Goal Setting

Overall Goal: Year-end goal: to move our Academic math students from level 3 to level 4 and to move our applied students from level 2 to level 3. Throughout the year, continue to move our focus students along the continuum of multiplication and division to develop skills to use the most efficient strategy when completing math tasks.

Needs Assessment / Where Are We Now?


<table>
<thead>
<tr>
<th>Course</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPM1D</td>
<td>72</td>
<td>78</td>
</tr>
<tr>
<td>MPM1D</td>
<td>52</td>
<td>62</td>
</tr>
<tr>
<td>MFM1P</td>
<td>62</td>
<td>68</td>
</tr>
<tr>
<td>MFM1P</td>
<td>62</td>
<td>72</td>
</tr>
<tr>
<td>MFM1P</td>
<td>62</td>
<td>82</td>
</tr>
<tr>
<td>MFM1P</td>
<td>62</td>
<td>68</td>
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<tr>
<td>MFM1P</td>
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<tr>
<td>MFM1P</td>
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<td>65</td>
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<tr>
<td>68</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>% Level 3/4 = 56%</td>
<td>% Level 3/4 = 43%</td>
<td></td>
</tr>
</tbody>
</table>

Mathematics Attitudinal Survey

2016 results: This year same students in grade 9 shows a shift in attitudes towards mathematics.

Results for All Students, Applied Course

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>MPM1D</td>
<td>59%</td>
<td>47%</td>
<td>58%</td>
<td>50%</td>
<td>48%</td>
</tr>
<tr>
<td>MPM1D</td>
<td>76%</td>
<td>72%</td>
<td>76%</td>
<td>75%</td>
<td>77%</td>
</tr>
<tr>
<td>MFM1P</td>
<td>55%</td>
<td>58%</td>
<td>55%</td>
<td>58%</td>
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</tr>
<tr>
<td>MFM1P</td>
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</tr>
<tr>
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<td>57%</td>
<td>62%</td>
<td>57%</td>
<td>62%</td>
<td>57%</td>
</tr>
<tr>
<td>MFM1P</td>
<td>58%</td>
<td>65%</td>
<td>58%</td>
<td>65%</td>
<td>58%</td>
</tr>
<tr>
<td>MFM1P</td>
<td>62%</td>
<td>68%</td>
<td>62%</td>
<td>68%</td>
<td>62%</td>
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</tbody>
</table>

100% of our Applied students scored level 2. 68% scored level 3 with 4% scoring level 4. 97% of our Academic students scored level 3 with 3% achieving level 4.

This was the first year that the EQAO test was used as a summative evaluation towards marks; it was counted as the final exam in the course.
Theory of Action: Due October 12, 2018

If we create engaging learning experiences through a focus on creating meaning and integrating curriculum and improve assessment and feedback practices through a focus on eliciting student thinking and learning through triangulation, then student engagement and achievement will improve as measured by monitoring our focus students.

Success criteria for engaging learning experiences:
- I can see and hear authentic learning experiences
- I can see and hear assessment and feedback practices
- I can see and hear student-centered learning
- I can see and hear students using resources with intention
- I can see and hear educators as responsive facilitators
- I can see and hear collaboration
- I can see and hear discourse along with independent think time
- I can see and hear wellness

Success Criteria for eliciting student thinking and learning through triangulation
- I can capture student thinking through observations.
- I can document my observations.
- I can capture student thinking through conversations.
- I can use One Note or other technologies to record and document student learning through conversations.
- I provide opportunities for students to explain their thinking in multiple ways.

DATA:
Monitoring the IF:
Based on the co-constructed success criteria for educator learning. (e.g. criteria for providing effective descriptive feedback)

The educator can capture student thinking through observations.
The educator can document their observations.
The educator can intentionally plan a relevant, real world assessment or task.
The educator provides opportunities for students to explain their

PRE: QUANTITATIVE EVIDENCE – DUE: October 12, 2018
Grade 8 (3 Focus Students)

MID: QUANTITATIVE EVIDENCE – DUE: November 16, 2018
Above: Mid-cycle check-in task

POST: QUANTITATIVE EVIDENCE – DUE: February 8, 2019

Blue Dots: Pre-data
Yellow Dots: Mid-data
Red/Green Dots: Post-data
thinking in multiple ways.

Monitoring the THEN:
Based on the co-constructed success criteria for the pre, mid and post assessments of student learning (e.g. success criteria for number fluency)

The student knows and understands what they are learning.
The student can reveal their thinking in a variety of ways.

The student shows and understands what they are learning.

At the mid-cycle check-in, 9 of the 17 students in the grade 9 applied math class did not use strategies on the continuum of numeracy development for multiplication and division.

At the end of the cycle, 1 out of the 17 grade 9 applied math students did not use strategies on the continuum of numeracy development for multiplication and division, whereas at the mid-cycle check-in, 9 students did not use strategies.
<table>
<thead>
<tr>
<th><strong>QUALITATIVE ANECDOTES – DUE: October 12, 2018</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade 9 Applied:</strong> --used fingers to count (Focus Student 1)</td>
</tr>
<tr>
<td>- drew pictures</td>
</tr>
<tr>
<td>-Conversation (Focus Student 2): I knew $4 \times 12 = 48$ and  $48 + 48 = 96$, $96 + 48 + 134$ and $44 + 4 = 12$ (6X48 then used the doubling from the left side to help)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>QUALITATIVE ANECDOTES – DUE: November 16, 2018</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>-Educators observed, experienced, and expressed the importance of observations and conversations with student in addition to the product to gain reliable insight into where their students are currently at.</td>
</tr>
<tr>
<td>- Educators noticed that many students regressed along the continuum...why? (lack of understanding? Approach to problem? Knowing where to start? What is the question asking? Perhaps not visualizing?)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>QUALITATIVE ANECDOTES – DUE: February 8, 2019</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>-Educators observed that students didn’t have a large repertoire of strategies initially. Through explicit teaching and co-creating the continuum of multiplication strategies, students were better equipped to tackle a multiplication problem.</td>
</tr>
<tr>
<td>-Many students chose a strategy that was comfortable to them and didn’t necessarily choose the most efficient strategy for a given problem.</td>
</tr>
<tr>
<td>-Teachers began to notice increased confidence and perseverance in their students with their abilities to solve multiplication problems without being dependent on a calculator.</td>
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</table>

<table>
<thead>
<tr>
<th><strong>PLAN – DUE: October 12, 2018</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers will use co-created success criteria and notice and naming strategies to move students along the continuum in math.</td>
</tr>
<tr>
<td>Teachers will identify next steps to move students along the continuum.</td>
</tr>
<tr>
<td>Teachers will provide students the opportunities to demonstrate their understanding through different methods with a balance of observations, conversations and products.</td>
</tr>
<tr>
<td>Teachers will provide students the opportunity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ACT – DUE: October 12, 2018</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- We had conducted our first Learning Team meeting in September where we had brought student work selected from the pre-assessments provided. As a team, we tried to place this student work along the continuum of addition/subtraction and multiplication/division where appropriate. The team had difficulty doing this and quickly realized the importance of knowing what you are looking for prior to determining your assessment.</td>
</tr>
<tr>
<td>- We looked at the multiplication/division continuum and together created a relevant learning task (based on an upcoming event at school: Homecoming) which allowed for demonstration of skills along this continuum.</td>
</tr>
<tr>
<td>- Similar task was used in three different classes providing us data from 9 focus students.</td>
</tr>
<tr>
<td>- Their work was moderated and their strategies were plotted along the continuum as outlined above.</td>
</tr>
<tr>
<td>- Students shared their solutions in class and discussions surrounding efficiency and level 4ness occurred.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ASSESS – DUE: November 16, 2018 &amp; February 8, 2019</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>November:</strong></td>
</tr>
<tr>
<td>After the pre-task (the hotdog question), discussions surrounded what constitutes a level 4 response. A post task was then given and two things became evident: students require more development of problem solving skills (making meaning of the problem) and students are limited in strategies to complete a calculation when a calculator is not permitted.</td>
</tr>
<tr>
<td>We didn’t see significant movement forward in efficient strategies. We feel that students are simply not aware of the strategies, so we anticipated and co-created a continuum based on the example of $28 \times 12$.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>REFLECT – DUE: November 16, 2018 &amp; February 8, 2019</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>November:</strong></td>
</tr>
</tbody>
</table>
| As noted from our quantitative and qualitative observations, many of our grade 9 applied math class did not use strategies on the continuum of numeracy development for multiplication and division. Reflecting on this, we realized that our students were unfamiliar with different strategies. Our next instructional move was to notice and name the strategies with our students. We have done this and, moving forward, will give the following as pre- and post-tasks to
To understand what constitutes a level 4 in their work.

As a team, we began anticipating student responses, so we knew what we were looking for and what various strategies might look like in a given prompt.

Educators wondered whether the challenges faced by students might lie in the interpretation/understanding of the problem, the multiplication itself, or both.

To assist students with interpreting and solving problems, educators co-planned (anticipating success criteria and student responses) and co-taught a lesson, where together with the students, they were able to co-construct success criteria for problem solving and model the criteria in a shared learning experience with the class.

February:
After our November “Assess and Reflect” we used the following question to identify the strategies students were using when solving the problem.

Educators wondered whether the challenges faced by students might lie in the interpretation/understanding of the problem, the multiplication itself, or both.

To assist students with interpreting and solving problems, educators co-planned (anticipating success criteria and student responses) and co-taught a lesson, where together with the students, they were able to co-construct success criteria for problem solving and model the criteria in a shared learning experience with the class.

determine if our students move along the continuum to more efficient strategies. This will also give us information as to if we need to provide intensive support to our students in developing their addition and subtraction strategies before attempting to move them forward in multiplication and division.

Above was a second pre-assessment given to the students after the math talks surrounding the multiplication and division continuum.

We plan on using the following as a post assessment as we move forward in our learning cycle.

February:
Following up on our mid-cycle reflections, we wanted to ensure that our students understood both the strategies for multiplication and the success criteria for problem solving.

We realized during this cycle that we did not necessarily understand, explain, nor use a variety of multiplication strategies in our explicit classroom teaching. Through anticipating student responses as a team, we quickly discovered the benefit of using a team approach. As we built our own professional capacities and comfort, we were better equipped to serve our students in our classrooms.

We became more intentional in selecting tasks that would elicit our students’ thinking in terms of multiplication and problem solving. We documented our students’ thinking...
Data was collected from a task that was completed prior to co-creating the success criteria to see how many students were accessing a known set of criteria from prior knowledge or learning.

Data was collected from a task that was completed prior to co-creating the success criteria to see how many students were accessing a known set of criteria from prior knowledge or learning.

Above: Number of students who included the success criteria in their responses in a task prior to co-creating success criteria.

Students very quickly realized these problem-solving criteria could be used in different content areas, such as Science.

Moving into cycle two, we would like to further our own professional knowledge and comfort in learning effective, efficient, and meaningful ways to document observations and conversations with our students, such that we can use these in our assessment practices. We feel that we currently gather some information that’s not product based, but we are unsure of how to use it and organize it and unsure about what to do with the information.

We feel that we have a better grasp on cycle 2, since we are beginning the journey with our students from the beginning of the semester and continuing with our intermediate students from where they were at. By starting earlier in the semester (secondary), we feel that we will be able to do a better job at embedding the fundamentals of mathematics into our content teaching, rather than as a stand-alone lesson/task. We feel by doing this, that it will be more meaningful and relevant to the students, as well as to ourselves. Our hope is to encourage our students to become less dependent on a calculator when using whole numbers in their operations. We would like them to further develop their efficiency, fluency, and flexibility with numbers.

2nd CYCLE OF INQUIRY

Theory of Action: Due February 15, 2019

If we create engaging learning experiences through a focus on creating meaning and integrating curriculum and improve assessment and feedback practices through a focus on eliciting student thinking and learning through triangulation then student engagement and achievement will improve as measured by monitoring our focus students.

Success criteria for engaging learning experiences:
I can see and hear authentic learning experiences
I can see and hear assessment and feedback practices
I can see and hear student-centered learning
I can see and hear students using resources with intention
I can see and hear educators as responsive facilitators
I can see and hear Collaboration
I can see and hear purposeful planning

Success Criteria for eliciting student thinking and learning through triangulation
- I can capture student thinking through observations.
- I can document my observations.
- I can capture student thinking through conversations.
- I can use One Note or other technologies to record and document student learning through conversations.
I can see and hear discourse along with independent think time
I can see and hear wellness

If we create engaging learning experiences through a focus on creating meaning and integrating curriculum and improve assessment and feedback practices through a focus on eliciting student thinking and learning through triangulation then student engagement and achievement will improve as measured by monitoring our focus students.

### DATA:

#### Monitoring the IF:
Based on the co-constructed success criteria for educator learning.

- The educator can capture student thinking through observations.
- The educator can document their observations.
- The educator can intentionally plan a relevant, real-world assessment or task.
- The educator provides opportunities for students to explain their thinking in multiple ways.

#### Monitoring the THEN:
Based on the co-constructed success criteria for the pre, mid, and post assessments of student learning.

### PRE: QUANTITATIVE EVIDENCE – DUE: February 15, 2019

**Attitudinal Survey Results for new grade 9 students this semester.**

- **Count of I want to develop my mathematical skills.**
  - Agree
  - Neutral
  - Strongly Agree

- **Count of I get a great deal of satisfaction out of solving a mathematics problem.**
  - Agree
  - Disagree
  - Neutral
  - Strongly Agree

- **Count of Mathematics is dull and boring.**
  - Agree
  - Disagree
  - Neutral

### MID: QUANTITATIVE EVIDENCE – DUE: April 12, 2019

**Comparison of Results: Grade 6 EQAO, Grade 9 Final Grade in Math, and Predicted Grade 9 EQAO Results (actual results will be compared when they are received)**

#### Grade 9 Semester 1

<table>
<thead>
<tr>
<th>Name</th>
<th>GE 6 EQAO</th>
<th>GE 9 Final</th>
<th>GE 9 EQAO Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>70</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>Student 2</td>
<td>80</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Student 3</td>
<td>65</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Student 4</td>
<td>55</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

**Data Analysis:**

1. Homework Completed
   - On-time complete: 1
   - Partially complete: 1
   - Not attempted: 4

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**PRE: QUANTITATIVE EVIDENCE – DUE: February 15, 2019**

**MID: QUANTITATIVE EVIDENCE – DUE: April 12, 2019**

**POST: QUANTITATIVE EVIDENCE – DUE: May 31, 2019**

- PRE: QUANTITATIVE EVIDENCE
  - DUE: February 15, 2019
  - Attitudinal Survey Results for new grade 9 students this semester.

- MID: QUANTITATIVE EVIDENCE
  - DUE: April 12, 2019
  - Comparison of Results: Grade 6 EQAO, Grade 9 Final Grade in Math, and Predicted Grade 9 EQAO Results (actual results will be compared when they are received)

- POST: QUANTITATIVE EVIDENCE
  - DUE: May 31, 2019
  - Data Analysis:
    - Homework Completed
      - On-time complete: 1
      - Partially complete: 1
      - Not attempted: 4
The student knows and understands what they are learning.
The student can reveal their thinking in a variety of ways.

Mid-year Attitudinal data for our Grade 7 class:

- **I want to develop my mathematical skills.**
  - Strongly Disagree: 2016, 2019
  - Strongly Agree: 2016, 2019
  - Neutral: 2016, 2019
  - Agree: 2016, 2019

- **I get a great deal of satisfaction out of solving a mathematics problem.**
  - Strongly Disagree: 2016, 2019
  - Strongly Agree: 2016, 2019
  - Neutral: 2016, 2019
  - Agree: 2016, 2019

- **I am able to solve mathematics problems without too much difficulty.**
  - Strongly Disagree: 2016, 2019
  - Strongly Agree: 2016, 2019
  - Neutral: 2016, 2019
  - Agree: 2016, 2019

This data shows a very strong shift in students’ attitudes towards mathematics. While some of this data was presented in ‘our current state’ section, we have now surveyed another group of grade-9 students and are pleased that the results show an even greater improvement.
• Educators recorded videos of students working and explaining their thinking during a three-act math task by Jon Orr: How much would it cost to travel 30 km?

• Observations from staff upon watching the videos included staff noticing that students were using different strategies.

• The above student used repeated addition to calculate the total cost. The student realized that the base cost was $5.00, then realized for 15 km that he should multiply 15 by $0.50 because that was the cost per km then he would add that number to the base cost of $5.00. The student realized that this would be a faster way.

Teachers have begun to use forms to track observations of students, specifically homework completion and steps used in the problem-solving process. (evidenced above)

Teachers feel the students are moving in the right direction in terms of understanding and their confidence levels have increased.
- The above student was recorded and observed using repeated addition. This student created an additional table at the side, so he could continue to add $0.50 for each km. Conversations with this student indicated that he used this strategy, so he wouldn’t have to guess the cost from 3 km to 15 km. He stated that it would be easier to check his work over to make sure he’s right by doing it this way.

- This student solved the problem right away in his head, using mental math strategies. Through conversations with the student, the following emerged: the student knew that for every 2 km the taxi travelled that it would cost half of the number of km, which is $1 (since each km costs $0.50), which demonstrates proportional reasoning. He then knew that if the taxi travelled 30 km that it would cost $15 (using halving) plus the base fee of $5 for a total of $20. This student then filled in the rest of the table. The student was able to create an equation that would work for any given value.
### PLAN – DUE: February 15, 2019

- Conduct a mathematics attitudinal survey with our grade 9 students (pre) and our grade 7 students (mid-year)
- Participate in Fundamentals of Mathematics System Professional Learning Days to further our understanding and to be able to notice and name the strategies and key ideas along the multiplication and division continuum
- Participate in full day learning team meetings where we can co-plan, co-teach, monitor student work and thinking, and come back to the table to moderate student work (discussing observation and conversations), and plan our next intentional teacher moves to move our students along the continuum in terms of flexibility and efficiency
- Learning Team will document student and teacher learning through one note, and potentially excel depending on teacher preference.

### April 12, 2019 (Additional Actions)

- Teachers are moving forward with documentation of student learning through observations using Microsoft Forms
- We have begun another learning cycle with a pre-diagnostic being co-planned and co-created with all learning team members. Release time has been planned so that classroom visits will include the delivery of the diagnostic and an opportunity for educator documentation. Following this the Learning Team will meet again and identify educator next steps for two full classes of learners. One final day of release will occur as Learning Teams members will revisit the classes with a co-planned post assessment.

### ACT – DUE: February 15, 2019

- This student created an equation to solve for any given value: km x 50 + 5.00. Through videos and conversations, the educator discovered that the student then used trial and error to figure out how many km could be travelled with $50. Student named that he was using trial and error.
- To calculate the total number of km that he could travel with $50, this student first subtracted the base fee of $5 to get $45. He then divided 45 by 0.50 and got 90 km.

### ASSESS – DUE: April 12, 2019 & May 31, 2019

#### April:

- Our attitudinal surveys (mid-year grade 7 and pre-for grade 9) were administered to our students, and data was collected on students’ beliefs and feelings toward mathematics.
- Results of these surveys indicate that most of our students enjoy math, want to further develop their skills, feel confident in their abilities to solve math problems, and get satisfaction when they have solved a difficult or challenging math problem.
- Educators are continuing to participate in the Fundamentals of Mathematics System Professional Learning Days and are furthering their understanding of the various strategies that students use when solving addition/subtractions and multiplication/division problems.
- Educators are feeling more comfortable in noticing and naming the strategies and key ideas along the continuum that their students are using.
- Educators are beginning to experiment with documenting observations and conversations using videos when there are two educators in the room.
- Educators expressed that they are willing to learn and use new tools for documenting observations but that they are not yet feeling ready to use OneNote or Excel to record this documentation.

#### May:

- Educators have started documenting observations and conversations through Microsoft forms as planned. Team members still see time as a barrier. One Note was not a platform they were comfortable using.

### REFLECT – DUE: April 12, 2019 & May 31, 2019

#### April:

Our team wanted to develop a way to begin to collect evidence and document observations made in the classroom. Starting small and being successful with documenting was important for our team. Upon reflection, we decided that creating a Microsoft Form would be a good starting point for us, rather than using OneNote or Excel, which the team felt would not meet their needs at this point.

Since problem solving had been identified as one area of focus for our grade 9 students, we decided to start our documentation in this area. This form was created during our latest learning team meeting, based on success criteria that had been co-created with the students. This form will be used by staff to gather evidence as we begin a third mini-cycle in our SIPSASW.
move students along the continuum. Teachers will provide students the opportunities to demonstrate their understanding through different methods with a balance of observations, conversations and products. Teachers will further their own professional knowledge and comfort in learning effective, efficient, and meaningful ways to document observations of and conversations with their students, such that they can use these in their assessment practices. Teachers will embed the fundamentals of mathematics into their content teaching, rather than as a stand-alone lesson/task. They feel by doing this, that it will be more meaningful and comfortable with using. However, one of the learning team members using OneNote exclusively when tracking student achievement through SST. Team members do use excel for tracking students’ achievements with products but have yet to make the shift to include O and C. • Educators are also using portfolios to track student achievement.

As a team, we see the benefit of meeting with shorter periods of time in between, so we can implement our next intentional move(s), assess and reflect, and see the impact on student learning right away. We feel that we sometimes lose momentum when there is a longer period in between our meetings.

May: As we look back over the course of the year, we have developed a solid understanding of the continuum and strategies that educators can use to move students along if the strategy is, in fact, the most efficient. Educators have recognized that sometimes the strategy that is on the right is not the most efficient for the task. Ex. 25X12; the algorithm is not the most efficient but partial products is.

Our team has also gained a deeper understanding of the importance of conversations and observations but we still need to embrace the uncomfortable with documentation to see the value of it.

Conversations have shifted and the team recognizes the importance of involving all grade 8 teachers in this process. Two post tasks have been created and distributed to grade 8 teachers for delivery in their classes. This will be collected and the learning team will join them in moderating student work. Gaps will be identified, learner profiles discussed and the placement of students in grade 9 will further provide points of discussion.

This data will serve as our pre-data (current state) for the beginning of our learning cycles for 2019-2020 school year.

1. Fractions (Show steps, write in lowest terms, leave as an improper fraction)
   a) $\frac{1}{2}$
   b) $\frac{5}{4}$
   c) $\frac{5}{6}$
relevant to the students, as well as to themselves