach (see Figures 5 & 6). In virtually every unit this year, students correctly completed more assignments in layered curriculum units than they did in non-layered units. While there are, of course, several possible explanations for this (e.g., longer units, shorter assignments, easier assignments, etc.), we don't believe that these provide an adequate explanation of the data. While neither of us has systematically analyzed the time required for students to finish an average assignment, or even necessarily the difficulty level of every assignment, we believe that the work assigned to students this year was equally rigorous and time-consuming than last year's assignments, if not more so. Instead, it is our belief that the most influential factor underlying this increase is increased student motivation arising from student choice. We believe that, following an initial adjustment period for the students, they began to view the layered curriculum as a very positive structure, one that clearly and predictably rewarded them for doing more work, and they bought in. *One student noted, "There are different things you can do...and it's your choice of what assignments you want to do."* Another noted, *"What I liked about layered curriculum is that I am able to do many types of work which makes the class more interesting which helps me to learn."* While this buy-in was most evident among students who historically had been high achievers, students who historically had been average achievers seemed to buy in, as well. As a secondary benefit of this increased motivation & buy-in, we were able to slowly ratchet up the work assigned per unit (see Figures 7-8), without incurring any noticeable pushback from students. On the contrary, over time, students began to see value in the work, and were willing to push themselves harder. *One student wrote, "The layered curriculum is a chance to prove what level of a student I am," while another wrote that s/he thought that layered curriculum helped them learn, "because I did it independently so I had to pay extra attention during lectures."*
- Second, **students completed a larger percentage of assignments** during the layered curriculum units than they did in an average unit from the prior year, or in units without a layered curriculum approach (see Figures 3 & 4). Perhaps this is stating the obvious, but it's worth repeating in a different way: students skipped, failed to do, ignored, or failed to turn in significantly fewer assignments in the layered curriculum units. This fact represents another metric for analyzing student motivation, one that provides more insight into the motivation level for a different type of student than those discussed in the point above. Stated directly, almost every teacher has experience trying to reach students who historically have turned in very little if any work, and has struggled with strategies to encourage them to turn in work. While we again acknowledge the limitations of our data (see our *caveat* above, regarding the absence of transient students from our data), it's worth noting

that the amount of missing work dropped significantly under the layered curriculum approach. As with the point above, it's unclear exactly what this shift can be attributed to, but student motivation seems to us to be the likeliest explanation. We allowed students independent time to use as they saw fit, either to work on our layered curriculum assignments, or to read silently by themselves. As simple as this sounds, allowing students the choice to either work on assignments and improve their grade (like most of their peers in the class) or sit by themselves reading a book created an atmosphere where almost every student chose to complete assignments. *One student wrote, "In traditional curriculum, I will most likely get bored, and not want to learn. But with layered, it lets you pick how to learn the stuff."* As teachers, we also worked extremely hard to provide students with near-real-time feedback on their work, and we also quickly updated their grades online, which was highly effective in reinforcing the students' perception that doing their assignments really was a worthwhile thing to do.

- Third, the switch to layered curriculum **allowed us as teachers to know with greater clarity individual students' degrees of understanding of the content, as well as where their misconceptions still remained.** This enhanced insight into student understanding arose primarily from the way in which we structured students' independent time (when they worked on layered curriculum assignments). During independent work time, students were required to speak with the teacher after completing an assignment. In this quick conversation, we asked the students a few questions to assess whether or not they learned what they were supposed to learn by completing the assignment. Often these little formative assessments took the form of 1) asking students to explain some key concept in their own words (e.g., "Talk to me about 'equilibrium'"); 2) asking students to solve a problem based on information/formulae/etc. found in the assignment (e.g., a density/mass/volume problem); or 3) asking students to create a drawing or diagram which explained a key idea (e.g., "Draw a diagram that shows the structure of an atom with 11 electrons, making sure to show the different energy levels and how the electrons fit within those energy levels."). If students correctly did what we asked them to do, they received credit and were told to move on to the next assignment. If students gave incorrect answers, they were instructed to review the assignment, go over it with a friend (if they wanted), and try again after a little time had passed. While these little mini-assessments were quick, they provided an enormous amount of information regarding student misconceptions, so that we could address these misconceptions in a whole-class format. *According to one student, "I liked how we learned the subject step by step. How we went from C- to A level. How we had a quiz before moving on to let us know what we need to study on and what we did well on."* While this benefit doesn't show up directly in the data, it is apparent in the survey results from students, many of whom appreciated the opportunity to get one-on-one time with their teacher to figure out difficult ideas. *Another student wrote that he thought layered curriculum was effective, "because if I needed help, I could ask for it, and it was more 1 on 1."*

- Finally, although following is not immediately apparent upon looking at our data, **we believe that the three factors above allowed students to perform better on summative assessments**. First, it's worth noting again that we chose to teach the chemical reactions unit without a layered curriculum approach. In both teachers' unit test data, it's clear that students performed far worse on this test than on any other unit test given during the 2007-08 year, and was well below the average unit test score they'd achieved in the prior year. If we exclude the data from this unit test (since they do not reflect the results of a layered curriculum), it's fair to conclude that the trend in summative assessments was mixed. With one teacher's data, the average test score seems to slowly rise as the year progresses; with the other teacher's data, the average test score dips, but subsequently rises steeply.

What is not immediately apparent, however, is the degree to which the year-over-year comparison of test scores is complicated by our conscious decision to make our 8th grade tests more difficult. In an effort to better prepare students for the end-of-year CST science exam, we made the strategic decision to get our students more comfortable with multiple-choice tests, a format which historically has been a struggle for our students. We also wanted to create unit tests that addressed more difficult content and conceptual understandings, in order to see if students' extra work they'd done as part of the layered curriculum would allow them to successfully tackle these more difficult questions. In the absence of any pedagogical change, these changes in our assessments should be expected to result in a drop in test scores. While there was some fluctuation, students adjusted and, by the time they got to later units, saw their test scores rise above last year's average. *One student wrote, "I get higher test grades if I do the C-Level & B-Level work."* So, while we acknowledge that the test data are inconclusive, we believe for the reasons listed above that our students' average performance on tests improved following the shift towards a layered curriculum.

Reflections

Overall, both of us strongly believe that the shift in our curricular structure towards a layered curriculum approach has been enormously helpful in reaching the diverse needs of a multiply-skilled student body. It has provided us with a mechanism or strategy for increasing the motivation levels of both high- and low-achieving students. It has allowed us to regularly perform formative assessments on students to see where individual students need help, as well as where an entire class needs help. It's also provided us with an opportunity to be creative and invent a wide variety of assignments that are engaging, educational, and work well across a range of student learning styles and modalities, and students responded positively. An end-of-year survey of student opinions showed that students preferred the layered curriculum to a traditional curriculum 74-57. Most important, though, for the reasons listed above, we believe that it was effective for our students. Without hesitation, we'd recommend that teachers look closely into incorporating layered curriculum strategies into their own practice.

However, switching to a layered curriculum is not without its difficulties, some of which are significant. It requires more planning time, more time to

research/locate/invent assignments that appeal to different learners. It requires devoting class time to “independent work,” which can be a nerve-wracking experience (particularly in the beginning). It requires devoting class time to explicitly teach students how to be successful in a new classroom environment. Then it requires re-teaching this, if students make poor choices when faced with newfound freedoms and responsibilities. It requires a commitment to engaging student after student after student as s/he wants quick, individualized feedback on his/her work. Make no mistake about it: changing to a layered curriculum requires much more work from the teacher compared to a traditional, teacher-led classroom structure. But it’s worth it...

Looking forward to next year, we both will look to deepen our understanding and implementation of layered curriculum. We’ll be looking to incorporate new aspects, such as more layered assignments throughout a unit, layering homework options, perhaps layering lab experiments to include extensions, etc. We’re looking forward to it!

Supporting Documentation

None.