Table of Contents

1. Program Goals and plan  
   - Goals  
   - Plan  
   - Team and Responsibilities  
   - Criteria of Quality Developmental Education
2. Key Issues and Barriers
3. Self-assessment of the Program  
   - Collective SII  
   - Error Analysis of the Modules
4. Philosophy of the Program
5. Basic Math Project Policies
6. Design of the Course
7. Mastery Learning Approach
8. Script for the Course
9. Improving the Process of Learning Mathematics
10. Activities Book
11. Improving Student Learning in an Active Learning Environment
12. Learning Assessment Journal
13. Effective Use of Technology
14. Teaching Techniques  
   - Getting Student Buy-in  
   - Current Best Practices  
   - Quick and Easy Things to Implement to Support Process Learning  
   - Managing Learner Frustration
15. Creating the Quality Learning Environment
16. Course Assessment System
17. Life Vision Portfolio
18. Syllabus
# PROCESS EDUCATION INSTITUTE PARTICIPANTS

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Department</th>
<th>Location</th>
<th>Work Phone</th>
<th>Home Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
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<td>Company</td>
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</tr>
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</tr>
</tbody>
</table>
Section 1 - Program Goals

1. Produce a process that achieves an average of 85% completion rate across all basic math courses in the system.
2. Produce a process that increases the success rate of following math courses so they also achieve an average of 85% completion rate.
3. Increase facilitation skills of instructors that will help increase student success in developmental courses
4. Produce updated materials for use in a student center learning environment based upon learning skill development
5. Learn how to apply instructional design principles in the design of learning activities
6. Integrate assessment into the learning process so students learn how to self-assess their own learning process
7. Build a team for supporting each other in reducing the attrition rate within and across institutions
8. Increase emphasis on process of learning mathematics
9. Incorporating mentoring into higher education
   • Increasing student retention
   • Mentoring faculty who are new to a college to help them
   • Mentoring at the college level (changing the culture)
10. Expand faculty members’ tool set by integrating new tools and techniques into the teaching/learning process;

Frequently Asked Questions

1. How do you get students to buy-in to a shift to Process Education?
2. How to get faculty to buy-in to this shift?
3. How to integrate the philosophy within a given program?
4. How do you objectify learning? Learning outcomes that can be measured and the design of the evaluation system
5. What is a life vision and why is it important?
6. How do you integrate knowledge-based learning (theory) and ability-based learning (application)?
7. How to produce a quality program assessment system (that satisfies outside accreditation. e.g., ABET)?
8. What is the role of control in a Process Education classroom?
9. How to get the support from administration in the role of a change process?
It is important to note that this project does involve a transitional cost for those involved in its implementation. A team of three is recommended. This team will be instrumental in creating a set of materials adapted to meet the needs of Baker College. In addition, they will facilitate the initial delivery of the course, make the key changes, and incorporate new processes. Finally, the team will mentor and assess adjunct instructors as they facilitate the course.

The above-mentioned efforts require substantial investment and deserve appropriate leave time to meet the expected outcomes. Past experience has shown that others in similar situations do put in more time than if teaching a full class load. Therefore, leave time is included as a necessary component of this proposal.

thomps_j@owosso.baker.edu

Needs:

<table>
<thead>
<tr>
<th>Needs (Activities)</th>
<th>Team Leader Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learning to Learn (Kim and Lori)</td>
<td>1. Communication (Nancy)</td>
</tr>
<tr>
<td>2. Teaching Institute (Clinton Twp, Dec. 10 and 11)</td>
<td>2. Blackboard Editor (Sherri)</td>
</tr>
<tr>
<td>3. Team meetings</td>
<td>3. Classroom computer resource person (Tina and ChrisD)</td>
</tr>
<tr>
<td>4. Computer Resources</td>
<td>4. Problem Solving Leader (RonD)</td>
</tr>
<tr>
<td>5. Coaching (modeling and peer coaching)</td>
<td>5. Language Development Leader (Lori)</td>
</tr>
<tr>
<td>6. Faculty Development</td>
<td>6. Activities (Kim and Sharleen)</td>
</tr>
<tr>
<td>7. Faculty reward</td>
<td>7. Institutional Research (Barbara and Ronie, Patti, Pete, Cindy)</td>
</tr>
<tr>
<td>8. Advanced TI (summer, 2003)</td>
<td>8. Self-assessment (Rose and Rosalie)</td>
</tr>
<tr>
<td></td>
<td>9. Faculty Development (Chris and Chris and Nancy) (Roll-out)</td>
</tr>
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</table>
Baker College’s Three-year Plan for Basic Math 2002 - 2005

**Goal:**

To significantly reduce the attrition of students while improving student learning

**Project Outcomes:**

1. Pilot sections of Basic Math in year three will have 50% of the attrition of the participating faculty team’s base years of 2000-2001 and 2001-2002.
2. The success rate of the students who then take a follow-on math course after completing the pilot Basic Math course (Introduction to Algebra or Business Math) will have half the attrition of students who have not taken the pilot Basic Math course.

**Background:**

September 11 – 14, Pacific Crest facilitated a Developmental Mathematics Curriculum Design Institute for a team of faculty and administrators from four Baker College campuses: Jackson, Flint, Clinton, and Auburn Hills. The purpose of this Institute was to form a system-wide project team that consists of four campus teams to improve student performance in the Basic Math course. The current course was examined, prerequisites were determined for students entering the subsequent course, a set of minimum standards in mathematical competency were articulated as learning outcomes, and a collaborative plan of action for improving student outcomes.
in Basic Mathematics was created. This proposal follows the plan designed for the Transitional Studies Developmental Mathematics program at the University of Louisville.

**Project Activities:**

The following action plan of activities and events are designed to improve the quality of the outcomes in the basic math course.

1. *Customize a set of curriculum materials* based on two main objectives; (1) increase the number of students who complete basic math (half the failure rate in three years), and (2) increase the quality of learning that takes place for those students taking the course.

2. Provide an *annual faculty development process* to build the facilitation and assessment skills of instructors with respect to math learning skills. The events include:
   - 2 Two-day coaching sessions for terms Fall ’01 through Spring ‘05
   - 1 day team meeting after each term (when no event is scheduled)
   - Developmental Mathematics Teaching Institute for all participating math faculty Dec. ’02
   - Advanced Teaching Institute for Developmental Mathematics Summer ’03
   - Learning to Learn Camp for non-successful students in Summer of ‘04
   - National Conference on Best Practices in Developmental Mathematics Summer ’05

3. Provide *ongoing assessment and coaching in the classroom*. As a follow-up to the annual faculty development event, classroom visits will be made each term to provide instructors with timely feedback and address current problems.
4. **Implement a Learning-to-Learn Camp** for the least prepared students and those who have failed the course at least twice to show how to build a strong foundation for success. The weeklong camp will have a main component that addresses building students’ math learning skills. After two such camps, the college would be in position to facilitate the camp themselves and integrate it into their institution processes.

5. **Create an ongoing project team** led by two project co-directors. They will facilitate communication, have faculty share discoveries among the four campuses, integrate technology effectively, incorporate reflective practice by faculty and students, constantly assess the project’s movement towards its outcomes, identify and research key issues, and finally provide the motivation and rewards for the participating faculty.

Co-director Responsibilities - 2002 - 2003 academic year

Dan Apple

Overall Consultant  
Trouble Shooter  
Modeling of Classroom Performance  
Leading the Peer Coaching Effort  
Classroom Research  
Mentor on Assessment  
Keep administrators informally informed  
Facilitation Skill Development (including cooperative learning)  
Mentoring of mentoring skills

Carol Atnip

Materials Development and Assessment of Materials  
Implementation of the set of materials  
Program Assessment  
Coaching Campus Co-directors and building the project team
Liaison between Karl Krumsieg and Baker
Faculty Development
Team meetings
Learning Centers
Coaching Visits
Teaming across the country (outside resources)

Anna Reseigh

Syllabus Preparation
Faculty Recruitment for adding to the team
Collecting Textbook Feedback from all members
Working with Carol and Karl on schedule for next edition
Facilitating Bi-weekly team meetings
Facilitating weekly leadership team conference call
Coaching Visits
Needs analysis of practitioners
Receive, record, and address student issues
Lead task directors:
  Tina
  Ron
  Lori
  Nancy
  Kim & Sharleen
  Affective Management – Joyce & Cindy

Rosalie Wild

Keeping the non practitioners involved (team teaching etc)
Project Historian and data storage
Annual Reports - Project Reporting
Grant Writing
Facilitator’s Guide (Instructor’s Guide resources)
Faculty Development Events

Lead task directors:
  Rose
  Ron DuChene
  Sherri
  Patty
  Faculty devel – Chris & Chris
  Administrative Activities

Technology Leader - Tina

Effective choice of the best software for this course
Use of technology for:
  • A pre-assessment tool (currently Asset – should it be changed?)
  • Self-assessment: Math & Graphing Skills for students
  • Practice tool
  • Practice tests
  • During class time
  • In the skill center
  • At home
  • Module testing process
Technical support during its use
Obtaining computer classroom time
Training for faculty in its appropriate and effective use

Language Development Leader - Lori

To identify the language learning issues
Role of a glossary development to support the language development
Assessment of language development
Role of language development in preparatory activity
Role of language development in the evaluation system
Role of the instructor in challenging and facilitating the growth of language skills
How can the skill centers help to improve language development

Improving Problem Solving Performance – Ron

Location or creation of a set of 50 to 100 problems that will challenge but not overwhelm students
How to incorporate problem solving activity in the classroom
How to incorporate problem solving in the homework
Differentiating skill development from problem solving
How to enrich word problem so that they are problem solving
Define the role of problem solving in the evaluation system
How to incorporate a quality problem solving project into the course

Self-assessment and assessment - Rose

The instructor’s guide for LAJ with the help from Dan
Develop the criteria and scoring rubric for the LAJ
Provide insights on how to effectively assess students self-assessments and assessments
Techniques for imbedding course assessment mechanisms into the course
Recommendation what student performances should be assessed and not evaluated
Training needs for faculty to improve their assessment performance
Guidelines for instructors to self-assess and peer-assess classroom performance
Determining the needs for Dan and Carol to assess aspects of the project performances

Textbook, supplemental materials, and additional resources – Kim & Sharleen
Define the knowledge table for the course and constantly update over time
Insure a quality activity for each knowledge item to support student learning to meet the learning outcome
Make sure that reading material exists that provide the students with the appropriate informational background to be successful with the activity
Determine the optimal number of skill exercises and means for skill development that builds the computation skill level desired by the course
Determine that the supporting material on learning to learn and math learning issues are comprehensive, meaningful and effective.
Supporting faculty resources – i.e. the facilitator’s guide help faculty to effectively implement the curricular materials
The relationship between the reflective journal (LAJ) and the text materials are designed to work with each other effectively
Collect and organize feedback on an annual basis so that the next edition incorporates all the strengths identified while making the recommendations for improvements and providing the synthesized direction for the authoring team.

Course Grading and Evaluation System – Ron G. and Ronnie

Look at the modules currently being used and make sure they measure the performance of expected learning
Identify components of an evaluation system and the performance tasks that will be used
Assess and improve upon the writing of the performance criteria established during the CDI
Put in place the performance measures for the course that align with the performance criteria
Develop the instruments for measurement that the course uses including scoring sheets
Identify the way in which the different components are weighted and integrated into a final grade

Communication Support for the project – internally and externally – Nancy

Provide an electronic weekly announcement of anything of importance over the last week
Provide a document to be used for pre-reading for our team meetings as well as used to announce to the Baker community and grant agencies about the progress the project is making and efforts to be undertaken over the next term.
Facilitate the communication system within Blackboard to determine how on-going consulting can be supported by Dan and Carol from off-site and collaboration among the team
Trouble shoot any issue that comes up regarding ineffective communication

Blackboard Support - Sherri

Design of the Blackboard site working with Project Co-directors
Study the effectiveness of its use to coach the team on how to better use Blackboard
Provide training as needed to improve use of the site
Explore how Blackboard can improve student learning as a pedagogical tool in the course
Provide for a secure document storage of highly sensitive, but important historical project information
Mentor the co-directors in the management of the site

Administrative Support and Systems – Barbara, Chris, & Patty

System-wide policies and procedures – Barbara
- Course designator
- Bookstore management
- Ways in which students are assigned sections
- Access and public nature of performance data
- Placing a priority of the course for accessing computers
- Encouraging a level of commitment of administrators to engage in the practice of team-teaching or peer coaching sections of the pilot
- Institutional research support and design
- Determination of where Baker can leverage in collaboration with other colleges

Technical Support - Chris
- Obtaining and synthesizing data needed from institutional research
- Provide the analysis capability to process data with the help of institutional research
- Technology support needed
- Guiding the design of curricula and curricula issues

Mentoring and Administrative Support of Co-directors – Patty
- On-going emotional support of the co-directors
- Expeditor
- Forecasting and addressing campus-level issues for the four campuses
- Teaming with each of the other three campus administrators to make sure their needs are being met

Faculty Reward System – Barbara, Cindy, and Patty
- Identify the ROI on every % increase in basic math
- Determine what is minimal performance level that is acceptable
- What level deserves additional reward
- Define the measure of performance

Faculty Development – Chris and Chris

Long-term development of the instructor base – Chris Stramn
- Course focusing on teaching of developmental math or parallel
- Increasing the pipeline of potential instructors from high school programs
- In-service workshops to support the recruitment and on-going instructors

Faculty development for the project – Chris Davis
- The design of the events in collaboration with Pacific Crest
- The inventory of needs analysis updated on an annual basis of the project team
- The linkage of other faculty development opportunities that connect with the project

Affect Management of the students, Team and especially the Instructors – Cindy, Patty, Terasa, & Joyce

Students - Joyce
- Developing a set of strategies for instructors to use to get student buy-in
- Inventorying affect issues that instructors confront with students and obtain a list of affect management techniques to address these issues
- Provide means of making the course more fun for students and instructors (like Dan and Carol’s idea about a math jamboree at the end of the term)
- Identifying key retention factors so that constructive intervention strategies are available and being used
Project Team - Patty
  - Keep aware of project’s emotional level to keep it steady and upbeat
  - Make sure that key issues effecting the affect of the team gets address quickly

Instructors – Cindy
  - Make sure that every instructor feels like a successful member of the team
  - Any individual instructor in some form of trouble gets the support and attention needed for improving their success in a timely manner
  - Making sure that there are share sessions on each campus weekly to talk about their current progress and among the campuses biweekly to support the affect side of the project

Grant Writing – Erica and Chris Stramn
  - Determine the resources needed
  - Identify viable sources for grant
  - Manage a grant writing process that successfully obtains the grant

Placement of Students in Basic Math
  - Minimum requirement for at least 75% success.
  - Pre=post tests
  - Intro to Algebra

Time Line of Activities:
<table>
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<th>Term</th>
<th>Date</th>
<th>Activity</th>
<th>Description</th>
<th>Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum ’02</td>
<td>9/11-14</td>
<td>Curriculum Design Institute</td>
<td>Produce a committed team; redesign a Basic Math Course; produce a project plan</td>
<td>Dan Apple &amp; Carol Atnip</td>
</tr>
<tr>
<td>Fall ’02</td>
<td>9/24-12/9</td>
<td>Practice New Techniques</td>
<td>Use of technology; assessment; active learning; other techniques</td>
<td>Tina; Rose &amp; Rosalie; all</td>
</tr>
<tr>
<td>Fall ’02</td>
<td>9/14-10/15</td>
<td>1st edition of new Book</td>
<td>Review, choose, and edit activities for inclusion in the 1st edition</td>
<td>Kim &amp; Sharleen</td>
</tr>
<tr>
<td>Fall ’02</td>
<td>October</td>
<td>Coaching Visit 2 day</td>
<td>Visit each campus – 5 to 6 hours and finalize curriculum</td>
<td>Carol Atnip</td>
</tr>
<tr>
<td>Fall ’02</td>
<td>November</td>
<td>Coaching Visit 2 day</td>
<td>Visit each campus – 5 to 6 hours and determine needs for TI</td>
<td>Dan Apple</td>
</tr>
<tr>
<td>Break</td>
<td>12/10-11</td>
<td>Developmental Math TI</td>
<td>Prepare faculty for teaching new methods and techniques for Basic Math pilots</td>
<td>Dan Apple &amp; Carol Atnip</td>
</tr>
<tr>
<td>Winter ’03</td>
<td>January</td>
<td>Coaching Visit 2 day</td>
<td>Visit each campus – 5 to 6 hours and review curriculum</td>
<td>Carol Atnip</td>
</tr>
<tr>
<td>Winter ’03</td>
<td>February</td>
<td>Coaching Visit 2 day</td>
<td>Visit each campus – 5 to 6 hours and problem solve issues</td>
<td>Dan Apple</td>
</tr>
<tr>
<td>Break</td>
<td>March</td>
<td>Team Meeting 1 day</td>
<td>Facilitated team meeting for assessing term and addressing issues</td>
<td>Dan Apple &amp; Carol Atnip</td>
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<tr>
<td>Spring ’03</td>
<td>April</td>
<td>Coaching Visit</td>
<td>Visit each campus – 5 to 6 hours and problem solve issues</td>
<td>Dan Apple</td>
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<tr>
<td>Period</td>
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<td>Facilitator</td>
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<tr>
<td>Spring ‘03</td>
<td>May</td>
<td>Coaching Visit 2 day</td>
<td>Visit each campus – 5 to 6 hours and problem solve issues</td>
<td>Carol Atnip</td>
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<td>Summer ‘03</td>
<td>June</td>
<td>Advanced Teaching Institute</td>
<td>Grow faculty understanding and skills in facilitating students’ learning</td>
<td>Dan Apple &amp; Carol Atnip</td>
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<td>Summer ‘03</td>
<td>June-August</td>
<td>Review Text</td>
<td>Revise and refine curriculum materials for Baker students</td>
<td>Kim, Sharleen &amp; Carol Atnip</td>
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<tr>
<td>Fall ‘03</td>
<td>October</td>
<td>Coaching Visit 2 day</td>
<td>Visit each campus – 5 to 6 hours and problem solve issues</td>
<td>Dan Apple</td>
</tr>
<tr>
<td>Fall ‘03</td>
<td>November</td>
<td>Coaching Visit 2 day</td>
<td>Visit each campus – 5 to 6 hours and problem solve issues</td>
<td>Carol Atnip</td>
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<tr>
<td>Fall ‘03</td>
<td>December</td>
<td>Team Meeting 1 day</td>
<td>Facilitated team meeting for assessing term and addressing issues</td>
<td>Dan Apple &amp; Carol Atnip</td>
</tr>
<tr>
<td>Winter ‘04</td>
<td>January</td>
<td>Coaching Visit 2 day</td>
<td>Visit each campus – 5 to 6 hours and problem solve issues</td>
<td>Dan Apple</td>
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<tr>
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<td>Dan Apple &amp; Carol Atnip</td>
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<td>Team Learning to Learn Camp Prep – Facilitated team meeting for assessing term and addressing issues</td>
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<td>Summer 04</td>
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<td>Review Text – Revise and refine curriculum materials for Baker students</td>
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## Project Budget:

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<td>Advanced Teaching Institute (20 participants)</td>
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<td>Co-director fees (Carol) (250 hrs/year)</td>
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<td>Total</td>
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<td>$84,000</td>
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* This is the discount that Pacific Crest is willing to contribute to the project (can be negotiated)

Characteristics of a Successful Developmental Education Program

1. Cohort manager/mentor of the student community (a single person ultimately responsible for the success of a student)
2. Timely and effective interventions (heading off key problems before they become key problems)
3. Strong Life Vision (students need long-term direction, meaning and commitment to the educational process as it relates to their future)
4. That the program explicitly states and believes in the learner and their success
5. Tough-love (it is important that life lessons occur and learning from failures be fundamental to their development – thus TLC and protecting learners disempower versus empower.
6. Systematically designs, facilitates, and assesses learning skill growth
7. Supports risk taking, letting students fail, and helping to achieve success through failure
8. Transferring ownership of learning and success – don’t do for the students what they can learn and grow to do for themselves
9. Strong connectiveness within the community – valuing, respecting, and caring – including language of success
10. Building strong reflective and self-assessment skills

Scholarship in Developmental Education

1. Define the Problem that is to be solved
2. Identification of the model
3. Clarifies the issue
4. Response to the problem and issues with the development problem
5. Defining the performance expectations that meet external criteria of performance
6. Put together using hybrid cost-effective model for a higher degree of success
7.
Section 2: Key Barriers and Issues

1. Having clear expectations of prerequisite skills (both knowledge and process skills) with reliable measures of those skills and strong placement procedures to put them in courses with strong likelihood for success.

2. A General Set of Attitudes that students bring in that include:
   a. Low persistence – quick to give up
   b. Been there/did that – already know it
   c. Don’t care
   d. Work habits don’t match need in order to be successful
   e. Great deal of fear

3. Limited nature of different teaching/learning techniques among the practitioners and a leaning towards more passive vs. active techniques.

4. How to build a team of Basic Math Instructors – due to the part-time nature, spread of campuses, etc. – how to build a community of educators who buy into the project

5. How to roll out the team to the system – faculty development, share ownership, etc

6. Lack of educational expertise of faculty – background in teaching and learning

7. Low valuing of the basic math course as critical to success to Baker College at each campus – assignment of load, recruitment of instructors

8. 10-week term – shortness and liability to meet a set of outcomes in a short cycle.

9. Poor learning behavior – students do not have strong learning process, learning skills, and have not learned how to be an effective learner
10. Socio/economic issues; magnitude of life crises – lack of support and life vision
11. Personal support system is a barrier – how to evolve your own personal system of support
12. Attendance pattern of students (take a head count of attendees at week 4 for baseline)
13. Communication/language skills of articulating mathematics – learn to use an abstract system of symbols
14. Self-assessment and validation skills are weak
15. Students’ learning process skill levels are unique; identify skill set for the course and develop those skills in the students: use the content of the course to grow the skill set of the student
16. Students don’t value their learning experience (math) and the outcome of that learning; why learn something; what relevance does it have. One solution is the Life Vision Portfolio
17. Institutional Barriers:
   a. support of learning support
   b. skepticism
   c. change and support in different educational processes
   d. placement of students (assessment/placement issues)
   e. current level of institutional research
   f. class size (classrooms available, instructors available, etc.)
   g. current policies on admitting and retaining students
   h. conditional admits
   i. continuity of students finishing course with another instructor/lab/tutor
18. Mentoring system for faculty who come into this program in the future
19. Diversity in knowledge and process skills of students
20. Bringing support services into the team

21. Strength of the grading system in measuring learning outcomes

22. $$\text{Building a cost effective model that rewards performance of faculty who achieve increased levels of performance}$$

23. Quality of materials and instruction – make sure there is a set of resources available for instructors

24. Resistance to change – status quo is ok

25. Mathematical maturity of the students

<table>
<thead>
<tr>
<th>Error Analysis and Validation Techniques to</th>
</tr>
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<tbody>
<tr>
<td><strong>Error Type</strong></td>
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<td>Smallest to largest</td>
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<td>Division of fractions</td>
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<td>Topic</td>
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<tr>
<td>--------------------------------------------------------------</td>
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<tr>
<td>Multiplying mix numbers</td>
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<tr>
<td>Converting to same unit (consistency)</td>
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<tr>
<td>Converting a mix number to improper fraction</td>
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<tr>
<td>Setting up a ratio (Decimal -&gt; fraction)</td>
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<tr>
<td>Property of one</td>
</tr>
<tr>
<td>Subtracting Mixed Nos. Borrowing</td>
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<tr>
<td>Rounding Off</td>
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<td><strong>Careless</strong></td>
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<tr>
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<tr>
<td>Advance multiplication</td>
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<tr>
<td>Transcribing to answer or to next step</td>
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<tr>
<td>Simple division</td>
</tr>
<tr>
<td>Simple subtraction</td>
</tr>
<tr>
<td>Simple adding</td>
</tr>
<tr>
<td>Forgetting to reduce fraction</td>
</tr>
<tr>
<td>Following instructions</td>
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<td>Misreading</td>
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<td>Sign mistake</td>
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<td><strong>Process Issues</strong></td>
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<td>Carryovers</td>
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<tr>
<td>Presenting a reduced improper fraction or mixed number</td>
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<tr>
<td>Reducing an improper fraction</td>
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<tr>
<td>Setting up a ratio</td>
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<tr>
<td>Doing in the head vs writing down</td>
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<tr>
<td>Issue</td>
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<tr>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Forgetting a small step</td>
</tr>
<tr>
<td>Forgetting to flip – other problems did</td>
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<tr>
<td>Flipping when doing multiplication</td>
</tr>
<tr>
<td>Reducing fraction multiplication all the way</td>
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<tr>
<td>Losing focus of what you are doing</td>
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<tr>
<td>Setting up the problem</td>
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<tr>
<td>Inserting a placeholder 0</td>
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<tr>
<td>Neatness</td>
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<tr>
<td>Using wrong number form</td>
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<tr>
<td>Converting percent with more than 2 places</td>
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<tr>
<td>Solving proportion</td>
</tr>
<tr>
<td>Used test A as pretest</td>
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</tbody>
</table>

### Grading

- B2 - #5 1.5
- B2 - #7 9/10
- D6 - #20 not reduced 2 12/21
- B2 - #19 34 14/35 (2)

### Problems

- Problem 16 on 5E is confusing
- Problem 22 on 6A
Comments:

1) Need a set of exercises on reducing a fraction and presenting it.
2) Need a set of reducing multiplication of fraction before multiplying.
3) Often the answer worked out is not related to answer placed in module.
4) Need to strengthen the discipline in converting to same unit to compare numbers.
5) Create an algebra readiness test - Modules 7, 8, 9, & 10 for determining readiness for an A in next course.
6) 

Further Research

1) Out of 500 module tests on each module – what is the % correct of each question? Does it differ by the specific letter test?

Validation Techniques by module

Module 1

1. Add backwards
2. Add backwards
3. Subtraction
4. Addition
5. Addition
6. Addition
7. Division (or multiply in reverse order)
8. Division (or multiply in reverse order)
9. Division (or multiply in reverse order)
10. Multiplication
11. Multiplication
12. Multiplication
13. Cover up the requirement and write down the place of last non 0 value
14. Ditto
15. Redo from scratch after you did the rest of problems
16. Division
17. Add backwards
18. Addition
19. Division
20. Multiplication

Module 2

1. After sequencing convert to same unit
2. After sequencing convert to same unit
3. Redo the process with reversing the numbers (also convert answer back to improper fraction and compare to addition)
4. Subtraction
5. Redo the process with reversing the numbers (also convert answer back to improper fraction and compare to addition)
6. Redo the process with reversing the numbers (also convert answer back to improper fraction and compare to addition)
7. Addition
8. Addition
9. Addition
10. Addition
11. Division
12. Division
13. Calculate right to left
14. Division
15. Calculate right to left
16. Division
17. Multiplication
18. Multiplication
19. Multiplication
20. Multiplication

Module 3

1. Check in backward order for correctness
   Check in backward order for correctness
2. Check placed round and see if matches up to request
   Check placed round and see if matches up to request
3. Subtraction
4. Add in reverse order
5. Subtraction
6. Addition
7. Addition
8. Addition
9. Addition
10. Division
11. Division
12. Division
13. Multiply in reverse order
14. Division
15. Multiply in reverse order
16. Multiply
17. Multiply
18. Multiply
19. Multiply
20. Multiply

Module 4
1. Use the words in different contexts (e.g. what is the exchange rate? What is the conversion rate? What is the ratio of orange juice to water for the mixture?
2. Translate back
3. Translate back
4. Multiply and check units
5. Multiply and check units
6. Multiply and check units
7. Multiply and check units
8. Cross multiply or divide the two sets of numbers (calculate a second way)
9. Cross multiply or divide the two sets of numbers (calculate a second way)
10. Substitute and calculate
11. Substitute and calculate
12. Cross multiply
13. Multiply and unit analysis
14. Multiply and unit analysis
15. Sum divide and multiply
16. Divide and multiply
17. Divide and multiply
18. Divide and multiply
19. Divide and multiply
20. Calculate the ratio of answer and multiply

Module 5
1. Convert back
2. Convert back
3. Convert back
4. Convert back
5. Convert back
6. Convert back
7. Convert back
8. Convert back
9. Convert back
10. Convert back
11. Convert back
12. Convert back
13. Convert back
14. Convert back
15. Convert back
16. Convert back
17. Convert back
18. Convert back
19. Convert back
20. Convert back
21. Convert back
22. Convert back
23. Convert back
24. Convert back
25. Convert back
26. Ratio it back
27. Multiply
28. Multiply
29. Multiply
30. Multiply

Module 6

1. Expand back out
2. Redo
3. Show factors
4. show factors
5. show products and add backwards
6. add in reverse order
7. add in reverse order
8. rework
9. rework
10. rework
11. add in reverse order
12. add in reverse order
13. add
14. add
15. multiply in reverse order
16. multiply
17. rework
18. rework
19. multiply
20. rework
21. restate answer in same units
22. circle signs, reorder
23. rework
24. rework
25. rework
Section 3: Philosophy of Process Education

Goal for our children: to be empowered enough to process life and get what they want out of it (rather than life processing them). Goal for our students: to be empowered to process their life and education

Process Education— an educational philosophy focusing on improving students learning skills and creating self-growers.

Significant change will occur when society values learning to learn more than knowledge itself.

The most difficult process within the Classification of Learning Skills is assessment. The most difficult context within assessment is self-assessment.

If you want to improve teaching, give control to those teaching. (administrators should give control)
If you want to improve the quality of learning, give control those learning. (faculty should give control)

In higher education the audit has been on the product.

Principles of Process Education
Which do you feel comfortable with and which do find the hardest to put into practice?

There are always constraints but the key is to strive to improve within those constraints.

February 28, 2001

Mr. John T. Brown
Vice President for Academics
Baker College System
1050 W. Bristol Road
Flint, MI 48507

Dear John,
During my visits to Flint over the past 18 months, I have been impressed with the commitment and student-centered approach of the Baker College administration, faculty, and staff. The Pacific Crest faculty development events at Baker have been well received; the skills-based, process approach to teaching and learning being consistent and supportive of Baker’s philosophy.

My reason for writing is to express my interest in addressing a particular problem that has been brought to my attention—the low success rate of Baker students taking the basic math course. While high attrition rates are not uncommon in these types of courses, I am confident that changes can be made that will result in significant improvements with respect to student outcomes in your basic math course.

This was the case at the University of Louisville. Working closely with Carol Atnip, Director of Mathematics for the Division of Transitional Studies, we were able to significantly raise completion rates over a three-year period (refer to attached paper). The focus was on two specific courses, Prealgebra (basic math) and Beginning Algebra. Those instructors who choose to change their approach (to active learning with student self-reflection) saw their attrition rates collectively drop from 48% to 28%. However, the instructors who continued with a lecture-based approach (about one third of the instructors) had attrition rates that remained unchanged. Refer to the attached

I recommend the following action plan, consisting of six activities or events, to improve the quality of the outcomes in the basic math course.

6. **Assess the current course** and learning environment with respect to student learning, faculty teaching, curriculum design, and the use of assessment. Focus on identifying areas which can be strengthened.

7. Determine what can be done to **better prepare students** for success in this course. Identify what can be done to build a strong foundation using processes that build confidence and lead to learner ownership and empowerment.

8. **Customize a set of curriculum materials** based on two main objectives; (1) increase the number of students who complete basic math (half the failure rate in three years), and (2) increase the quality of learning that takes place for those students taking the course.
9. Provide an *annual faculty development process* to build the facilitation and assessment skills of instructors with respect to math learning skills.

10. Provide *ongoing assessment and coaching in the classroom*. As a follow-up to the annual faculty development event, a classroom visit will be made each term to provide instructors with timely feedback and address current problems.

11. *Implement a Learning-to-Learn Camp* for the least prepared students to build a strong foundation for success. The week-long camp will have a main component that addresses building students’ math learning skills. After two such camps, the college would be in position to facilitate the camp themselves.

The above mentioned activities involve the following the types of activities: an initial assessment visit, a Process Education Teaching Institute, on-campus consulting day with classroom visits, and a week-long Learning-to-Learn Camp.

The costs for these events in terms of three-year time frame are as follows:

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<td>Teaching Institute (3 days)</td>
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<td>On-campus consulting visit (10 hours)</td>
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<tr>
<td>Learning-to-Learn Camp (week)</td>
<td>$32,000</td>
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*3rd year, no Pacific Crest’ facilitation*

In conclusion, the poor completion rate of students in basic math at Baker College is a situation that can be improved upon. The resources of Pacific Crest can provide Baker College with faculty development services, curriculum that can be adapted to meet your needs, and the experience and knowledge of working with higher education for more than 15 years.
Should you have any questions or if I can be assistance, please don’t hesitate to contact me.

Sincerely,

Dr. Daniel K. Apple
President, Pacific Crest
(541) 754-1067
dan@pcrest.com
Section 4: Self-assessment of the Basic Math Program

Strengths of the current program

S: Free tutoring at the LSS – provide more time on task in a supervised and coaching arena and its free and utilizes resources more effectively – doesn’t tie up the instructors – students are cheaper resource and they have more connectedness to student perspective.

S: small class size – under 40 – Manageable – much more class interactions, oral communication can be used, instructors still can address individual needs and provide individual attention.

S: Practice test – allows the students to be able to self-assess where they are, what their strengths are, and what to focus on before they take to evaluation test. Incorporated in this processing of review testing is how math should be learned through reflective practice.

S: Flexibility to master the course early when performance meets the learning outcomes – corrects misplacements, reduces the numbers in which the instructor needs to deal with, allows the students to shift focus to the next course and work on it, and as any video games illustrate, movement forward shows progress and motivates.

S: Serves well the motivated student – Older returnee student who needs refresher it works well with – self-prescribed to build confidence – modular & master learning based thus it builds confidence as modules are completed – supportive environment of a caring and loving teacher

S: Succeed packet – a resource that each student given – The evolving nature of the package to meet needs, that students have highlighted the valuing of practice tests, study skills, grading scale, the structure or guide to the course.

S: Textbook and the accompany video – instructors feel that it is a good resource all the students say they like the textbook – how many keep it?

S: Opportunity to retake module tests once after practice test or other intervention: truly measure competency by not letting test anxiety to misread performance
S: Current content especially the computation skill – a high priority of the next courses and the programs is based upon math literacy, especially the ability to compute and fundamental math language

Areas for improvement

I: if large classes 25-40; instructors need mechanism to keep students strongly engaged – Specific techniques to support class management and produce a challenging environment for 25 to 40 students

I: Fix the number of retakes so students take test taking seriously – determine the number of retakes per term and once the number has been reach they do not pass the class.

I: Shorten the time spent on manual calculation skill development – to use a calculator when professionally people use a calculator, but only after demonstration that it can be done by hand

I: Expand the design of the grading system to incorporate more of the learning outcomes that are designed into course – Add to the expected performance criteria and expand the number of performance tasks the student need to be successful with: may incorporate a project, a teaching session, problem exercise, and a journal of reflective analysis of their self-assessment and reflective writings.

I: Define what is needed to perform successfully in the basic math course in knowledge skills, learning readiness, and process skills – LASSIE (college success course) – pure learning skills performance (California Critical thinking tests) -

I: Need to intervene on those students who are not ready with a different process - create a new process.

I: To increase attendance of students including the strong performers – Persistence log – increase the classroom value – provide motivation to attend through vehicles such as daily quizzes

Insights
I: The analysis when first determine the threshold the 85% was where the students were successful. It is important that students are prepared.

I: To qualify and train and assess and evaluate instructors of basic math – make sure they meet the profile of what a potentially successfully instructor would be, train them on the basic best practices and give them resources for advancing their practice, coach them through assessment of their practice and then set standards for minimum performance with probation periods and finally dismissal when performance doesn’t meet the standard

I: A strong recruitment program for instructors – to build a national or regional campaign for math educator that the opportunity to grow professional skills in doing math education through a quality program, training, coaching, assessing, and inclusion in constant curriculum redesign

I: Revisit the placement test – to see what it really is and what it measures and what it can provide as insight to our learners and how it is administrated.

I: Separate those who come in with proper skills from those who do. Define the various audience and have different types of sections.

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**Grading**

- B2 - #5 1.5
- B2 - #7 9/10
- D6 - #20 not reduced 2 12/21
- B2 - #19 34 14/35 (2)

- Problem 16 on 5E is confusing

**Comments:**

7) Need a set of exercises on reducing a fraction and presenting it.
8) Need a set of reducing multiplication of fraction before multiplying
9) Often the answer worked out is not related to answer placed in module
10) Need to strengthen the discipline in converting to same unit to compare numbers
11) Create an algebra readiness test - Modules 7, 8, 9, & 10 for determining readiness for an A in next course
12) 

Further Research

2) Out of 500 module tests on each module – what is the % correct of each question? Does it differ by the specific letter test?

Validation Techniques by module

Module 1

21. Add backwards
22. Add backwards
23. Subtraction
24. Addition
25. Addition
26. Addition
27. Division
28. Division
29. Division
30. Multiplication
31. Multiplication
32. Multiplication
33. Cover up the requirement and write down the place of last non 0 value
34. Ditto
35. Redo from scratch after you did the rest of problems
36. Division
37. Add backwards
38. Addition
39. Division
40. Multiplication

Module 2

21. After sequencing convert to same unit
22. After sequencing convert to same unit
23. Redo the process with reversing the numbers (also convert answer back to improper fraction and compare to addition)
24. Subtraction
25. Redo the process with reversing the numbers (also convert answer back to improper fraction and compare to addition)
26. Redo the process with reversing the numbers (also convert answer back to improper fraction and compare to addition)
27. Addition
28. Addition
29. Addition
30. Addition
31. Division
32. Division
33. Calculate right to left
34. Division
35. Calculate right to left
36. Division
37. Multiplication
38. Multiplication
39. Multiplication
40. Multiplication
Module 3

21. Check in backward order for correctness
    Check in backward order for correctness
22. Check placed round and see if matches up to request
    Check placed round and see if matches up to request
23. Subtraction
24. Add in reverse order
25. Subtraction
26. Addition
27. Addition
28. Addition
29. Addition
30. Division
31. Division
32. Division
33. Multiply in reverse order
34. Division
35. Multiply in reverse order
36. Multiply
37. Multiply
38. Multiply
39. Multiply
40. Multiply

Module 4

21. Use the words in different contexts (e.g. what is the exchange rate? What is the conversion rate? What is the ratio of orange juice to water for the mixture?)
22. Translate back
23. Translate back
24. Multiply and check units
25. Multiply and check units
26. Multiply and check units
27. Multiply and check units
28. Cross multiply or divide the two sets of numbers (calculate a second way)
29. Cross multiply or divide the two sets of numbers (calculate a second way)
30. Substitute and calculate
31. Substitute and calculate
32. Cross multiply
33. Multiply and unit analysis
34. Multiply and unit analysis
35. Sum divide and multiply
36. Divide and multiply
37. Divide and multiply
38. Divide and multiply
39. Divide and multiply
40. Calculate the ratio of answer and multiply

Module 5

31. Convert back
32. Convert back
33. Convert back
34. Convert back
35. Convert back
36. Convert back
37. Convert back
38. Convert back
39. Convert back
40. Convert back
41. Convert back
42. Convert back
43. Convert back
44. Convert back
45. Convert back
46. Convert back
47. Convert back
48. Convert back
49. Convert back
50. Convert back
51. Convert back
52. Convert back
53. Convert back
54. Convert back
55. Convert back
56. Ratio it back
57. Multiply
58. Multiply
59. Multiply
60. Multiply

Module 6

26. Expand back out
27. Divide
28.
Section 5: Basic Math Program Policies

Student Responsibility for Miss Classes

It is expected that students attend each class so that they are prepared fully for taking each and every module. Under severe situations when a student must miss a class, it is expected that they catch up before the next class period.

Here are means in which to use the campus resources to catch up.

First Option is attend another instructor’s class which are held at the following times:

Second Option – email the instructor for the assignments that are required by the next class period and use the Learning Skills Center to work through and get questions answered or send a set of questions through email to the instructor.

Team Meeting Minutes for 1-16-03

Present: Sheri Sovis, Barbara Honhart, Ronnie Bordine, Norm Kubbe, Rosalie Wild, Joyce Fremeau, Lori Ross, Tina Karsten, Anna Reseigh, Dan Apple, Carol Atnip

Roster count and number attending

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
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<tbody>
<tr>
<td>Anna</td>
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<td>12</td>
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<td>Tina</td>
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<td>23</td>
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<tr>
<td></td>
<td>36</td>
<td>33</td>
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</table>
Joyce recorded excuses from her students for missing class. The excuses included the following: car trouble, no babysitter, worked late and therefore slept in, eye infection, husband had emergency heart surgery, and sick child.

Dan suggested a “course requirement” is added that students must make up a class by attending another session or by going to the learning center – held accountable for attending class. Barbara stated that a new course requirement cannot be added at week two or three. The team will discuss how to handle this situation at the team meeting in March. For the time being – Carol will write up a guideline to encourage students to take advantage of the opportunity of making up a missed class period by several options, and to not do so will greatly effect their probability of passing the course.

**Identifying Students**
At the end of week three, Dan would like the instructors to identify each of their students as one of the following: safe, marginal plus, marginal minus, or lost (minimal success possible). Along with each identification, the instructor should give the reason why the student has been identified as such. This information should be emailed to Dan or Carol. Dan will help analyze the issues involved in helping the students be successful in the class. We will discuss these issues at the next team meeting. The date is Jan 24th.

**Carol Atnip’s Visit**
Carol will not be able to visit every instructor next week. She asked if anyone really needed to have her visit their class. Ronnie Bordine suggested that Carol visit Jim and Mike since they were unable to attend the team meeting today. Rosalie would also like Carol to visit her class. All others have no preference between a visit from Carol or Dan. Carol will develop her schedule and send it to Anna. Anna will send it to everyone on the team.

**Textbook Issues**
First, several technical editing errors need to be corrected before the next edition – please mark these in your master and we will substitute it at the end of the term.
There is no answer key. (An answer key is being developed by Rosalie). Negative numbers are used in the exercises prior to them being studied. Sequencing issues of chapters, modules, and activities will be reviewed and changed to meet the needs for the next edition.

Math Skills Assessment Issues
Some students have had difficulty loading the software on their computers at home. Dan asked the instructors to give him the names and phone numbers of those students and he will contact them. Karl will call 5 to 10 till we find the issues.

Pretest Issues
Clinton Township, Jackson, Anna, and Tina are using the redesigned pretests. Norm is not using the redesigned pretest. It is unknown if Ron Gerych, Jim, and Mike are using the redesigned pretests. Some students are putting the validated answer in the answer key as opposed to the answer to the problem. A suggestion was made that the answer key be moved to the left box.

Validation on Tests
All instructors expressed satisfaction with the validation requirement on the tests. Students also like the validation requirement, although it is an increase in the number of problems to solve on the test and an increase in the time required to complete the test.

Other Issues
Some instructors are behind in working through the math material because of the time spent doing the activities, even though the activities are worthy. Carol will analyze during her trip to make general and specific suggestions.

The next team meeting is Thursday, January 30 at 1:00 p.m.
Section 4: Course Design

Long-term Behaviors

1. Easily translates mathematical dialogue into exact mathematical representations so that they can explore, play with, and evolve mathematical understanding and meaning
2. Consistently demonstrates a self-directed approach to practice by assessing current performance against the course’s performance criteria to determine what current effort needs to be done to meet the expectations
3. Consistently documents their process of problem solving in a discipline and structure that values neatness and clarity of thinking in every significant problem solving challenge.
4. Confident in tackling new mathematical learning with enthusiasm and enjoyment for the power it will bring.
5. Aggressively links prior knowledge to new learning situations to reconcile inconsistencies in mental models to advance integrated mathematical understanding
6. Consistently chooses appropriate mathematical concepts, models and processes to given real-world situations to provide strong solutions and effective reasoning to mathematically related challenges.

Course intentions

1. To build competency (at a mastery level) in mental math computation skills independent of calculators and computers during their first two terms
2. To ensure future success in subsequent math and math-related courses
3. Increase confidence in mathematical ability
4. To alleviate any past math anxiety that has built up to allow them to obtain a fresh start
5. To strengthen their learning process of mathematics to incorporate more best practices in how they go about their learning
6. To have students to be more open to the necessary changes in their rote practices that may be illogical and inconsistent, but their belief is so strong that they can’t move forward.
7. To advance problem solving process especially in the context of story problems
8. To better use a set of validation tools (including estimation)
Measurable Learning Outcomes

Competencies
1. Can write a systematic and sequential set of steps that documents the process of problem solving that was used.
2. Can effectively use various notation and application of negative numerical models in common practice and articulate their meaning.
3. Can accurately evaluate an expression and solve an equation.

Movement/Growth
1. To increase the ability to learn mathematics and transfer the obtained knowledge to others through effectively teaching a concept
2. To become a more active learner with stronger ownership of their learning process
3. To advance the performance in interpreting, setting up, performing, documenting, and validating story problems

Experience
1. To have a few days where they become the successful mathematical expert and end up consulting to help others be successful
2. To make successful use of the supporting resources that Baker College has for mathematical learning

Integrated Performance
1. A comprehensive exploration of the effective use of mathematical reasoning and problem solving in a real-life experience (professional or personal) that increased the quality of outcome based upon the following:
   - strong problem solving process that is well documented and validated
   - the effective use of mathematical models and concepts during the project development
   - clear and effective communication in language and symbols to effectively connect to the intended audience
   - made use of new mathematical ideas outside of what was presented or covered in the course syllabus
   - incorporate a project report of self-assessment to discuss the strengths and areas to improve in their performance with learning, applying, and teaching of mathematical concepts and principles
   - to make effective use of the abundant available resources (such as design institutional resources as well as external to institution) to support their exploration and research
Knowledge Table

Learning Skills

- Estimation (Skill)
- Effectively using resources (skill)
- Pattern recognition (skill)
- Taking risks (skill)
- Validating (skill)

Concepts

- Concept of a fraction/mixed numbers (c)
- Properties of 1 & 0 - C
- Order numbers – Number Line – (C)
- Percents - C
- Exponents - C
- Variables -C
- Geometric areas - C
- Place values – C

Processes

- Long Division (P)
- Order of Operations (p)
- Round numbers (P)
- Add & subtract fractions OF like fractions (p)
- Add & subtract fraction unlike fractions (P)
- Multiply fractions - P
- Multiplying whole numbers - P
• Divide fractions - P
• Subtracting whole numbers (p)
• Adding whole numbers (p)
• Add & subtract decimals - P
• Multiply decimals - P
• Divide decimals - P
• Converting decimals to fractions to percents - P
• Sorting numbers - P
• Solve a proportion - P
• Solving for a variable - P
• Substitution - P
• Reducing fractions - P
• Problem Solving - P
• Unit rate – P
• Converting mixed numbers to improper fractions - P

Tools
• Sets of numbers (tool)
• Calculator - T
• Fact tables - T

Contextual Knowledge
• Use of Negative numbers in Computation (context)
• Translating English language to symbolic - contextual
• rates vs. ratios – Contextual

Way of Being
• Neatness - WOB
- Self-assessment - WOB

Baker College

Knowledge Table for Basic Math Course

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Processes</th>
<th>Tools</th>
<th>Contextual</th>
<th>Ways of Being</th>
<th>Skills</th>
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<td>Long Division (1.4)</td>
<td>Sets of numbers (Ch 1.1)</td>
<td>Use of Negative numbers in Computation Ch 4</td>
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numbers to improper fractions (Ch 2.6)

## Module to text mapping

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<th>Module 1</th>
<th>Knowl Table</th>
<th>In Text</th>
<th>Explained</th>
<th>Models</th>
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<td>Y</td>
<td>pp 2 – 5</td>
<td>P2</td>
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<td>3</td>
<td>n</td>
<td>I</td>
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<td>Whole number addition facts</td>
<td>1 – 12, 15 - 20</td>
<td>Y</td>
<td>pp 6 – 8</td>
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<td>No</td>
<td>#3</td>
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<td>Y</td>
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<td>pp 23 - 27</td>
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## Themes

1. Building Computation skill
2. Problem Solving
3. Language Development
4. Neatness/preciseness/clarity
5. Self-assessment

### 1. Learn a beginning concept in Intro to Algebra as an independent self-directed learner of mathematics up to level 3 knowledge application in Bloom, in a real-world context from their life

Factors: application to a new context

### 2. Consistently produce an orderly problem solving process with the accompanying validation

<table>
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<th>Pp 128 - 141</th>
<th>128, 137</th>
<th>6 for + 4 for –</th>
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<td>Distributive property (?) or order of ops.</td>
<td>23 – 25</td>
<td>N</td>
<td>37 - 41</td>
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</table>
Factors: their documentation of their process

3. Confident, competent, and comfortable in computing basic expressions using precise mathematical language and rules by hand and computing tools
   Factors: accuracy in doing calculations across any course content with documented validation
   Factors: the growth in comfort and confidence through writings over time

4. Consistently chooses the best mathematical approach to real-world problem as well as during academic settings

5. Easily teach others the fundamental mathematical concepts and processes to beginning students in a peer tutoring environment
   Factors: measure level of learning of the student being taught
   Factors: effectiveness of teaching approach and quality of articulation of the mathematical concepts or processes

6. Very persistent during the difficult learning challenges by seeking additional resources and alternative approaches to achieve learning success
   Factors: the time spent with alternative sources
   Factors: The number of different sources used

7. Appreciates the value of mathematics and learns it with robust curiosity by asking questions, exploring solutions independently and expressing pleasure in accomplishment.
   Factors: Interest and inquisitiveness level in mathematics
   Factors: helpfulness in sharing knowledge with others

8. Risk taker, responds favorably to assessment, deals with evaluation productively and is aggressive in seeking mastery in common educational environments

**Key Learning Skills**

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**Design the course assessment system**

Students will be continually assessed throughout the course with the goal of growing performance in the key skill areas and progress through the performance criteria.

**course evaluation system**

From the following list of student products, decide what percentage of the students’ grade should come from which factor.

1. LAJ
2. Learning Journal
3. Math and Graphing Skills
4. Modules
5. Problem Solving Project

Since the textbook needs to support the complete learning process, it will have the following sections for each and every knowledge item.

1) Clear Presentation of the Concept
2) Models/Examples for each Concept
3) An activity to assist Student Learning
4) Key Critical Questions to Develop Comprehension and Understanding
5) Skill Exercises to build proficiencies
6) Practice Tests
7) Problem Solving challenges to put the skill in context
8) Validation Techniques integrated throughout each section

I. Criteria for presentation

Concise
Illustrative
Focused
Relate to module component
Clear
Comprehensive for the topic
Validation techniques
2. Models
Diverse
Multilevel from simple to complex
Related to the modules
No missing intermediate step
Context presented

Validation

3. The activity
Justification for the content (motivation for the learner)
Clear direction
Defines the performance expectation
Baseline expectation
Links resources to the performance expectation (LAJ, M&GS, Models, written materials)
Identifies the vocabulary challenges for the content
4. CTQ
Directed to assess preparation
Cornerstones are laid
Key relationships are formed
Sequenced appropriately
Comprehensive to meet the learning challenge
Clear in articulation
Doable based upon expected skill level
Linked to the discussion and models
Challenging
Provide appropriate white space to fully develop quality answers

5. Skill Exercises
Graduated in difficulty
Context
Build to the performance expectation
Designed for thinking, not mimicking
Minimum sufficient set
Complement but do not replace software
Additional problem set available on Blackboard
Space is designed for validation

Module pretest
More challenging than the modules
Uses validation
Multiple tests so can be repeated (test 2 -> test 4 on line)
Assessment component to determine errors
Problem Solving Context
Relevant for this audience
Graded from easier to more difficult
Grow skills in interpreting language

Baker College Basic Math Activities Book Design
Baker College – Auburn Hills
March 17 – 20, 2003

Workshop Agenda ................................................................. 67
Development Cycle........................................................................ 68
Style Guide.................................................................................. 68
Integration Plan for the LAJ and activities book......................... 69
Support needed.......................................................................... 69
Template for an activity.............................................................. 70
Methodology for designing and activity....................................... 70
Process of Designing of an Activity: Addition and Subtraction of Fractions.................. 72
Table of Contents for the Activity Book.................................... 82
Activity Design Model for Prime Factorization......................... 86

Workshop Agenda
1. Table of Contents
2. Specifications on the Content
3. Criteria for what makes a quality chapter
4. Style Guide
5. Model of an Activity
6. Schedule for development
7. Techniques for writing CTQ
8. Error analysis of modules for designing activities
9. Publishing agreements
10. Support plan

Development Cycle

Author drafts activities – with coaching – and sends to paired reviewer.
Reviewer sends comments back to author.
Author makes changes and sends to Carol.
Carol approves or suggests changes and then sends to Joyce.
Joyce edits and posts through Carol for team review (2 weeks for review).
Author makes final changes based upon feedback and sends to Carol.
Carol sends to technical editor for final editing.
Technical Editor makes changes and sends to Karl
Joyce does one more pass after Karl finalizes.

Style Guide

1. Methodologies will be in tables
2. For this edition – will be black and white (including shades) – but save color images for next edition.
3. Type set 12 point font
4. Style type – math type should match the font type
5. Use of as many images in the pre-activity reading (save the images in some transferable form j-peg format) as practical.
6. Three pages maximum for pre-activity reading
7. See the specifications
8. See the criteria list
9. Word is the original copy –
10. Text boxes or table?

Integration Plan for the LAJ and activities book

1. Combine the two resources into one.
2. At the end of each chapter there are two reading logs (with permission that copying is allow for additional)
3. At the end of each activity – one self-assessment form. (one page)
4. Collection points/.note area; one page for each activity.
5. Student generated glossary at the end of the book – Carol will do it and it will provide 3 columns – one for the word, one for student description, and an illustration
6. Appendix for the cooperative learning tools
7. One free writing per chapter
8. Appendix – pull out from FOL the description of the roles
9. Add an additional activity on the Reading Process & Problem Solving Process

Support needed

1. Dan and Carol will visit every two weeks – Carol will set up the schedule with Karl
2. Paired reviewer for each author
3. Style guide
4. Specifications sheet(s)
5. Criteria List updated
6. Designer – Karl will take care of the math type setting.
7.
Template for an activity

Title
Why
Learning Objectives
Performance Criteria
Things to know
Common Errors
Success Tips
Models/Examples with validation
Critical Thinking Questions
Work Sheet of module like problems with space for estimation and validation.
Corrections of poorly worked out problems.

Methodology for designing and activity

Step 1: Title: Label the title to accurately reflect the knowledge item.
Step 2: Justification: What is it; Why, big picture; Why, learner.
Step 3: Learning Objectives: 2 to 3 learning objectives per activity – critical thinking 15 –20 minutes
Step 4: Performance Criteria with factors
Step 5: Facts that need to be known
Step 6: Top 5 Common Errors
Step 7: Tips for success
Step 8: Critical Thinking Questions: Directed, Convergent, Divergent
Step 9: Presentation:
   Illustration
   Concept
Notation
Terminology
Mathematical properties, principles, and laws
Explanation: Methodology for process knowledge or conceptual development

Estimation & Validation
Step 10: Models/Examples with validation
Step 11: Work Sheet of module-like problems with space for estimation and validation
Process of Designing of an Activity: Addition and Subtraction of Fractions

Step 1: Title
Label the title to accurately reflect the knowledge item.

Adding and Subtracting Fractions

Step 2: Justification

What?
Fractional arithmetic is the ability to apply basic math operations with fractional notation.

Why is it Important to the big picture?
Fractions provide holistic insights into the comparisons of numbers, such as ratios, rates, and proportions.

Why is it relevant to the learner?
Fractions are commonly used in a wide range of activities such as cooking, music, measurement, and sports betting. (should be contextual for the activity)

Step 3: Learning Objectives

2 to 3 learning objectives per activity – critical thinking 15 –20 minutes

LO 1: To add any two or more fractions
LO 2: To subtract any fraction from another fraction
LO 3: To learn to estimate and validate that the operation was done correctly
Step 4: Performance Criteria

PC 1: Add or subtract any combination of fractions and mixed numbers.
- Accurate
- Validated
- Estimated

PC 2: Quality of the Presentation
- Reduced
- Neat
- Logical flow
Step 5: Facts that need to be known

Common denominators are required for adding and subtracting fractions.
When mixed numbers are added remember to carry if the numerator of the fraction is greater than the denominator.
When mixed numbers are subtracted borrow only when needed.
Always find the LCD for fractions being added or subtracted.
Always reduce before (to make calculations simpler to do) and after calculations.
Validate by using the opposite operation and a different method.

Step 6: Top 5 Common Errors

1. Not reducing.
2. Not adjusting the numerator to balance the change in the denominator.
3. Not borrowing correctly.
5. Subtract based upon the size of the fraction rather than the position in the problem.
6. Losing sight of the operation being performed.
7. Not using LCD.
8. Notation: [Note incorrect ways as well] writing 2 2/3 =4/6 (carrying the whole number with the changed fraction.)

Step 7: Tips for success

1. Graph Paper
2. Take the easy path.

Step 8: Critical Thinking Questions

Directed Questions

1. What is the property of one?
2. What do you need to do to subtract or add fractions with common denominators?

3. When do you need to borrow or carry in fractional calculations?

4. What are three methods/tools for finding the LCD?
   • 
   • 
   • 

Convergent Questions
5. In order to add or subtract fractions, when and why is it essential to convert to least common denominators?

6. What are the important steps in converting fractions to equivalent fractions with a LCD?
7. How do you assure that the new equivalent fractions are correctly built up?

Divergent

8. What are the reasons that fractions intimidate individuals?

Step 9: Presentation

Illustration
Concept
Notation
Terminology
Mathematical properties, principles, and laws
Explanation: Methodology for process knowledge or conceptual development
Estimation & Validation

Illustration:
Three brothers were on a ski trip. They had 5 energy bars to share. Each had $\frac{1}{2}$ bar and they saved the rest. Later their sisters met up with them and shared their remaining bars…

Concept
Addition of fractions is the process of aligning the whole number part and the fraction part with common denominators to perform an addition.

Notation:
All possible ways to write a problem

Math principles, properties, laws
   New: Property of 1; Fundamental Principle/Property of Fractions
   Previous: Associative, commutative, equivalent statements

Terminology
   Previous terms, numerator, denominator, equivalent fractions
   New terms

Explanation: Addition of Mixed Numbers

Methodology: if more than three steps to apply, from the student perspective, then it’s process knowledge and a methodology should be presented.

   Step 1 set up the problem
   Step 2 estimate the answer
   Step 3 determine the easiest method/easiest path and appropriate approach
   Step 4 determine if the denominators are like or unlike
   Step 5 find the LCD and construct equivalent fractions
   Step 6 determine if borrowing is needed for subtraction; convert as necessary
   Step 7 combine the numerators, keep the same denominator
   Step 8 reduce to lowest terms
Step 9 validate
Methodology

Situation:  want to add 4 and 5/6 with 2 and 3/8.

| Step 1: Setting up the problem | 4 5/6 + 2 3/8 |
| Make sure that whole numbers align and the fractional parts align. |

| Step 2: Estimate the answer | 4 5 +2 3 |
| By obtaining an underestimate and an overestimate we know the answer must be between 6 and 8. |

| Step 3: Determine the easiest path and appropriate approach: | Adding mix numbers approach |

| Step 4: Find the LCD if denominators are unlike | 6 and 8 are unlike |
| Notice the denominators 6 and 8 are not the same thus a LCD needs to be developed. Notice that we must have all the factors in LCD that is in either of the denominators. |
| 6 = 3*2 |
| 8 = 2*2*2 thus 3*2*2*2 = 24 |

| Step 5: Find the equivalent fractions and validate. | 5 * 4 = 20 |
| The LCD is 24 thus using the property of one, we can multiply 4/4 and 3/3 to create the equivalent fractions. Make sure that your multiplication is correct by cross multiplying 24* 5 = 20 * 6 and 24 * 3 = 9 * 8 to see if they are equal. |
| 6 * 4 = 24 |
| 3 * 3 = 9 |
| 8 * 3 = 24 |

| Step 6: If subtraction, determine if borrowing is needed | Not needed, it is an addition |

| Step 7: Setup the problem substituting the equivalent fractions and perform the operation. |
| Make sure you add the whole numbers separately from the fractional components. |

| 4 20/24 |
| 6 29/24 |
| + 2 9/24 |
Step 8: Convert improper fractional components to mix number. Since \( \frac{29}{24} \) is an improper fraction it can be converted and then added to the whole number.

\[
\frac{29}{24} = 1 + \frac{5}{24}
\]

\[
6 + 1 + \frac{5}{24} = 7 \frac{5}{24}
\]

<table>
<thead>
<tr>
<th>Step 9: Reduce the fractional component</th>
<th>It is already reduced</th>
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</table>

<table>
<thead>
<tr>
<th>Step 10: Validate the answer</th>
<th>See the discussion below.</th>
</tr>
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</table>

\[
7 \frac{5}{24} - \frac{9}{24} = 4 \frac{20}{24}
\]
Validation

There are three techniques for validation: estimation, using the opposite operation, and using a different method/approach.

Step 10
Models/Examples with validation
  Addition or Subtraction of proper fractions
  Subtraction with borrowing
  Whole with a mix number
  Addition of multiple mix numbers

Properties to be incorporated

1. Property of One    1 and 2
2. Commutative Property   1
3. Associative Property   1
4. Property of Zero    1 and 2
5. Multiplication property of equality 4
6. Additive property of equality 4

Step 11
Work Sheet of module like problems with space for estimation and validation.
  6 to 10 total problems
Corrections of poorly worked out problems.
  No more than six problems
  Use the error analysis and section on common errors for determining the problems presented.
Table of Contents for the Activity Book

Introduction to the Activities Book

Module 1

Preview to the chapter
Pre-assessment Instrument

Pre-activity reading: Whole Numbers (place values, various notations, translating between symbolic and English language, )
   Activity 1.1: Whole Numbers
   Activity 1.2 Advancing your basic math fact skills
Pre-activity reading: Estimating, Rounding, and Validating (Including number line)
   Activity 1.3 Estimating, Rounding, and Validating
Pre-activity reading: Adding and Subtracting Whole Numbers
   Activity 1.4 Adding and Subtracting Whole Numbers
Pre-activity reading: Multiplying Whole Numbers
   Activity 1.5 Multiplying Whole Numbers
Pre-activity reading: Dividing Whole Numbers
   Activity 1.6 Dividing Whole Numbers
Pre-activity Reading: Prime Factorization
   Activity 1.7 Prime Factorization

Practice Test

Module 2:

Preview to the chapter
Pre-assessment Instrument

Pre-activity Reading: Introduction to Fractions (notation – mix numbers, terminology, concept and meaning of the relationship of the numerator to denominator, parts to the whole, relationship of fraction to division, converting fractions to different forms)
   Activity 2.1 Exploring Fractions
Pre-activity Reading: Creating Equivalent Fractions using LCD (including reducing)
Activity 2.2  Ordering Fractions
Pre-activity Reading: Adding and Subtracting Fractions (property of one)
Activity 2.3  Adding and Subtracting Fractions
Pre-activity Reading: Multiplying and Dividing of Fractions
Activity 2.4  Multiplying and Dividing Fractions

Module 3:
Preview to the chapter
Pre-assessment Instrument
Pre-activity reading: Connecting Decimals with Whole Numbers (ordering)
Activity 3.1  Relating Decimals with Whole Numbers
Pre-activity reading: Adding and Subtracting Decimals
Activity 3.2  Adding and Subtracting Decimals
Pre-activity reading: Multiplication of Decimals
Activity 3.3  Multiplication of Decimals
Pre-activity reading: Division of Decimals
Activity 3.4  Division of Decimals

Chapter 4
Preview to the chapter
Pre-assessment Instrument
Pre-activity reading: Ratios (order in writing ratios, any units, simplest form, higher primes)
Activity 4.1  Writing ratios
Pre-activity reading: Rates and Unit Rates (units must be different, notation, simplest form, ordering rates)
Activity 4.2  Writing and ordering rates
Pre-activity reading: Interpreting Word Problems
Activity 4.3  Interpret and writing Ratios, Rates, and Unit Rates (differentiating)
Pre-activity reading: Writing Proportions (equations vs. expression, dimensional analysis, determining if they are true)
Activity 4.4  Writing & Validating Proportions
Pre-activity reading: Solving for an Unknown in Proportion (variables, algebraic principles, substitutions)
  Activity 4.5 Solving for an Unknown in Proportions
Pre-activity reading: Problem Solving Process
  Activity 4.6 Solving Application Problems
Practice Test

Chapter 5
Preview to the chapter
Pre-assessment Instrument
Pre-activity reading: Percents and Converting Between Decimals and Percents (movement of the decimal place)
  Activity 5.1 Percents and Converting Between Decimals and Percents
Pre-activity reading: Converting between Fractions, Decimals and Percents
  Activity 5.2 Converting Between Fractions, Decimals and Percents (Ordering Fractions, Decimals and Percents)
Pre-activity reading: More tools in Interpreting and Solving Word Problems
  Activity 5.3 Solving More Application Problems
Pre-activity reading: Introduction to Geometric Objects
  Activity 5.4 Solving More Application Problems in areas and perimeters
Practice Test

Chapter 6
Preview to the chapter
Pre-assessment Instrument
Pre-activity Reading: Advanced Addition and Subtraction
  Activity 6.1 Advanced Addition and Subtraction
Pre-activity Reading: Advanced Multiplication and Division
  Activity 6.2 Advanced Multiplication and Division
Pre-activity Reading: Exponents
  Activity 6.3 Exponents
Pre-activity Reading: Order of Operations
   Activity 6.4 Order of Operations
   Activity 6.5 Problem Solving with Numbers (gain true sense of ordering real numbers)
Activity Design Model for Prime Factorization

Step 1: Finding Prime Factors

Step 2: Why

Every whole number can be written as the product of a unique set of prime factors. The analysis of a whole number is used in many other mathematical situations covered in this course, including fractions and proportions. Learning to break things into their components is a necessary skill for almost every occupation.

Step 3: Learning Objectives

Lo1: To be able to determine if a number is prime.
LO2: To find the prime factors of a number.
LO3: Build a tool kit for doing prime factorization.

Step 4: Performance Criteria

PC1: Write any composite number as a product of primes
• accuracy
• appropriate notation
• validated

PC2: Determine if a number is a composite number or prime number
• correctly classified
• validated by using multiple methods

Step 5:

Vocabulary
Prime number
Composite
Prime factor
Exponent

Things to know/key facts

- 0 and 1 are special cases and neither prime nor composite
- This tests your multiplication facts
- Use of the divisibility rules is critical
- Use of the Tile method
- Factoring Tree

Common errors

- accepting non-prime factors
- lack of systematic process
- not validating

Tips for Success

Neatness
Documentation of steps
Graph paper

Models/examples
Higher level Tile method
Higher level Factor tree
Critical Thinking Questions

1. What are the first ten prime numbers?

2. Why are 0 and 1 not prime numbers?

3. What are three methods to find prime number factors?

4. What are four applications for prime numbers in this course?

5. Why are the divisibility rules important in quickly finding the prime numbers factors?

6. Why do we represent multiple prime factors with the use of an exponent?

7. How do you make sure the prime factors are truly correct?
8. How do you differentiate and validate a prime number from a composite number?

9. How would you go about finding a prime number that is greater than greatest prime number currently known?

Work Sheet of module like problems with space for estimation and validation.
   6 to 10 total problems
Corrections of poorly worked out problems.
   No more than six problems
   Use the error analysis and section on common errors for determining the problems presented.

Pre-activity Reading

Illustration

Isn’t it amazing that looking at a multiplication table that some numbers cannot be generated through the multiplication of other numbers. Look at the table below, what is the first number missing when multiplying other numbers in the 5 X 25 table? Map the composites over to the number line and circle the missing numbers to find the first 15 missing numbers.

| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 |
3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | 39 | 42 | 45 | 48 | 51 | 54 | 57 | 60 | 63 | 66 | 69 | 72 | 75 |
4 | 8 |12 |16 |20 |24 |28 |32 |36 |40 |44 |48 |52 |56 |60 |64 |68 |72 |76 |80 |84 |88 |92 |96 |100 |
5 |10 |15 |20 |25 |30 |35 |40 |45 |50 |55 |60 |65 |70 |75 |80 |85 |90 |95 |100 |105 |110 |115 |120 |125 |
Concept

The numbers that appear in the multiplication table are called composite numbers because they are constructed (composed) by multiplying two whole numbers other than 0 or 1. The numbers that can’t be constructed by multiplying two whole numbers (excluding 0 and 1) are called prime numbers.

Notation

2*2*2*3*3  = 2^3*3^2

Terminology

Composite Number
Prime Number
Prime Factors
Exponent

Math Principles

Every composite number has a unique set of prime factors.
Using again:  Commutative law

Explanation

Divisibility Rules
Tool 1 – Tile Method

Tool 2 – Factoring Tree

Validation

Simply multiply the factors out twice – forward and then backwards.

Prime numbers tested must pass the largest prime when multiplied by itself exceeds the number being questioned.
Section 11 – Learning Assessment Journal

11 tools; use six for the course.

Glossary – Lori picks top 25-50 key vocabulary words
Reading Log – critical for preparation for class (every reading activity)
Collection Point – where students collect thoughts and ideas, a focus place, note taking
Free Writing – affect management, frustrations…prompt with questions, not just freestyle writing. Outside of class activity. What are your worst nightmares in learning math and how did you deal with them? (do not peer assess) (once per week)
Self-assessment - need to be assessed; focus areas are important, use the course key skills. (do not peer assess) (after each class)
Reflector Report
Recorder Report

Questions on the LAJ:
1. Were the objectives and performance criteria given to students before use? How much training on the forms is needed? Use, assess, improve use. Understand purpose, identify features, use, limitations.
2. How does the facilitator provide feedback to students on the LAJ forms? Quality feedback is critical to getting the students to use the forms to improve their ability to self-assess. How to assess and how to evaluate? Keep it as a book (don’t tear out the forms), assess during class while students are working, grade once at the end of the term.
3. Evaluating the LAJ: 50% on completion; then levels of quality,
4. Night classes meet once per week, are all assignments doubled? How do you sustain engagement over a 4 hour class?

For the student demonstration: Student buy-in?, Student expectations?
1. How, at the student level, fast the activity is accepted…the strength of their learning experience and it’s outcome.
2. Highly engage students in the process of learning math: read, thinking to bring meaning, transfer math/apply to relevant context, work on teaching a math idea.
3. Performance in roles
4. Students can choose (as a group) which topic will be covered.
5. Problem 1 on page 188 will be used as a gaming example.
6. How to constantly get students to engage with their team. (How strong students are engaged in their learning.)
7. How do you get rid of the excess baggage students bring to class. Use LAJ for affect, respond from failure to build ability to throw off past baggage
8. Self-assessment, team and individual.
9. Help students to transition from teacher centered to learner centered.

**Baker Author’s Meeting Minutes**
*May 27, 2003*
*4:00 – 5:30*

In attendance: Chris, Debra, Rose, Sharleen, Ronnie, Carol, Dan, Barbara, Lori, Joyce, Teresa, Ron, Rosalie.

Agenda:

1. Agreement of format
2. Development schedule
3. Discussion on reflection component
4. Review process
5. Next conference call

Dan reviewed the format as it has evolved: Part 1 to be done prior to class; Part 2 to be done in class. Amendments to the format will be discussed and changed by consensus.

Part 1

1. **Illustration of the concept** - Reading from Tobey/Slater; if not adequate author writes a motivation of the topic as warm up for the student.
2. **Terminology** - choices are to have students capture all vocabulary themselves; provide a list of terms; provide definitions and have students transcribe into their own words.
3. **Notation**
4. **Methodology** - including validation as the last step; with a model provided if not in Tobey/Slater.
5. **Validation** if not in Tobey/Slater.
Part 2

1. Why
2. Learning Objectives
3. Performance Criteria
4. Things to Know
5. Models
6. Common Errors
7. Tips for success
8. CTQ
9. Skills
10. Correct These Problems

Suggested for inclusion: Table of Principles and Properties (can be referred to in the Things to Know)

Part 1

1. Pre-activity preparation – Illustration

   Why and illustration parallel each other and might need to be put together so the instructor can use it to introduce the material. Authors can put a “Why learn it” and give a context for use as the introduction to the topic. The WHY statement answers three questions: What is this, why is it important, what impact (relevance) does it have to the learner.

1. Should the activities have a section for Pre-activity? (Agreed, 5/27)
Pre-activity section should include everything before the Critical Thinking Questions. The in-class activity will begin with the CTQ’s.

NOTE: This was later amended to include the Learning Objectives in the in-class activity as a starting place for students.

2. Should the WHY and Illustration be combined? (Agreed 5/27)

The pre-activity instructions will be referenced by page number and section number for all readings, illustrations, warm-ups, etc., wherever necessary. The author is responsible for referencing Tobey/Slater; there must be both a WHY and a warm-up/illustration. If not, then the author will write both a WHY and an illustration to motivate the activity and concepts.

3. Author’s discretion on “valued added”, component by component; will not be judged but open for review (assessment) to strengthen added value but review can’t over rule author’s decision. (Agreed, 5/27)

Terminology

Choices for format for Terminology:
- Listed in a section in each activity by author with space for adding words,
- Glossary with blanks for adding words;
- Students generate glossary (re-definition in their own language).
4. Will new words be presented to the student in list format, then students can capture their own meaning by building their own glossary? (Can use new words and appropriate old terms.) (Agreed, 5/27)

Notation

If it is in Tobey/Slater, author can leave the section blank for students to fill in symbols, including primary and supplementary notation, language as well as symbols.

Notation links can be made in CTQ’s but need to be explicit.

5. Should there be a section on notation? (Agreed, 5/27)

Methodologies

When application requires more than 3 steps, including validation, a methodology should be created. It should be presented in a table with examples. Estimation and validation are important steps. Students should be held accountable for the steps in each methodology.

Writers can reference methodologies in Tobey/Slater or can create their own.
As time was running out, discussion ensued on meeting again. After some negotiation the following date will be scheduled: May 29 4:30 – 5:30.

Review Process

As the review process progresses it will be necessary to keep track of changes, updated documents, assessments and other issues. For each document there should be a cover page with a review table: who has reviewed, when; which document version; and progress of each activity.

Thursday 4:30

In attendance: Chris, Debra, Rose, Sharleen, Ronnie, Carol, Dan, Barbara, Lori, Joyce, Teresa, Ron, Rosalie.

Restatement: If it is in Tobey/Slater, reference it by page number, don’t restate it.

The dividing point between pre-activity and in class activity is CTQ’s

6. Validation: Should there be a section for validation other than in the CTQ’s?

   Explicit validation in multiple contexts on each component in the course is expected; if it is in T/S, reference it, if not, create it.
Learning Objectives and Performance Criteria

Learning Objectives: T/S has lists of Learning Objectives in each section. If AB is different list them, in not, reference them.

Performance Criteria: The performance level the student should meet in order to pass the module test. Performance Criteria should go across the Learning Objectives.

Perhaps put the Learning Objectives and Performance Criteria in the activity rather than in the pre-activity?

Learning Objectives will be used as a segue to the in-class activity and will precede the Critical Thinking Questions.

7. Should the Activity Book include Learning Objectives and Performance Criteria?

Things to Know:
List of facts faculty use to get the content summarized for the students.

Ronne: wants students to summarize for themselves in a collection point area in the AB.

Should Things to Know be explicit for the students? –Should be in the pre-activity after validation section, the last thing in the pre-activity. Students could use the list as a prompt for re-reading. Change the name to Preparation Assessment/Inventory –the learning outcome form pre-activity preparation.

8. Should the Activity Book have a section of “things to know” called Preparation Assessment/Inventory?
Common Errors

<table>
<thead>
<tr>
<th>Issue</th>
<th>Example</th>
<th>Resolution (leave blank)</th>
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</thead>
<tbody>
<tr>
<td>Students should analyze the issue and example and as a group work on the resolution. Put it in the pre-activity but process in class as needed and last class activity will be to fill in the last column.</td>
<td></td>
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</tr>
</tbody>
</table>

9. **Should the pre-activity contain a section called Common Errors?**

Models:

Context of the module tests need to be explicitly covered by models. Need 2 easy, one more complex, with validation. Should be tied to the CTQ’s.

10. **Should the Activities Book contain Models non-redundant with Tobey/Slater?**

11. **CTQ – All agree.**

Skills

Faculty need to be able to assess students’ work in class before practice with homework problems. Faculty now simply check off or even grade homework rather than assess the work. Students need to demonstrate their work with validation so the facilitator can assess work in class. Space will be provided in the AB for the work. Author can reference problems or can create their own. Assessing practice is the goal. Faculty should to have enough to be able to assess each Performance Criteria.

12. **Should a limited set of skill exercises be included in the Activities Book?**
Tips for success:

Should it be combined with Preparation Inventory as they are closely aligned? Can also be included in students’ self-assessment and reflections. Tips for success are different enough to be included in the activity as discussion within groups.

13. Should Tips for success be included in the Activity Book?

Fix Errors – let the students fix the errors.

Sidebars:

1. Rosalie: How many pages will the supplement be and much will it cost the students? Should run about $25 or so depending on length of the activity book. The supplement will be as long as it has to be to include all of the components needed for instructors to ensure success of their students.

2. The number of activities planned for the activities book was questioned and authors were referred to work done in March that mapped activities with knowledge table and contents of module tests. Some activities will not need to be covered in class, but can be tested out with the module test.

3. Barbara suggests that the AB have more rather than less for the first go-around and then pare down as needed.

4. Barbara offers kudos to all the brave authors who have volunteered to draft chapters for the activity book.

5. Chris offered words of encouragement and reminded everyone that the project was moving forward very rapidly and consensus agreements would ensure the high quality we want and expect.

6. Dan thanks everyone for their energy and input.

Teresa shared her design for activities that she had posted on Blackboard.

PRE- ACTIVITY
1- Illustration/Why statement
2- Terminology- Key words to be written in Glossary.
3- Notation
4- Assignment from Tobey/Slater (to be followed by...)
5- Reading Log(s)- If one is needed for each activity.
6- Models: With a sentence stating 'See Methodologies on pg. ---'
7- Estimation and Validation techniques.
8- Review (aka Things to Know)- could also go as first section of the Class Activity

CLASS ACTIVITY
1- Critical Thinking Questions
2- Tips for Success
3- Skill Exercises
4- Find the Errors
5- Common Errors (Leave Blank- or provide maybe 1 or 2 out 5)

Inventory of reflection tools:
  Reading Log -18 logs; 36 pages
  Glossary - 5 pages
  Free writing –
  Collection Points
  Self Assessments

All agenda items were not finalized therefore another conference call is scheduled for Friday, June 6 from 2:00 - 4:00, Baker time.

Summary of included topics to date:

Part 1
1. Illustration of the concept with Why and Performance Criteria
2. Terminology
3. Notation
4. Methodology
5. Validation/Estimation
6. Models
7. Common Errors
8. Things to Know

Part 2
1. Learning Objectives
2. CTQ
3. Tips for success
4. Skills
5. Correct These Problems

Votes:

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<td>9. Common Errors</td>
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Section 8: Improving Performance in an Active Learning Environment

Most individuals when they are introduced to a process learning environment find that they would like to increase their performance. Many faculty are not use to an active learning environment and would like to perform much better than they initially do. This discussion is to help you improve your performance so that you can obtain more knowledge at a higher level, grow your own learning skills, accomplish more of your learning objectives, and finally feel better about yourself during the time invested. What are the main reasons for lack of performance?

1. The shift of ownership of the overall process from the facilitator to the learners and the community of learners.
2. The shift from information transfer to active learning situations.
3. The shift from expert performing the communication of knowledge to the learners constructing knowledge.
4. The shift from learning in private to learning in public.
5. The shift from working as an individual to learning within a community of learners.
6. The shift from being evaluated under a clear set of rules by the expert to more focusing on self-assessment of performance to improve future performance.
7. The shift from external affirmation to self-affirmation.
8. The shift from performing for others to performing for yourself.
9. The extended boundaries of how to go about performing, while at the same time having strong performance criteria that must be met.
10. The diversity of interests and disciplines, inability to truly communicate across cultures and value systems, and lack of leadership and teamwork skills.
11. Learning to measure what is learned and growth gained and not feel bad about missed opportunities.
12. Performing three roles at the same time: learner, teacher, and researcher of a process learning environment.

These common concerns and issues can be grouped into the following areas of exploration where many are addressed together and revisited often.

1. How to perform an activity
2. How to perform as a leader
3. How to perform well as a team and community member in a learning community
4. How to set strong learning objectives and monitor progress over time
5. How to manage your own personal emotions effectively ("affective management") and assist those around you
6. How to obtain a working understanding of a system to optimize the system for personal benefit.

1. The shift of ownership of the overall process from the facilitator to the learners and the learning community. (3,4,5,6)
2. The shift from information transfer to active learning situations. (1)
3. The shift from expert performing the communication of knowledge to the learners constructing knowledge (1,.
4. The shift from learning in private to learning in public.
5. The shift from working as an individual to learning within a community of learners.
6. The shift from being evaluated under a clear set of rules by the expert to more focusing on self-assessment of performance to improve future performance.
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11. Learning to measure what is learned and growth gained and not feel bad about missed opportunities.
12. Performing three roles at the same time: learner, teacher, and researcher of a process learning environment.
How to perform an activity better

Step 1: Prepare for the activity

Most individuals love to perform well and most people need the proper preparation in order to perform well. The important characteristics in of a quality preparation are: obtaining the proper background information, getting a good systematic overview, understanding of the current and future context, understanding why the activity is being undertaken, knowing the overall objectives from the activity, and knowing what performance criteria needs to be met and how it will be measured. With this you need to understand the constraints in the system (all boundaries), available resources, the general framework that you can operate within, and risks to performing well. As in most situations the more that you learn to get prepare and then assess your preparation level after the activity the better you will perform in the future. The following is an assessment tool for measuring the quality of preparation.

Understanding the why
   Can rephrase what is going to be learned
   Can identify how it fits in a big picture
   Can state relevance and personal value
   Can enrich the why to meet personal learning goals
   Can link activity to past activities

Systematic Overview
   Can match activity to appropriate goals set for the learning process (institute, course, program, etc.
   Can identify the boundaries for this activity
   Can layout and organize the structure and priorities for the activity
   Can reuse previous activities and their performance as basis for performing this activity
   Can produce a simple diagram of the activity with known constraints

Obtained Appropriate Information and Background
   Organized the set of informational resources
   Produced a quality reading log of these sources
   Have produced a set of working questions that need to be addressed
   Inventory prior knowledge that is relevant
   Related personal experiences to given learning situation
Understanding current and future context and objectives
   Can rephrase the objectives
   Can clarify the current context for the activity (eg. learner, teacher, or researcher)
   Can clarify the future context for the activity (eg. learner, teacher, or researcher)
   Know what are the liabilities for the given activity (how important to the evaluation system
   Know what the overall support and resources you have available for the current activity

Understanding the performance criteria and assessment/evaluation systems
   Can rephrase the performance criteria
   Can rephrase the factors
   Know how the factors are going to be measure
   Can relate the components of the activity to factors that are being measured
   Know the value of this activity to the bigger picture of assessment and evaluation
Step 2 Setup for the Activity

The time before actually doing the activity should be approximately 2 to 5 percent of the total time. In this period of time organization is a must. The allocation of roles if using a team, collection of resources, setting up the learning environment (getting rid of extraneous materials), and establishing any operating rules, conventions, and curtesies. Coming to agreement to what is expected and shared understanding of the activity is critical to the performance of the activity.

Activity Setup
- Assigning appropriate roles
- Creating an efficient learning environment
- Define the operating rules and parameters
- Gain share meaning of key aspects of activity
- Organize the resources

Step 3 Create a Plan for an Activity

The plan for executing an activity is critical if current and future improvement of performing an activity is desired. The clear definition of what tasks are critical to be accomplished in what sequenced by whom is fundamental to performing at the level of the performance criteria. Clearly state the outcomes desired and the means of measuring if the outcomes are at the quality desired. Agree upon what the key tasks are that need to be accomplished in order to meet the outcomes. Organize the flow of the activity by sequencing the tasks. Then assign responsibilities to each of the tasks and allocate how much time is given to each task. Make sure contingencies are included and extra time for review and rehearsal for the final presentations.

Quality Plan
- All key tasks identified
- Resources (time and people) effectively allocated
- Tasks sequenced appropriately
- Checkpoints clearly identified
- Reserve resources and time planned
Step 4 Execute a Plan

Once a plan is created it is important that the team captain is in control of implementing the plan. The schedule should be followed and that the plan should be reviewed every 10 to 15 percent of the way. When major decisions need to be made that need to be that causes a detour in the plan, it is the team captain that must make this final decision and held accountable for the decision. The team captain also must make sure that the tasks are being accomplished and hold those accountable for their performance.

Executing a Plan
- Captain is conscious of progress against the plan
- Captain makes all key decisions vs. the plan
- Captain is monitoring each task
- Captain applies extra resource to critical crisis
- Captain gets an assessment of performance of the plan
Step 5  Assess Performance against the criteria

The most important aspect of performing an activity is to keep focus on the agreed upon criteria. The desire to go down interesting tangents often is exciting, but leaves very little to show. Tangents are powerful and enriching if contained within the overall objectives and performance criteria, else become an endless road that traps you and leaves performance at a very low level. When a tangent is taken you should be asking the question are we getting value with regard to the performance criteria or are we using up time. Quality is what you are seeking and if the tangent gets you there then it is a positive use of time. The times you should review performance criteria would be 2 to 4 minutes after taking a tangent, at 3 to 5 scheduled check points during the activity, and anytime that a person feels lost.

Monitoring performance against the criteria
  Evaluating the value of the tangents
  Assessing performance criteria at check points
  Number of people who got lost
  Productivity consistency during the activity

Step 6  Rehearse the presentation

In almost all activities that products of the efforts will be required to be presented. It is always a good idea to practice the presentation of the products to maximize the reception of what has been accomplished. This requires a person to be a quality communicator. For those who need help in this area there is the communication methodology that covers defining the message, assessing the audience, picking the medium, collecting the supporting evidence, organizing the message, and trying out the presentation before giving the public performance.

Use the criteria that exists for the communication methodology.

Step 7  Perform the presentation

The preparation of the activity, followed by the quality execution of the activity, and the rehearsal of the presentation will give the presenter the presence and confidence to carry off a public performance that actually exceeds the
performance of the activity and not discount the efforts made during the effort. The key is in preparation so that real-time corrections can be made based upon the feedback that is being received.

Step 8 Assess the overall performance of doing the activity

After each activity, do an activity assessment. An activity assessment looks at the performance of each individual, the team, the facilitator, and the activity. It is important to determine who is responsible for strengths of the process and products and what can be improved by every part of the process or product in the future. Also insights in all areas should be searched for.
Getting Student Buy-in

Top Ten Ways to Ensure Student Buy-in for Process Oriented Courses

1. Emphasize student learning as the number 1 goal on day 1 and every day after that.
2. Involve students as much as possible in helping to define setting grading strategies.
3. Do several mid-course assessments and try to implement student suggestions that will improve learning.
4. Plan rich, process-oriented activities in class and assess performance in real time.
5. Always tie learning to the long view – preparation for life in the world of work.
6. Create high expectations for class preparation and assess that preparation.
7. Acknowledge different learning styles and promise to provide learning opportunities in all these styles.
8. Build teams with maximum diversity.
9. Keep foot on the accelerator so each team reaches a crisis point and expect the students in the team to resolve the crisis themselves.
10. Demand that students assess learning in teams (End of Class Report) and individually (Learning Assessment Journal).

Strategies for getting student buy-in-

1. **Explicit communication throughout the course** – contract at the beginning – emphasize the benefits that are transferable beyond the course – model that students won’t get hurt by asking questions.

Detriment: assumptions we make about students before we start -> need to pre-assess.
Don’t contradict what you say – strong follow through and be consistent

2. **Trust Building**

Strategy: give students more control – seeking an implementing students defined changes

Detrimental – being judgmental, taking things for granted – making assumptions about things
3. **Preparation**

Strategies – passport journal/paper, in class writing or quiz, use the prep in class, assess out-side of class efforts

Detrimental – lecture on what is required for preparation, ignore the prep, allow students to use class time for prep, unclear assignments

4. **Promote risk taking**

Strategies – promote a safe experience for failure (non-evaluative experience, trials – support the taking of the risk – showing that the outcome won’t be penalized), be supportive of risk taking even when outcome is unsatisfactory, and model risk taking (failures are ok), Making clear the expectation that risk taking is going to happen, assess vs. evaluate when dealing with risk taking, answering questions with questions

Detrimental – not giving needed critical support, don’t slam dunk, do the teacher is right thing, pulling power rank, don’t cave into student need for affirmation and validation,

5. **Clear performance criteria**

Strategy: Clarify your own objectives, give both oral and written at the beginning, provide a model of the level of performance,

Detrimental: accepting sub-standard performance, lowering the bar (grade inflation)

6. **Maintaining high expectations**

Strategies: Producing demanding activities and expecting the performance by communicating affectively the importance, requiring contact with the community (connections to the real world or professional standards), give them clear mechanism for calculating their own grade, challenging mediocre work

Detrimental -Caving into students demand for lowering expectations.
7. Demanding a quality performance

Allow students to succeed among their peers, guide with directed questions, point out successes, have achievable goals,

Detrimental – lowering standards

8. Assessment

Strategies – teach the what, why and hows of assessment with lots of practice and provide timely assessment of these assessments, make sure that a trusting environment evolves, Daily behavior, frequent oral reflector’s reports, increase incrementally,

Detrimental – failing to assess the assessments in a timely manner. Long turnaround time, overdesign or making complex.
## Things That Can Be Done To Accomplish PE Philosophy Implementation Quickly

<table>
<thead>
<tr>
<th>Techniques/Way of Being/</th>
<th>Time Energy</th>
<th>When</th>
<th>How</th>
<th>Value</th>
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<tbody>
<tr>
<td>Assign an internet search for complex project</td>
<td>Faculty – low Student - medium</td>
<td>Middle of the term</td>
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<tr>
<td>have student teams research course content…</td>
<td>Faculty – low Students – medium</td>
<td>Once per term</td>
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<td>don’t do for the students what they can do for themselves</td>
<td>Faculty – low Students – low</td>
<td>All the time</td>
<td>Keep this question in your own mind</td>
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<td>Get students understand levels of learning</td>
<td>Faculty – low Students – low</td>
<td>Week 3 or 4</td>
<td>Use Mark Morey’s Activity … (get from Mark)</td>
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<td>Student summarize learning at the end of class instead of the faculty member</td>
<td>Faculty – low Students – low</td>
<td>Most of the time</td>
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<td>Let students answer questions first…</td>
<td>Faculty – low Students – low</td>
<td>All the time</td>
<td>faculty member should wait a short time (2 min.) before answering</td>
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<td>Transfer responsibility to students to investigate “great ideas” that they bring up</td>
<td>Faculty – low Students – low</td>
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<td>Dialog journal…student –to-student</td>
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<td>Dialog journal = write to friend about your biggest concerns, switching dialog journals</td>
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<td>Affective experience – direct attention to affective issues, eg math anxiety</td>
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<td>Listen to the student as to where they want to go with the class</td>
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<td>Have students rephrase difficult concepts.….</td>
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<td>Establish learning “contract”</td>
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<td>Verbalize your confidence in the student to the student. Students achieve more if they feel that you believe in them</td>
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<td>Have students create learning activities</td>
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<td>Open evaluation system ; students set values of course evaluation</td>
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<td>Students set “social contract” for class</td>
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<td>Cultural sharing between students at begin of semester – “Ice-breaker Bingo” (Carla) “Encyclopedia of Ice-Breakers”</td>
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<td>Students write down top questions – find out status of students</td>
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<td>Read body language</td>
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<td>Direct eye contact with students, make sure students talk loud enough (beware of cultural differences!!!)</td>
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<td>“5-minute dump” at begin of class (verbal or written)</td>
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<td>Use on-line resources (BlackBoard, webCT)</td>
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<td>Cancel all classes for first day and</td>
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<td>“Pizza Lunch”…..Yum!</td>
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<td>Orient students to the highest affect issue /assignment at begin of semester</td>
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<td>Assessment / feedback early and often</td>
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<td>Creating an index card for student-created profile closed and open-ended questions</td>
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<td>Have students refer to each other by name – Name Tags, Tents, Remember names</td>
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<td>Make efficient use of time outside of class, more structure to out of class time will free up time in class</td>
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<td>Make sure students use consulting time effectively</td>
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<td>Student leaders, using UG TAs and student leaders as assistants- don’t let students coast in class- use them, non-evaluative help to other students - good experience for student leaders – good recommendation from faculty!!!!</td>
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<td>Bacchus Gamma – National peer certification program</td>
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<td>Buddy system – collaborative learning (unstructured with two students) can be very beneficial</td>
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<td>One-on-one meeting with students</td>
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several times during the semester
Grading homework for completion (as opposed to content), and then use as basis for brainstorming in class to bring out content

Setup – Example of Social Contract
informal groups brainstorm what they did and didn’t like about teachers in past. (circle what’s good)
Inventory what makes a quality student. Inventory what are major problems faced by students. Both teacher and students will be held to following good behaviors and avoiding bad behaviors

Midterm assessment by week 4 in semester (need to know how to pull data from midterm assessment). Must change three things in the course based on assessment. Must be done publicly (students take ownership of the changes)

Instead of lecturing on what you think students need. Lecture by exception
Students get a consulting question
Students make table.
Quick Guide to Assessment of Written Piece
1. Quickly skim the piece, setting 3 criteria that are in line with its purpose
2. Go through the piece in reasonable detail
3. Mark areas as +, -, check mark neutral
4. Say why of +, and generalize
5. Say why of -, and specify
6. Your goal is to take specifics and give direct feedback
7. Do an SII
Managing Learner Frustration

Accelerator Model
Refer to page 93 in the TI Handbook.
New instructor’s first strategy usually tries to match the students’ skill set with the challenge of a learning activity.
Then instructor’s realize that the level of challenge should be higher than students’ skill set.

A third axis involves the affective domain (refer to page 60 for more about the affective domain).
Affective skills include: persisting, time management, focusing, handling frustration, tending to one’s needs

As affective skills improve (more emotional maturity), you can widen the “happy zone” and push down on the level of challenge (the accelerator).

Students with low affective skills will have a small happy zone and will be quick to move through the range of emotions (from anxiety to disengagement).

People have motivation to work on their affective skills when they out of the happy zone.

Many of today’s traditional students come with low level affective skills.

The limiting factor for the affective level in the classroom in dependent upon the instructor’s affective skills (his or her ability to allow students to be out of the happy zone and experience some degree of anxiety and frustration.

Peer Coaching of Joyce Fremeau and Lori Ross
1-22-03
Peer Coach Carol Atnip

Joyce and Lori began class at exactly 10:00 and all 23 students were on time and ready to work. 8 students were absent. Joyce and Lori picked the focus areas of persistence, engaging in, and inquiry/questioning.

Strengths

1. The two warm up questions listed on the board was an effective way to quickly assess how students were progressing and to give them a gage of where they are and how they are doing without judgment; a bonus was that it got students to class and working on time.

2. Use of white laminated paper allowed students to explore alternative methods, without tangible evidence, allowing the freedom of testing/trying without penalty;
it can also be a terrific tool for the facilitator to quick check work, check when groups are finished, let groups share work and tons more.

3. The use of inquiry questions was helpful in getting the students to think deeper about topics, lead to greater understanding and clarity and also brought out misperceptions very quickly.

4. Students were very involved in class and really pushed to perform and please the facilitators. This allowed the pace of the class to keep steady and the amount of material to not overwhelm; it also allowed lots of different questioning techniques to be used: inquiry, challenging, comparing.

5. The timed test exercise really elevated the activity level and engagement in the room; letting the groups strategize before the test helped groups establish a connection to the exercise even though it was a single effort product.

Areas for Improvement

1. Use of the white laminated sheets should allow the facilitator to assess groups’ work by moving through the class and quickly intervening as necessary, then pass on the validating to other groups rather than the class as a whole – move on/save time. [I would have used them even more – great idea!]

2. Students need to be asked specific questions rather than “blanket” questions so that they can’t hide – hold them accountable with specifics such as: “Question 4 shows an important point; can group 6 share their answer?” rather than “Did everyone get question 4?”

3. Working groups often have needs/misconceptions which need to be addressed/caught while work is in progress therefore taking the time to monitor groups’ work is an important facilitator job and can be done by quickly joining in on a group conversation; listening from afar; watching that each member is engaged. Get close to the groups to monitor their progress.

Insights

1. Creative use of everyday materials, like the laminated white paper, can cheaply and effectively add to facilitators’ resources. In this case the make-shift marker boards enhance group work and enable the facilitator to monitor work more efficiently.

2. Having two people facilitate gives one time to do the mechanics while the other one is monitoring progress; it frees up both to concentrate on students’ progress and accountability as needed; this could be a model for facilitators new to process educator to follow. Lori and Joyce bring their strengths together to new heights; they complement each other very well.
3. The quick pace of changing activities kept the classroom atmosphere up beat and students attentive; time flew by; no one got bored or disengaged. The pacing of activities might be hard to sustain over time without a team of facilitators.

Peer Coaching of Mike Knoll
1-22-03
Peer Coach Carol Atnip

Class began with 19 students and 5 joined class late. The activity for the day was to work through the practice test therefore the focus area was chosen as listening, documenting, and validating.

Strengths

1. The use of the group process with the practice test made the groups work together to ensure all teammates were up to speed on the material; it encouraged sharing and communicating within the groups.

2. Five teams was a manageable number of groups to work with; the facilitator had no trouble making it around to help and assess the progress of the groups and to ensure that the groups were held accountable for each member’s progress.

3. Students were engaged in their activity and were eager to help teammates, which in turn helped themselves by making them articulate the concepts in order to explain them to others.

4. Intervention was necessary and effective to hold groups accountable for team progress and teams moved forward after the intervention and began to work towards helping keep everyone together.

5. Using self-assessment to predict success in the class is a practical way students can begin to appreciate the power of self-assessment; use it in a context they can benefit from…test preparation.

Areas for Improvement

1. Students should try to answer each other’s questions before asking facilitator for help because getting the group to work together will help strengthen their validation skills and help move them toward independent ways to validate other than asking the facilitator if they are right. Having the spokesperson or captain be the only one who can ask a question would ensure that they work together to come up with a consensus question.

2. Many instances of students using the facilitator as their ultimate resource for the final answer could have been avoided if the facilitator held the groups accountable
for validating each other before anyone in the group could request help. This could be achieved by using questions like: “What do your team mates say?” “Have you tried another approach?” “How do you know when you are right?”

3. A closure activity could be used to help get the groups closer to finishing together and tie up loose ends on unfinished concepts. Get them to write something like: “What were the three hardest questions and why were they hard?” “What validation techniques did you use?” “What were the three easiest questions and why were they easy for you?” “What do you need to work on to make this solid?”

Insights

1. Getting students to validate each step of their work – not just the answer – is a huge step towards their growth in mathematical maturity; we need to focus and encourage validation for each step. This can be done by questioning and challenging each step; perhaps a round robin set of problems where the next person validates each step before continuing.

2. Sometimes seeing something for the first time is overwhelming for students, but after reflection and thought and struggle the second time seeing the same concept is much smoother sailing; they are ready for the explanations after struggling rather than before.

Peer Coaching of Ron DuChene
1-21-03
Peer Coach Carol Atnip

Ron’s class began at 12:34 with 16 students; one more student arrived late. I chose Ron’s focus areas: risk-taking, validating, understanding context.

Strengths

1. Passing out the tests without a percent grade caused some students anxiety but really got them interested in figuring out what they did, right and wrong – it was a real attention getter – it forced students to focus on the issue of self-assessing and analyzing their work.

2. Letting students struggle through rough work before intervening helped all students see the importance of validating each step of their work; the intervention encouraged risk taking in the context of validating.

3. Listing issues with fractions is a great way to get students aware and in control of their anxiety as well as debunk myths about how hard they are.

4. Promoting risk-taking: hand them the chalk! This actually showed great respect for the students as people who had something positive to contribute to class; all were engaged in the activity and were there to help each other.
5. Parsing out the activity into very small portions helped the students stay on top of and in control of their new knowledge; no one got lost and all questions and comments were addressed.

6. Showing validation techniques with new material and developing skills helps them think of validation as a parallel process for working problems so that it becomes a natural step in solving problems.

Areas for Improvement

1. Quicker paced start-up gets students involved in class from the beginning; students should be productive at the start of class. Students can read and produce a reading log while the facilitator is going through the mechanics of getting class started like handing back work, taking role, etc. Other tools are a quick 2 question quiz; five minutes to check each other’s homework; time to come to consensus on what are the two muddiest points from the previous class; self-assess their preparation for class; any free writing topic… others?

2. The dynamics of the group process is missed when groups are to work individually rather than collaboratively; shared understanding of the concepts may be lost; clear articulation to other members of the group is missed. If you ask them to work in groups, give them a group task to complete.

3. Using group work is making good use of class time but the facilitator must actively monitor work as groups progress; if not, then class turns quickly into a lab situation and the facilitator looses the power of having students held accountable to their group.

4. Vocabulary slips by the students need to be addressed as soon as possible so that the words are appropriate and transferable. Students should record vocabulary in their LAJ’s and should add words as needed and be referred to their LAJ list as soon as slips are caught.

Insights

1. Respecting students’ perceptions of the difficulty of a topic can remove many affective barriers to success leading to better student buy-in; beginning discussions with a listing of what causes difficulty about a certain topic can focus attention on how to avoid common errors.

2. Using humor and getting students to perform publicly opens up opportunities to address many developmental math issues from affective issues through content issues; getting them to make up their own problem examples to illustrate their point validates their knowledge while getting them to think deeper about the topic.
3. Giving up control of the class to use student centered learning is hard work but the rewards are worth the risk and until you take that risk you won’t know how powerful it is to control the groups nor how effectively students learn from each other.

Peer Coaching of Tina Karsten
1-21-03
Peer Coach Carol Atnip

Tina’s class began at 9:04 with 23 students present. Four students were late; one left early. One student was there for the first time – week three.

Tina chose the following skill areas to focus the assessment: engaging in, listening, understanding context.

Strengths

1. After using a reading log for the first time students wanted some clarification of the use and purpose of the form; Tina led them through her expectations and allowed them to make extrapolations to other courses thus allowing the students to get more out of the exercise than would be possible from holding them accountable for reading with a quiz or other method.

2. Tina modeled good listening by rephrasing, and clarifying what students were saying, she also asked others to expand on a response thereby getting students to respect what others have to contribute.

3. Use of color to highlight board work helps focus attention to specific areas; underscores how important it is to keep work neat and readable; and underscores the particular concept being covered. It is also a good way to attend to the needs of more visual learners.

4. Asking lots of questions led to lots of feedback from students. Students were totally focused on the lecture portion of the class as shown by their responses to inquiry-type questions, which made them think about how to communicate what they were learning to the rest of the class.

5. Balancing the use of time to keep students engaged was very successful. Use of time for group activity and holding teams accountable for each team member sometimes takes more time than planned for all teams to be ready but holding steady to time allocated for an exercise helps push slower students while giving faster students respect for their interests to keep moving ahead.

Areas for Improvement
1. Groups could be charged with discussing their progress on homework, reading, and other pre-class activities, rather than with a whole class discussion, which would validate their understanding and help them to learn to communicate the developing concepts. The more the students can do for themselves the quicker they become independent learners; they will learn to validate and respect their own work.

2. Students and instructors need to insure consistency with terminology – one way is to have students record new words in their LAJ as they occur; using the LAJ as a collection point for their class notes will help them keep notes, developing vocabulary and sticking points handy and all together in one place.

3. Quick checks for engaging and listening by calling students by name helps hold students to task and keeps them aware that they may be called upon to perform and therefore must always be “in the game!”

4. Hold students accountable for assessing and validating their work by using challenging language such as: Are you sure?; Is there another way?; How do you know?; etc.

5. Use team roles effectively; ensure each group member is fully participating by getting the captain to “vouch” for all team members; question by name either the captain or non-performing students. Don’t let students think they can hide or opt out without penalty.

Insights

1. Reviewing concepts that were assigned is crucial to the understanding of concepts but getting students to validate their own understanding by working together, rather than watching the facilitator, strengthens their understanding and helps them progress in “mathematical maturity.”

2. Taking the time to learn students’ names gives a big pay-off in holding them accountable for their performance in day-to-day activities; it is difficult to hide or opt out when you are challenged by name.

Highlighting some of the Observed Best Practices

Norm:

1. Extensive use of student centered learning: He used most of time during the class period for student centered activity. More time students can spend thinking critically, engaging in, and performing the learning process, the more knowledge is constructed and application of the knowledge improves. The students were doing a
wide-range of activity, but each was focused on their construction of knowledge. He had a quick set up, he used a short concise concept lecture to the point out the key issues giving meaning to converting % fractions and decimals, with the remaining time spent on organizing learning using ct, journal, skill exercises. Students worked collaboratively during the process. Norm was able to go from group to group to assess journals, ctqs and respond to questions.

2. Profile sheet for each student: Provides a tool for Norm to quickly size up each student’s progress and issues. It is organized by category such as attendance, work products, module performance, and special learning issues. What is it that we need to know about each student…will share this resource on the blackboard.

3. Has a strategy of early module taking, all 6 by week 7, Norm can now work with students who haven’t passed first time. This reduces his spread and allows him to focus on catching up students on their needs. He uses the pretests as the means for students to focus on needed areas to speed up the performance on the modules.

Jim

1. Building a community of learners where learners are comfortable and respectful of each other why; how

2. Ability to intervene appropriately and contextually based upon who the student is. Why; how

3. Playfulness with challenge. Students tend to relax given the current comfort level with what’s going on…to maximize their learning, their interaction he challenged students to higher levels of performance…encouraged, pushed, raised the bar relative to the needs of the student.

Mike

1. Dedication and respect for each student and desire for their success is very strong; he is an advocate for his students and wants to ensure that they have the best chance to succeed. He showed this by entering into dialogue with several students during class time about their preparation for the upcoming module test and what they needed to do to improve their chances of success.

2. Accessibility to students and trust in him allowed questions and comments to be made without fear of being rejected or disrespected. He gently corrected one young man’s use of street language, the young man apologized and the class went on without any interruption.

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Jim

1. **Building a community of learners** where learners are comfortable and respectful of each other. Jim desires and models open sharing and caring about the needs of the learners, willing to interact, and most importantly invests in his students that is apparent to each and every learner thus expects commitment to the community.

2. **Ability to intervene appropriately and contextually** uniquely with each student. Jim spends time to understand specifics about each student; what they value, their needs, and expectations. He is strongly connected to their affect and knows what they need in order to continually be there in their learning efforts.

3. **Playfulness with challenge.** Students tend to relax but still maintain focus. There is a current comfort level with what’s going on. This is described up above. Therefore, to maximize their learning, Jim with his interactions challenges students to higher levels of performance by sometimes encouraging, pushing, and raising the bar relative to the abilities of each student.

Mike

1. **Dedication and respect for each student and desire for their success** is very strong. He is an advocate for his students and wants to ensure that they have the best chance to succeed. He showed this by entering into dialogue with several students during class time about their preparation for the upcoming module test and what they
needed to do to improve their chances of success. He is constantly analyzing what they need explicitly in the process to increase their success level.

2. **Accessibility to students** and trust in him allowed questions and comments to be made without fear of being rejected or disrespected. He gently corrected one young man’s use of street language, the young man apologized and the class went on without any interruption.

3. **Does not prejudge students and their abilities.** Mike realizes that students’ current abilities with their math skills are not the indicator we want to use for their potential for success. He has seen so many counter examples of students who have been successful with minimal skills, but through strong teaming of faculty with learners are able to cross many hurdles. He thus has a strong will which connects with many students as a belief in their potential and this helps the student make the level of commitment necessary for success.

Rose

1. **Rose dedication to her students gets most students to value and dedicate themselves to their own learning.** Rose is a consistent presence with her students. She is approachable but will not give them the answers or direct response, but realize that it is important for them to do the learning. She consistently challenges without wavering in her interactions of having the students do the learning. The students appreciates and understands what she is doing and because of her commitment end up doing a lot of effort in response.

2. **Respective use of student presentations** throughout the class period. Rose has discovered that it is more helpful for students to articulate the process, its meaning, and issues associated with applying the knowledge. Her expectation is that the students explain their work as an instructor will, challenge each other, and analyze their thinking as they perform mathematical thinking.

3. **Peer assessment:** students not just checking students’ answers but analyzing each other’s solutions to help improve students thinking. This is a powerful technique to shift the validation process away from the instructor and to the learners. Having the community environment set up where students are consistently reflecting their learning produces stronger learners.

Rosalie

1. **Effective use of math and graphing skills.** Rosalie has integrated the use of the software to increase students’ practice and ability to apply their skills in preparation of the modules. The students spend time at home and at selected locations on campus using the math and graphing skills to build performance and validation skills.
2. **Use of Critical thinking questions to increase student understanding and comprehension.** Rosalie has integrated the use of the thinking questions in their learning process and sees the value of gaining understanding before applying the knowledge. Classroom time really focuses on this thinking process.

3. **Cooperative learning and teamwork.** Rosalie has increased the amount of community learning in her classes, with many techniques of student to student interactions. The use of formal tools, expecting a team performance, and dealing with teams vs. just individuals has strengthen the community learning in her classes.

Teresa

1. **Use of the Reading logs** – Teresa has discovered the power of strengthening students reading performance and preparation for their classes. The quality of the reading logs has increased and so has their preparation for the course. She will be able to copy these and provide models for other faculty and students on the power of reading in the learning process.

2. **She has a strong focus on getting student buy-in.** The level of commitment and buy-in by the students is critical for student success and she accomplished this very well in one of her sections more than the other. She was able to leverage the turning around of a cynical non-traditional student to become the leading advocate for the process. The way she did this was to tap into his need for self-improvement as a professional and in his personal life. By having him discover that he could get better at learning really connected. She took his strength – reading and writing – and got him to read and write about his learning through reading about learning.

3. **Motivating students for validation.** The valuing and integrating validation process throughout her efforts has gotten the students to value the validation process. Holding students accountable for validating also illustrates that she is serious about validation.

Joyce

1. **Peer challenging.** Joyce has increased the student team to student team interaction by having the students challenge each other teams performance by offering bonus points. The students quickly and aggressively stay with other teams’ presentations to determine whether and how they performed. Additional ideas for the future encourage that students only get credit for a challenge if they are able to explain how and why they went down an incorrect path.

2. **Strong facilitation plan for each class.** The valuing of class time has taken on a new dimension. A carefully scripted class where there are a serious of mini-activities, which I counted 6 during my visit, including a self-assessment, review by exception, consulting session, challenge exercises, student presentations, and peer challenging were some of the activities. A thoughtful and eventful class period that goes quickly and intensely where students are at a high performance level like you want during a
3. **Use of team roles.** The students must take turns doing each role and thus all students in the class must perform. I did not see a single student who wasn’t working very hard and helping their team and members being more successful. The strength of the team learning is being modeled very well.

**Lori**

1. **Level of analysis of student learning and success.** Lori has more tools and methods for analyzing what are reasons for students’ success and those factors for lack of student success. She is willing to share and can trace the issues for students who do not complete through follow up. For example, her Ratio and Proportion’s Assessment instrument and her data file that incorporates critical thinking question, practice test, self-assessments, peer assessments, comments, etc. All of this provides more meaning to why students are successful or not successful.

2. **Design of materials.** Lori values and appreciates instructional design, especially at the activity level. Well-designed materials can assist students’ learning, engagement, and performance. She has produced ten supplemental documents that now can be integrated back into the textbook to strengthen this resource. The materials range from presentations, models, questions, and additional challenges. It is important that Rosalie makes sure that the team meetings in March collect these resources by each and every instructor. These would include also management and assessment tools that have been developed.

3. **Individualization of learning plans.** Lori with the help of Joyce has developed more skill in customizing special approaches tailored to an individual. The techniques used include Plato, Math & graphing skills, the critical thinking questions, and a lab environment. Some used pairing, while others individual.

**Tina**

1. **Energy and enthusiasm.** Students are alert, eager, and ready to perform is a reward for Tina’s upbeat attitude and high energy. She holds interest by keeping the pace swift, holding to time restraints, and keeping student/teacher interaction at a maximum.

2. **Feedback to/from students.** Students fully participate in Tina’s interactive lecture class format. They feel comfortable jumping in with questions, answering her questions and answering each other’s questions. Tina is able to gauge the depth of students’ reception of new material as well as determine readiness for moving on by the content of the interactions.

3. **Accommodate different learning styles.** Use of color, activity choice, interactive style, combination of individual and group work all incorporate awareness and accommodation of divergent learning preferences. The more varied the activities the
greater the percentage of a student’s time using his or her particular learning preference.

Anna

1. **Sincere belief in students’ success.** A strong belief in each student’s ability to perform is necessary in order to build a foundation of trust so that the student is willing to risk failure in order to grow. Anna believes that she can facilitate growth in her students and is determined to find whatever it takes to achieve success whether inside of class or outside of class.

2. **Willingness to change.** Seeking new and innovative ways of teaching and learning as well as thinking about how people learn enables facilitators to constantly expand their tool box of techniques and approaches thereby expanding their ability to meet the needs of every learner. Changing one’s approach to teaching is challenging for anyone; it is less stressful when one looks forward to building upon their toolbox.

3. **Data oriented assessment practice.** Perhaps more than anyone in the pilot program, Anna has embraced the concept of documenting both the changes and the effect on the learners of the changes. It is now no longer acceptable to make statements without having the data for backup. Instead of saying “some students can’t reduce fractions”, the new way is “3 out of 19 students failed to reduce the fraction in module 2, #3 to lowest terms.”

Ron

1. **Promoting risk taking.** Ron constantly challenges students to become less afraid of math by getting them to perform publicly at the board and in their seats. Have a question about a topic? Ron hands the student the marker and gets the student to make up a problem and then work through it with the class validating each step with the student. After the student struggles with the concept, Ron asks critical questions to get the student to the final conclusion, thus turning the risk into a top performance by the student.

2. **Ability to parse the activity.** The ability to dissect each activity into important, manageable segments can enhance student performance in the activity. Rather than have groups work through an activity, Ron directed each part of the activity thus keeping all students working together as a facilitator led group. This is very useful, particularly in a very small class or a class with severely under prepared students.

3. **Teaching the importance of validating.** One discovery from a student was that each step in a mathematical process should be validated, not just the answer. Ron led the student to that discovery by letting the student find her own mistake on board work. The mistake was not a content mistake from the new material, but a careless arithmetic mistake. The student readily saw the benefit of validating each step rather
than waiting for the final answer, and then validating the final answer after being sure that there were no errors in computation.

Section 11 - Producing a Quality Learning Environment

Introduction

Consider for a moment the impact and influence of environment upon a person’s growth, development, and performance. In context after context, an engaging, stimulating, and challenging environment can significantly enhance performance and growth; whether it be an infant learning to speak, a worker on the job, or a student in the classroom.

As an educator, it is important that you create an environment that will support the outcomes you desire for students. In general, every educator is looking for those magic moments in teaching when “the lights go on.” A conducive learning environment definitely increases the occurrence these events.

For “process” educators, they want students to grow and to develop a set of learning skills (from the Classification of Learning Skills) in addition to mastering course content. In order to improve student’s performance as learners, an environment must be created which allows for greater ownership, responsibility, and control of the learning process by students. Some characteristics of a quality learning environment include:

- a high degree of trust and mutual respect between students and the instructor
- both instructor and students share a commitment for success of the learner/student
- judgmental statements and language are avoided
- students are challenged and risk-taking is promoted
- criteria for performance are clearly stated
- assessments are provided on a consistent and timely basis
- progress and growth are documented

Methodology

The following methodology describes the steps used to create a quality learning environment. It can be applied within the context of a course, a program, or an entire institution.
Methodology to Create a Quality Learning Environment

1. Establish initial respect.
2. Start with no prejudging.
3. Obtain shared commitment.
4. Foster and support risk-taking.
5. Permit the learner to fail.
6. Set high expectations.
7. Establish clear performance criteria.
8. Implement a quality assessment system; utilize peer and self-assessment.

Note: as performance increases at higher levels, respect increases; as respect increases so does the degree of trust; as trust builds, this reduces the amount of judgment.

Discussion of the Methodology

Note that the Methodology to Create a Quality Learning Environment can be applied within the context of a single course, a cohort group in a program, a department, or within the culture of a college.

Step 1 Establish initial respect.

The first step in creating a quality learning environment involves establishing respect. From the faculty perspective, it is important that each and every learner be recognized as an individual – for who he or she is, for what he or she can contribute, and most importantly, respected for his or her potential to perform. Note that the focus here is on faculty respect for student potential to perform as compared to respect earned through actual (quality) performance.

The more you facilitate student growth and see individual successes, the greater your belief that every student can be a star. As this belief grows, students sense and feel this respect as it shows in your attitude and actions with them. Clarify the behaviors you expect and convey your belief that all of your students can meet these expectations.

From the student perspective, initial respect for faculty can be developed by:
- maintaining a professional demeanor which is free of judgmental language and statements,
- being well organized and not taking things for granted,
- having a positive attitude toward students and sharing your belief in them,
- producing a quality syllabus which includes a fair evaluation system (based on your desired outcomes for the course),
- not making assumptions and prejudging, and
- quickly learning each student’s name.
Teaching Tips and Ideas

Collect information about your students using 3 x 5 cards. Ask students to provide information such as name, major, year in school, top two or three learning objectives, important questions, and a personal characteristic or area of interest.

Learn student’s names as quickly as possible. Use the class roster and/or the 3 x 5 cards mentioned above along with memorization techniques such as association (e.g., a visual picture for each name) to help speed up this process. Be willing to take risks when you are not completely sure of someone’s name (e.g., “You’re John, right?”) Using a group photograph can help with learning student’s names.

Share with students at the beginning of a course. This includes sharing information not only about the course but about yourself – your background as well as any personal interests, experiences, traits or characteristics. For process educators, it is important to share your educational philosophy. You can then relate your philosophy to how the course is structured and your expectations for student performance. You may wish to let students know that they will have more input and control than other courses; that you will be asking for feedback and are open to making changes based on this feedback.

Obtain input from students about past educational experiences and their expectations. Take class time at the beginning of a course to ask students to assess their previous courses. Ask for strengths (what students felt were good about other courses) and areas for improvement (what students didn’t like and how things could have been improved). Also, ask students to state what they want or expect from this course. Inventory the data you collect on the board. Use this data to help define or set the parameters for how the course will operate.

Allow students to help develop a set grading criteria. As a class, develop the criteria for determining course grades within certain constraints or guidelines that you set. For example, students may choose the percentages for components of the grading scheme or determine which components will get included in determining the grade. This should be done on the first day of a course.

Have students perform a team building activity (such as the first activity in the Foundations of Learning Activities Book). This interview-based activity helps students to get to know each other and starts the process of building learning communities and teams.

Provide a learning assessment survey to determine where students are in terms of content knowledge. This is especially important when you have certain expectations for prerequisite knowledge.

Step 2  Start with no prejudging.
Nobody likes to be prejudged. People like to start with a “clean slate” that has no history or baggage that could negatively influence the building of a new relationship. This does not mean you should ignore information you might know about a student but rather avoid letting this information bias or prejudice you in negative way. In fact, it is usually a good idea to do some form of pre-assessment so that you know a person’s knowledge and skill level when starting to work with him or her. Avoid making assumptions and use this information to validate a clear and proper starting point.

In the case of a classroom learning community, the absence of prejudging helps relationships among learners as well as between the learners and the instructor/facilitator. Do your best to defuse any pre-judgment you notice realizing that the more you judge your students, the more they will withdraw or back off.

Also, realize that students are coming into your class with information they have gathered about you and judgments they have made. If you don’t pre-judge students, they will be less likely to do so toward you.

Teaching Tips and Ideas

- Use peer coaches to help identify pre-judgments that you might not see.
- Limit the comparisons you make about a previous class/individual with a current class/individual.
- In necessary, dialog with students in order to “clean the slate” regarding misinformation or mistruths that you know exists.

Step 3 Obtain shared commitment.

Best results will occur in a course when both faculty and students are “on the same page” with respect to their commitment to work together to achieve the course outcomes. As a faculty member, you want students to be committed to learning, their courses, and their discipline. Students want to know that you are committed to helping them achieve the course outcomes. This shared commitment should be made public so that there is no misunderstanding about the level of commitment.

As a process educator (whose outcomes include student growth), you must demonstrate to students a commitment that goes beyond your commitment to content and a discipline to include a genuine desire to help them grow and develop as learners. You must get the students to believe that you are committed to their growth, their success in the course and beyond, and that you have their best interest at heart. This is the beginning of creating an environment of trust that is not judgmental and promotes growth.

Teaching Tips and Ideas
Dialog with students about expectations for performance. On the first day of class, describe how the course will involve a non-traditional learning environment that will be different from other classes. Explain that students will not be lectured about material that can easily be read from the book outside of class. Students will take part in activities which will require them to work through the material, learning to understand it in their own way. While this is more work for students (than just taking notes), you promise to work equally hard.

Have individuals in the class sign a contract (an example can be found on page 69 in the Process Education Teaching Institute Handbook). Ask the class to write, sign, and hand in their own contract based on this example.

Develop a student-centered syllabus that states what you will do for students given that they commit to a specific set of items that you ask of them.

Step 4 Foster and support risk-taking.

Most students are not risk-takers in the classroom. Past educational experiences have reinforced that risk-taking behavior typically does not lead to good outcomes. In order to change this perception, it is important that faculty be supportive of risk-taking students from an affective or emotional perspective immediately after an unsuccessful event occurs. For example, when a bad outcome occurs, you may even congratulate a student for taking the risk and then provide constructive feedback to address the problem.

Make it clear that risk-taking will be supported and not penalized in the course (no “slam dunks” against students). Let students know that you will encourage risk-taking by telling them to “experiment and try it.” Remind them to not always do what they think the instructor wants, but rather to think for themselves. At the same time, let students know that you will not give in to their demands for affirmation, validation, and answers to every question asked. Tell students that a risk-taking environment also means that you will be challenging them to think critically, to affirm and validate on their own, and that you will typically answer their questions with another question.

Get students to take accountability for small, short-term failures or setbacks that might occur during a course. Assist students by providing feedback that can help turn small failures into long-term successes. On the hand, you as a faculty member will be there to help them avoid and handle potential larger, long-term failures.

Share that entrepreneurial environments, e.g. high tech firms, often encourage risk taking in their culture.

Teaching Tips and Ideas
Promote a safe experience for risk-taking and failure during the first two weeks by setting up a policy whereby performance during this time period will not be graded or evaluated; in other words, these will be considered as “practice” experiences or trials.

Point to examples where poor/bad classroom outcomes resulting from risk-taking were not penalized. This is best done after students have achieved success after the failure. Be supportive when the first bad performance occurs.

Model risk-taking for students. In appropriate situations, share with students situations in which you took a risk. Examples that illustrate overcoming an initial small failure can be especially meaningful and beneficial to students.

Step 5 Permit the learner to fail.

Most faculty find it difficult to watch students struggle in a learning situation. Their natural tendency is to jump in and remedy the situation; typically with a content-related intervention. This serves to temporarily end the struggle and provide momentary success. However, be careful to avoid enabling behavior which does not allow for failure, and in the long run, is not always in a student’s best interest.

The bottom line is that it’s emotionally difficult to watch someone failing in a particular situation. Yet the key question to ask in these situations is, what course of action or non-action that will result in the best long-term result for the person who is struggling? This is how parents are able to let failures happen with their children because they know that it will lead to producing long-term success.

It’s important that you not view student’s short-term failures as a reflection of your performance as an educator. Realize that when students experience small failures it builds their emotional resilience and increases their ability to cope and respond to failure. You actually empower students by allowing failure to happen in small steps. The “good learner” experiments, discovers and is secure in his/her emotions, so he/she can take risks, and accept failure as a frequent and productive event on the road to success at a new task” (taken from Foundations of Learning, 2nd Edition, Profile of Quality Learner, page 58). Lastly, in order to set high expectations (a later step in the methodology), the learning environment you create must allow for students to fail.
Teaching Tips and Ideas

During the first two to three class periods of a course, establish a risk-taking culture by providing appropriate opportunities in a supportive environment. Increase the level of challenge during a class or during an activity so that there is the potential to cause small failures. When a bad outcome or failure does occur, do not penalize and but rather affirm risk-taking behavior or decision making. Then during the remaining class time, work to create situations where it possible for students to bounce back and achieve success.

Incrementally increase the challenge level of assignments during the term. Create and allow for opportunities to fail while also providing opportunities to “catch-up” or be successful after a failure.

Set and maintain high standards for student performance. By doing so, students at various times will feel temporary emotions of frustration and failure. However, when standards are not met, make sure students don’t feel judged. Inform students that their performance was not acceptable in a positive, caring, supportive manner; in other words, build a scaffold to support or prop up failures.

Offer students seconds chances. However, limit your use of this technique as it loses its value if overused.

Let students self-assess their failures. As their self-assess skills improve, students will be able to bounce back from failures on their own. Students can assess their assignments and tests, looking for strengths, then analyzing areas for improvement and determining how they can become successful in the future.

Have the students in top 5% of the class to mentor students in the bottom 5% of the class. Students who are not challenged enough because of their mastery of the content can use their time in a constructive manner by helping students who are struggling with the material.

Step 6  Set high expectations.

The productivity of a learning environment is highly correlated to the expectations that are set at the beginning of an educational process. In general, students will typically perform to the level of your expectations. As you raise your expectations, students will raise their level of performance accordingly. This is the message advocated by the Wingspread Group as a result of their research efforts and documented in their 1995 report entitled, “An American Imperative – Higher Expectations for Higher Education.”
(Note: this report can be accessed from links section of the Pacific Crest website at http://www.pcrest.com.)

As you experience students performing at higher levels, your expectations for future performance increase leading to a high quality standards. However, as mentioned in the previous step of the methodology, if you do not allow for failures, then you will be in
situation where you lower standards to accommodate student’s lower levels of performance.

Teaching Tips and Ideas

Choose classroom activities that are challenging and demanding. Set clear expectations for performance. Also, provide a mechanism by which students can calculate their grade. Don’t let students influence you to lower standards through various means including: delay tactics, having you do their work, wanting examples for familiar contexts on exams, asking you to define and set up problems, asking you for answers to avoid doing the critical thinking, etc.

Link high classroom standards with developing long-term behaviors that will be beneficial in future classes and beyond college. Communicate the importance of high standards as they relate to performance in “the real world” or professional standards.

Implement standards, techniques, and approaches that you are comfortable with. Knowing that expectations must realistic, ask yourself, are you comfortable with the level of what you are asking students to do?, Is your comfort level impeding the process rather than supporting the process?

Step 7 Establish clear performance criteria.

People who are in challenging situations which require high quality performance want and need explicit and clear (performance) criteria. In the case of students, they want explicit criteria so they know what an instructor expects and what they need to do to get a good grade; implicit criteria are of little use to students. In general, you should avoid hidden or implicit objectives or criteria as it will erode the trust you have built with students.

When expectations for student performance are high, it is critical to have clear performance criteria. Without criteria, students do not know what they need to do be successful and are likely to rebel, stray off target, or disengage. Students want feedback relative to the criteria so they know how to succeed.

Teaching Tips and Ideas

- Clarify your objectives and performance criteria as the instructor/facilitator. Do so in both oral and written form at the beginning of a class or activity.
- Do not accept sub-standard performance by lowering the bar (grade inflation).
- Don’t lecture on material that students can easily grasp from the textbook. Don’t spend time solving problems that you know students can do themselves.
Step 8  Implement a quality assessment system.

From a Process Education perspective, a learning environment cannot be a “quality” learning environment without a good assessment system in place. Acting upon quality assessment feedback (including self-assessments) is the key that can help students improve their future performance.

Consider situations when a person’s performance does not meet the established standards. When this happens, every person wants specific feedback about his or her performance so that the next (future) performance will improve and meet the standard. Therefore, a quality assessment system design is essential for providing necessary feedback when in a high performance environment.

Assessment feedback will have greater impact and benefit when it is given as soon as possible after a performance. For this reason, real-time assessment should be a component within an assessment system. Another important component (of an assessment system) is self-assessment. While most people find self-assessment difficult to do, this skill can be strengthened through practice. This is important because self-assessment skills are a major factor in differentiating a high performing student from and a poor student.

Assessment feedback should be given in a positive tone or manner and be limited to the most important points. An assessor should be consistent, complete, direct, and honest with his or her assessment. As an educator, be a “straight shooter” with your students. Students will sense your genuineness just as they will know if you are trying to manipulate them.

Develop an assessment system that provides students with many opportunities to practice assessing and self-assessing. Assure students that what their efforts in this area will make a significant difference in future performances. Focus not only on the “what” and “why” of assessment but how. Provide examples and models of quality assessments. Simplify the (assessment) process for students; especially when they are first learning and practicing the process.

Your assessment system should include a peer coaching component. Ask a trusted colleague to observe a class you facilitate and provide feedback as to strengths, areas for improvement, and insights. Peer coaching is a mutually positive process for both the assessee and the assessor; both come away with new insights and ideas.

Teaching Tips and Ideas

Use the SII Method when assessing. An excellent model for assessment requires the assessor to identify strengths and why they are strengths, areas for improvement and how to make the improvements, and insights gained and their significance.
Assess the assessments you ask students to do and provide feedback in a timely manner. Timing is an important factor when providing assessment feedback. Don’t let too much time elapse from when an event occurs (e.g., students turning in an assessment) until feedback is provided (e.g., you provide oral or written feedback about student’s assessments). Be careful not to overburden yourself with assessing assessments. You don’t need to assess every student’s assessment every time he or she does an assessment. Randomly collect assessments. It more important to provide feedback early in the course and to focus on quality rather than quantity in terms of the feedback you provide. Use the SII Method.

Utilize both oral and written reflector reports whenever using cooperative teams in active learning situations. Gradually increase the performance criteria for reflector reports over the course of a semester or term. Require reflector reports on a regular and frequent basis.

Offer students an opportunity to estimate their score on an exam. After taking an exam, give students the opportunity to estimate their score. It is important that students know what they know and don’t know. Give a bonus (e.g., five points) if the student accurately estimates within five points of the actual score. On the other hand, deduct points (e.g., five points) if the student is not within 15 points of the actual score.

With exams that involve problem solving, give students the opportunity to rework parts of the exam on their own and submit it for partial credit if it is correct. Set a time frame after an exam is given (e.g., one or two days) in which a student can rework parts of an exam that they feel were answered incorrectly. Students must document in detail the process used to arrive at an answer. Partial credit can then be given if the reworked material is correct and well documented.

Use “pre-tests” before exams are given. This gives students the opportunity to assess the quality of their preparation before an exam. The pre-tests can count towards a students grade and/or be used strictly for self-assessment purposes (the feedback can be integrated into a self-assessment system).

Step 9 Document performance.

A process-oriented class requires more effort on the part of students (and faculty) than does a traditional lecture-based course. The motivation for students to put forth the extra effort required comes from the excitement of seeing improvement and growth. Realize that personal growth and improvement of skills are a much stronger motivators for students than the learning new content or information.

Students need to see evidence that they are making progress otherwise they will lose their motivation to work hard and put forth a quality effort. Students get excited when they see they progress, where they were as compared to where they are now. Therefore, it is extremely important to document performance (both failures and successes) over time.
By documenting failures or struggles, students are better able to appreciate the successes and resulting growth.

As part of your course assessment system, you should provide students with feedback that not only helps them improve performance (direction for future action) but also helps them to see growth and improvement when it occurs (which keeps students motivated). As part of documenting their performance, students should also do self-assessment – identify strengths and why along with areas for improvement and how. Structured self-reflection (self-assessment) is a skill you want students to develop and use throughout their lives.

Teaching Tips and Ideas

Make use of portfolios as tool for documenting and measuring growth over time. The portfolio should be integrated into the course evaluation system, otherwise students will not put the effort in or value it much.

Step 10 Continuously challenge performance.

The implicit goal behind this methodology is to create learning environments which facilitate achievement quality outcomes for a course. It is presumed that these outcomes include growing skills in addition to mastering content.

Growth occurs not when we are “coasting” but rather when we are challenged. For this reason, don’t let students get complacent. Continuously challenge performance. Keep students motivated by raising performance criteria and challenging work that is mediocre or not up to a person’s standards. While it takes effort and energy to challenge, the tendency for most students is not to challenge one-self; external motivation is needed. Realize that by challenging, you are showing respect and a sense of caring for an individual. If you didn’t care, you would just let that person “slide by.”

While you want to challenge students, realize that you can’t expect students to constantly perform in high-challenge situations. There needs to be some “down time” scheduled in the design of a course; time when students are not required to perform at such high levels. In general, the key is not lower standards.

Teaching Tips and Ideas

Adjust the level of challenge with the questions you ask. During a class or an activity, the difficulty of questions you ask can raise or lower the degree of challenge presented to students or student teams. Directed questions are easier to answer than convergent questions while divergent questions are the most difficult.

Changing the performance criteria is another means of regulating the level of challenge. Do feel that are locked into the performance criteria you set at the beginning of an
activity or class. While you don’t want to make a habit of changing the performance criteria, it is a means to get students to perform at higher level when you realize the criteria are too low, or to lessen the challenge when you realize that the criteria are set too high.

Encourage the use of mentors. The role of a mentor is to help a person with his or her growth and development. A mentor is a position to challenge performance with his or her mentee.

Note

Throughout the methodology for creating a quality learning environment be aware that the following processes are occurring:

- the level of productivity increases as a function of an increase in challenge,
- when you see a person perform well, your level of respect for that person increases,
- as the level of respect increases, so does the level of trust,
- as the level of trust increases, the amount of judgment decreases and the opportunities for quality assessment increases

These dynamics are occurring among students as well as between students and the instructor.

Issues, Questions, and Answers

1. What is the significance of being both a assessor/mentor and an evaluator in this model of a productive learning environment?

   The assessor/mentor and evaluator role played by faculty can be compared to the analogy of a “good cop” and “bad cop.” The good cop is the role of mentor and assessor. This person is there to assess performances and provide quality feedback to help students grow and improve future performance. The bad cop is the role of evaluator. This person sets the standards and evaluates performance against those standards. It is important to realize that from an affect or emotional perspective, the bad cop role dominates the good cop role, typically by a factor of ten to one. Therefore, let your students know which role you are playing and when you are in that role.

2. What is role of communication in creating a productive learning environment?

   Explicit communication is needed throughout the course. Your syllabus is the explicit contract at the beginning of the course which emphasize the benefits that are transferable beyond the course and what you will do to help students succeed.
Students should put in writing what they will commit to do in order to achieve the success they are seeking. Encourage students to communicate and give feedback to you during the course. For example, conduct at least one midterm assessment session during the course where students are required to give assessment feedback. In general, build trust through your communication by not contradicting what you say with your actions. Follow through and be consistent.

3. How do you get students prepared to increase the productivity of the learning environment?

Some ideas include: passport journal/papers, in-class writing or quizzes, and assess outside of class efforts by students.

Some thing which can be detrimental: lecturing on what is required for preparation, ignoring the preparation required of students, allowing students to use class time for preparation, and making assignments that are vague and unclear.

4. How much time during class at the beginning of a course should you take to build the quality learning environment?

The first two weeks are critical for setting the stage for the rest of the course. The first class period is important because you must address the most significant issue for students, what’s in this for me? Identify three key short-term needs and three key long-term needs for learners. During the first week, allocate up to 60% of class time and up to 90% the second week. Beyond second week, be aware that you don’t do anything detrimental to negate what you accomplished.

If you want students to better appreciate that you are seeking to develop skills in your course, ask them to project themselves five years in the future. What will it take to get them to where they want to be. Ask them to devise a “road map” to get them from where they are now to where they want to be. Also, realize that students care less about knowledge skills than they do about growth skills.

5. I am interested in using some process techniques in my content course, how soon should I begin addressing and using the course content?

Begin in the first class period. You can gradually integrate some of the techniques you plan on using. Integrate course content into the application of process techniques.

6. What is are two important considerations for faculty when implementing the methodology creating a productive learning environment?

Adherence to a philosophy you believe in. This translates into consistent behavior in the classroom and toward students. Stick to your convictions. Students will sense motivations that are not genuine.
Getting student buy-in very early in the process is necessary to creating a quality learning environment.

7. How do you strike a balance between student and teacher control in the classroom?
   • use student feedback; written, small group etc.
   • let students develop class goals within a framework established by the instructor
   • have students identify individual needs to be met in the class
   • let students have a more active role as teachers in the classroom
   • as an instructor, participate within the student groups; demonstrate active listening
   • use humor
Section 12: Course Assessment System

Characteristics of a Course Assessment System

<table>
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<tr>
<th>Characteristics</th>
<th>Description</th>
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<tr>
<td><strong>Goals with Measurable Outcomes</strong></td>
<td>The learning outcomes for the course is what the assessment system is based upon.</td>
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<tr>
<td><strong>Defines the Purpose of Assessment</strong></td>
<td>Each area of assessment must have a clear defined purpose leading to specific course improvements.</td>
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<tr>
<td><strong>Improves Performance of Students, Faculty, &amp; Course Curriculum</strong></td>
<td>Feedback is targeted from the perspective of the assessee.</td>
</tr>
<tr>
<td><strong>Has collaboration between assessee &amp; assessor</strong></td>
<td>Design is based upon needs of the assessee.</td>
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<tr>
<td><strong>Ongoing</strong></td>
<td>There are repeated measurements and feedback opportunities in the design.</td>
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<tr>
<td><strong>Done in a positive language</strong></td>
<td>All the language use is constructive and positive (non-judgmental)</td>
</tr>
<tr>
<td><strong>Student must have ownership</strong></td>
<td>The power and control is placed in the hands of the assessee.</td>
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<tr>
<td><strong>Based upon classroom activities</strong></td>
<td>A lot of the assessments are done when they can be observed (process)</td>
</tr>
<tr>
<td><strong>Should be integrated in &amp; not added on</strong></td>
<td>Are thought through and not just appended.</td>
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<tr>
<td><strong>Ratio of student time 5 to 10% of total</strong></td>
<td>Students spend at most reflective thinking a total of 10 percent of their total effort.</td>
</tr>
<tr>
<td><strong>Classroom time is very valuable</strong></td>
<td>Assessment of process and peer assessment are almost impossible out of class.</td>
</tr>
<tr>
<td><strong>Clarifying Criteria, Factors, &amp; Scales</strong></td>
<td>Each assessment has been designed with quality criteria, factors, and scales.</td>
</tr>
<tr>
<td><strong>Current &amp; Up-to-date</strong></td>
<td>A assessment system itself must be assessed to be the quality you seek.</td>
</tr>
<tr>
<td><strong>Authentic –real world validity</strong></td>
<td>Time spent assessing should be authentic and real-world to be valuable.</td>
</tr>
<tr>
<td><strong>Relationship to long-term student behaviors</strong></td>
<td>The measurement of student performance should be connected to behaviors that will last.</td>
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<tr>
<td><strong>Level of involvement of peers</strong></td>
<td>Peer input is powerful to improve self-assessment skills.</td>
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<tr>
<td><strong>Non-evaluative</strong></td>
<td>Language should not be evaluative as it decreases receptivity of the person being assessed.</td>
</tr>
<tr>
<td><strong>Measures the processes without needing to evaluate the product</strong></td>
<td>The practice of performance can be assessed.</td>
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<tr>
<td><strong>Should motivate change/growth</strong></td>
<td>Future improvement should be measurable and documented.</td>
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<tr>
<td><strong>Continuous process</strong></td>
<td>There should not be any significant gaps in assessing performance.</td>
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<tr>
<td><strong>Learning centered</strong></td>
<td>The whole system must constantly be checked to determine if learning outcomes and learners as central.</td>
</tr>
<tr>
<td><strong>Promotes critical thinking</strong></td>
<td>The analysis in assessment must be incorporated to be meaningful and valuable.</td>
</tr>
</tbody>
</table>
Encourages risk taking The environment supports and rewards quality risk taking
Consistent The basis of the assessment system is not eradicate
Departmental engagement Relates to a broader assessment system.
Linked to a few crucial course outcomes The system has a clear focus to match up to the outcomes.
Enhances learning Quality of what is really important is improved.
Assess system meets external performance standards The system supports external evaluation syst
Components of a Course Assessment System

Students -> Instructors
Students -> Students
Instructor -> Student
Student -> Curriculum
Student -> themselves
Instructor -> themselves
Implementation Plan (System has a plan for quality implementation)
Instructor -> Instructor
Instructor -> assessment system
Educational research design (Assessment system is linked with quality research designs)
Graduates -> Instructors
Instructor -> Curriculum
Students -> Assessment
Stakeholders -> curriculum
Graduates -> curriculum
Consultants -> Instructor
Consultant -> students
Students -> Professionals
Student external mentor -> student
Adm/staff -> instructor
Peer Instructor -> students
Students -> external students
Internships Managers -> Student Performance
Student to employer
Consultant to curriculum
Student to profession
Student to team (reflector)
Learner to learning community
| Advisory comm. to program                      |
| Dept to instructor                            |
| Students assessing evaluation system          |
| Discipline to curriculum                      |
| Students to state, local, and national govern|
Assessment Tools for Incorporating into A Course Assessment System

SII
Assessment Methodology
Cross & Angelo CATS
Essays & quizzes
Recorders & reflectors reports
Portfolios & self-growth papers
LAJ reports: free writing, collection points, Self-assessment
One-minute paper or Spokesperson reports & group answers with rephrasing surveys (frustration) & midterm assessment
math skills, compass
peer coaching form
Muddiest point or Inquiry questions
Rubrics
Clinical diagnostic measures/instrument
Products
Log of performance – reading log
Interview logs
Skill exercises
Site assessments
Course assessment form
Peer assessment tools
Pre-assessment tools
Discussion group
Faculty coaching tool – improvement guidelines
Outside accred agency
Collaborative Learning
Videotape
Guided journal entry
Electronic mail feedback
<table>
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<tr>
<th>Threaded discussion</th>
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<td>Certification exams</td>
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</table>
Key Issues to be Addressed when designing a Course Assessment System

Timing

Frequency

Amount of student input and agreement needed

Clarifying both Eval & Assess systems

Differentiate the assessment vs. evaluation

Helping Students strip evaluative language

What are the easy things to implement

How much time

Assessments of assessments

Improving assessment skills

Measuring student preparation/outside class performance

How to do assessments in distance learning

On-site vs. Off-site

How related is the evaluation system to the efforts of the process?

Effectiveness in peer assessments

How to implement improvement from assessment

Valuing the outcomes?

Strength in increasing level of knowledge

Skill of faculty interpreting data

Skill of student interpreting data

Distributive learning issues

Reliability and validity

Issue of standards in use of professional literature

Students’ perception of the value of the course & the role assessment plays in the course?

Employer school relationships

Funding level

Role model the assessment

Physical environment
Confidentiality
Available time and distance
Time compensation
Who sees the assessments
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Multiplication table _____ Long Division ________ Final Grade ________

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<th>Module 4</th>
<th>Module 5</th>
<th>Module 6</th>
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</tbody>
</table>
Section 14 – Life Vision Portfolio

Life Vision Portfolio

Executive Summary

Table of Contents

<table>
<thead>
<tr>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1: Personal Historical Research #1</td>
</tr>
<tr>
<td>- Educational Background</td>
</tr>
<tr>
<td>- Personal Accomplishments</td>
</tr>
<tr>
<td>- Community Efforts</td>
</tr>
<tr>
<td>- Family Relationships</td>
</tr>
<tr>
<td>- Important Friendships</td>
</tr>
<tr>
<td>- Key Highlights</td>
</tr>
<tr>
<td>Section 2: Initiating a Personal Exploration #2</td>
</tr>
<tr>
<td>- Who Am I?</td>
</tr>
<tr>
<td>- What is my Life Story?</td>
</tr>
<tr>
<td>- What is my Life Vision?</td>
</tr>
<tr>
<td>Section 3: Self-analysis #3</td>
</tr>
<tr>
<td>- Clarifications of Likes &amp; Dislikes</td>
</tr>
<tr>
<td>- Personality Analysis (Myers Briggs) #4</td>
</tr>
<tr>
<td>- Learning Styles Analysis #5</td>
</tr>
<tr>
<td>- Values Analysis #6</td>
</tr>
<tr>
<td>- Processing Life’s Difficulties #7</td>
</tr>
<tr>
<td>Section 4: Researching Your Environment #8</td>
</tr>
<tr>
<td>- Role Model Exploration</td>
</tr>
<tr>
<td>- Choosing a Mentor #9</td>
</tr>
<tr>
<td>- Exploring the History of Your College/Organization #10</td>
</tr>
<tr>
<td>- Exploring Your College Resources #11</td>
</tr>
<tr>
<td>- Exploring Your Community #12</td>
</tr>
<tr>
<td>Section 5: Goal Setting #13</td>
</tr>
<tr>
<td>- Life</td>
</tr>
<tr>
<td>- Career</td>
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<tr>
<td>- Educational</td>
</tr>
<tr>
<td>- Spiritual</td>
</tr>
<tr>
<td>- Family</td>
</tr>
<tr>
<td>- Personal</td>
</tr>
</tbody>
</table>
Section 6: Career Planning
- Selecting a Career #14
- Building a Professional Network #15
- Performing a Job Search #16
- Interviewing – Presenting Yourself #17
- Writing a Resume #18

Section 7: Educational Plan
- General Education #19
- Choosing a Major #20
- Building a Quality Transcript #21
- Seeking Additional Academic Experiences #22

Section 8: Key Academic & Career Skills
- Writing #23
- Making a Quality Presentation #24
- Using a Computer Effectively #25
- Reading Effectively #26
- Study & Preparation Skills #27

Section 9: Key Life Learning & Performance Skills – (Focus on 5)
- Time Management #28
- Conflict Resolution #29
- Coping Skills #30
- Prioritizing #31

Section 10: Meaning of Life
- Exploring Your Passions #32
- What have or will have the most meaning in your Life? #33
- Time Analysis #34
- Expanding Your Life Experiences #35

Section 11: Servant Leadership #36
- Committing to a Community #37
- Community Service Project #38

Section 12: Personal Financial Planning
- Create a Financial Plan #39
- Managing a Budget #40
- Writing Successful Proposals #41

Section 13: Performance Compared with Internal & External Standards
- Planning for a Quality Performance #42
- Improving Self-assessment Performance #43
- Self-growth Paper-Measuring Growth & Development #44
Appendix A: Constructing a Portfolio
Appendix B: Presenting a Portfolio
Appendix C: Glossary for Portfolio
Appendix D: Reflection Forms

Content to be included (Inventoried by Mentors at St. Augustine College)

1. Time Management Skills
2. Conflict Resolution
3. Coping Skills
4. Reading Performance - Speed, comprehension, techniques
5. Goal Setting
6. Financial Plan
7. Educational Plan: GE & Major
8. Constructing a Portfolio
9. Presenting a Portfolio
10. Prioritizing (Doing First Things First)
11. Presentation Skills
12. Teamwork
13. Selecting and working with mentors
14. Using a computer effectively
15. Interviewing skills
16. Finding a Job
17. Building a Network
18. Use of Campus Resources
19. Awareness of your society & keeping current
20. Servant Leadership
21. Community
22. Historical Perspective
23. Writing Skills
24. Study Skills
Appendix A: Constructing a Life Vision Portfolio

In Foundations of Learning there is a chapter describing what is a Life Vision and the role a Life Vision Portfolio

Classroom Activities
1. Myers Briggs
2. Learning Styles
3. Value Analysis
4. Role Model Exploration
5. Choosing a Mentor
6. Campus History (Camp Activity)
7. Analyzing Campus Resources
8. Goal Setting
9. Building a Professional Network
10. Performing a Job Search
11. Interviewing Successfully
12. Writing a Quality Resume
13. General Education
14. Building a Quality Transcript
15.
16.

Out-of-class Activities
1. Personal Historical Research (Camp Activity)
2. Personal Exploration (Camp Activity)
3. Likes & Dislikes (Camp Activity)
4. Processing Life Difficulties (Camp Activity)
5. Exploring Your Community
6. Career Search
7. Choosing a Major
8. Expanding Your Academic Experience
INSTRUCTOR NAME:

DESCRIPTION: Consists of six modules covering the concepts of whole numbers, fractions, decimals, ratios, percents, and the basic use of signed numbers, exponents, and order of operations. It is designed as a review of basic mathematics concepts for those students whose experiences and/or placement test scores indicate that a review is needed to improve chances for success in subsequent mathematics and mathematics-based courses. Students must pass each module with a score of 85% or higher.

Prerequisite(s): None. Co-requisite(s): None.


ADDITIONAL MATERIAL(S): None.

INSTRUCTOR TUTORING: See your instructor for recommendations on tutoring, Learning Support Services, and/or other help.

HONOR CODE: Any student who violates the Honor Code, as defined in the Student Handbook will receive a
“F/zero” grade on that work. Further details are available in the Student Handbook.

COLLEGE POLICIES:

1. Eating and/or drinking in class is prohibited.

2. Smoking is allowed only in designated smoking areas.

3. Children are not allowed in the college buildings. This includes regular class and lab periods. Children may not be left unattended anywhere, especially in the Student Center or Library. Children may come into the building, rather than be left unattended in a vehicle, while a parent conducts college business, picks up a check, drops off an assignment, etc.

4. Pagers and cell phones must be kept in an inaudible mode in the classroom.

MTH099: BASIC MATHEMATICS
DRAFT 4 Quarter Hours
Syllabus Guide

©COPYRIGHT 1997

COURSE DESCRIPTION: Consists of six modules covering the concepts of whole numbers, fractions, decimals, ratios, percents, and the basic use of signed numbers, exponents, and order of operations. It is designed as a review of basic mathematics concepts for those students whose experiences and/or placement test scores indicate that a review is needed to improve chances for success in subsequent mathematics and mathematics-based courses. Students must pass each module with a score of 85% or higher. Prerequisite(s): None. Co-requisite(s): None. (Matches College catalog as of Fall, 2001.)


**ADDITIONAL MATERIALS REQUIRED FOR INSTRUCTORS:**

For each campus:
The Computer Tutor for Instructors Computerized Text Generation, available when the textbook is ordered from publisher.

**CLASSROOM SETUP:**

MathPro Explorer Software Network Version 4.0 available in Learning Center or lab for student use.

**COMPUTER CONFIGURATION:**

(approved by rb/cis -- ???)

Hardware:
Standard PC
32MB of available RAM (64 MB recommended)
200 MB of free hard disk space for media
VGA display, 640 x 480 resolution required
2x speed or faster CD-ROM drive
QuickTime 5.x or later
Sound Card

Software:
Windows 98
MathPro Explorer

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<tr>
<td>Developer: Sharleen Gonzalez/F; Reviser: Judy Thompson/O</td>
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<td>Approved by: Judy Thompson (O) 12/01</td>
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All COs are addressed in this syllabus guide (???)

0-536-67605-4.
TEACHING STRATEGIES

1. Any modules not passed at 85% can be retested anytime during the term. Do not put this off for the last week.

2. Please refer to the following Supporting Resources for this course:
   - Handouts

WEEK 1

1. Distribute and discuss the course syllabus and course outcomes.
2. Lecture on Chapter 1 (Whole Numbers) to focus on:
   a. 1.1 (Understanding Whole Numbers).
   b. 1.2 (Addition of Whole Numbers). [This addresses CO #1.]
   c. 1.3 (Subtraction of Whole Numbers). [This addresses CO #1.]
   d. 1.4 (Multiplication of Whole Numbers). [This addresses CO #1.]
   e. 1.5 (Division of Whole Numbers). [This addresses CO #1.]
   f. 1.7 (Rounding and Estimation).

WEEK 2

1. Give the Module One Test.
2. Begin lecturing on Chapter 2 (Fractions) to focus on:
   a. 2.1 (Understanding Fractions).
   b. 2.2 (Simplifying Fractions).
   c. 2.3 (Improper Fractions and Mixed Numbers).
   d. 2.4 (Multiplication of Fractions and Mixed Numbers). [This addresses CO #2.]

WEEK 3

1. Complete the lecture on Chapter 2 (Fractions) to focus on:
   a. 2.5 (Division of Fractions and Mixed Numbers). [This addresses CO #2.]
   b. 2.6 (The Least Common Denominator and Building up Fractions).
c. 2.7 (Addition and Subtraction of Fractions). [This addresses CO #2.]
d. 2.8 (Addition and Subtraction of Mixed Numbers and Order of Operations). [This addresses CO #6.]

2. Have students review for the Module Two Test.
WEEK 4

1. Give the Module Two Test.
2. Begin lecturing on Chapter 3 (Decimals) to focus on:
   a. 3.1 (Decimal Notations).
   b. 3.2 (Comparing, Ordering, and Rounding Decimals).
   c. 3.3 (Addition and Subtraction of Decimals). [This addresses CO #3.]
   d. 3.4 (Multiplication of Decimals). [This addresses CO #3.]
   e. 3.5 (Division of Decimals). [This addresses CO #3.]

WEEK 5

1. Complete the lecture on Chapter 3 (Decimals) to focus on:
   a. 3.6 (Converting Fractions to Decimals and Order of Operations).
   b. 3.7 (Applied Problems Using Decimals).
2. Give the Module Three Test.
3. Begin lecturing on Chapter 4 (Ratio and Proportion) to focus on:
   a. 4.1 (Ratios and Rates). [This addresses CO #4.]
   b. 4.2 (The Concept of Proportions). [This addresses CO #4.]

WEEK 6

1. Complete the lecture on Chapter 4 (Ratio and Proportion) to focus on:
   a. 4.3 (Solving Proportions). [This addresses CO #4.]
   b. 4.4 (Applied Problems Involving Proportions). [This addresses CO #4.]
2. Give the Module Four Test.
3. Begin lecturing on Chapter 5 (Percent) to focus on:
   a. 5.1 (Understanding Percents).
   b. 5.2 (Changing Between Percents, Decimals, and Fractions). [This addresses CO #5.]

WEEK 7

Complete the lecture on Chapter 5 (Percent) to focus on:
1. 5.3 ((A) Solving Percent Problems Using An Equation). [This addresses CO #5.]
2. 5.4 ((B) Solving Percent Problems Using A Proportion). [This addresses CO #5.]
WEEK 8

1. Give the Module Five Test.
2. Lecture on Chapter 9 (Signed Numbers) to focus on:
   a. 9.1 (Addition of Signed Numbers).  [This addresses CO #6.]
   b. 9.2 (Subtraction of Signed Numbers).  [This addresses CO #6.]
   c. 9.3 (Multiplication and Division of Signed Numbers).  [This addresses CO #6.]
   d. 9.4 (Orders of Operation With Signed Numbers).  [This addresses CO #6.]
   e. 9.5 (Scientific Notation).  [This addresses CO #6.]

WEEK 9

1. Give the Module 6 Test.
2. Use any additional time to re-take any Modules not yet passed with 85% accuracy.

WEEK 10

Continue re-testing of the Modules as necessary.
The student will, as measured by the tests of the modules described with and a minimum of 85% accuracy, demonstrate knowledge of the subject matter of the following concepts without the use of a calculator:

1. Calculate, using addition, subtraction, multiplication and division, round whole numbers.
2. Calculate, using addition, subtraction, multiplication and division, fractional numbers.
3. Calculate, using addition, subtraction, multiplication and division, round decimal numbers.
4. Set up and solve problems dealing with rate, ratio and proportions using simple word problems.
5. Convert whole and mixed numbers to fractional, decimal, and percent equivalents and their uses in setting up and solving problems involving percents.
6. Understand simple algebraic concepts dealing with order of operations, signed numbers and exponents.
ACADEMIC GOALS

Critical Thinking Skills are addressed in COs 1-5.
Information Literary Skills are not addressed in these COs.
Cultural Diversity Awareness is not addressed in these COs.
Global Awareness is not addressed in these COs.
Teamwork is not addressed in these COs.
Professional Etiquette/Appropriate Professional Behavior is not addressed in these COs.
Customer Service is not addressed in these COs.
A Direct Measure for Assessment is not addressed in these COs.

These COs are approved for experiential credit. Judy Thompson/O 12/01

MTH099: BASIC MATHEMATICS

Developer: Sharleen Gonzalez/F; Reviser: Judy Thompson/O

Approved by: Judy Thompson (O) 12/01

(new textbook edition)
01/03/02 dm
Basic Math
Process Education Section
Course Number:
3 Credits
Location
Dates

Instructor:
Office:
Email:
Phone:
Fax:
Contact Hours:

Educational Philosophy

This course focuses on student success by increasing key learning skills for learning mathematics. In order to do this, the learners are expected to come to class prepared for an active experience of learning by reading the text materials and producing quality reading logs. The classroom periods are highly intense learning experiences using team learning, critical thinking, and problem solving. There is significant use of technology in the learning of mathematics. Most important is increasing your ability to self-assess the quality of your own learning.

Course Description

This course builds competency in mental math computation skills independent of calculators and computers. It builds the foundation to ensure future success in subsequent math and math-related courses by increasing confidence in mathematical ability while alleviating any past math anxiety. The students strengthen their learning process of mathematics to incorporate more best practices in how they go about their learning reducing rote practices that may be illogical and inconsistent. Also, students advance problem solving process especially in the context of story problems along with better use a set of validation tools. Consists of six modules covering the concepts of whole numbers, fractions, decimals, ratios, percents, and the use of signed numbers, exponents, and order of operations.
Learning Objectives and Outcomes

1. Write a systematic and sequential set of steps that documents the problem solving process used, including validation.
2. Effectively use various notation and application of negative numerical models in common practice and articulate their meaning.
3. Accurately evaluate an expression
4. Increases ability to learn mathematics and effectively teaching this knowledge to others
5. A more active learner with stronger ownership and control of their learning process
6. Advance the performance in interpreting, setting up, performing, documenting, and validating story problems
7. Successfully be the mathematical expert and consultant to help others be successful in learning and applying mathematics
8. Successfully use the supporting resources of Baker College for mathematical learning
9. A comprehensive exploration of the effective use of mathematical reasoning and problem solving in a real-life experience (professional or personal) that increased the quality of outcome based upon the following:
   • the effective use of mathematical models and concepts during the project development
   • clear and effective communication in language and symbols to effectively connect to the intended audience
   • made use of new mathematical ideas outside of what was presented or covered in the course syllabus
   • incorporate a project report of self-assessment to discuss the strengths and areas to improve in their performance with learning, applying, and teaching of mathematical concepts and principles
   • to make effective use of the abundant available resources (such as design institutional resources as well as external to institution) to support their exploration and research
Performance Criteria

9. Learn a beginning concept in Intro to Algebra at Bloom’s level 3 knowledge (application) as an independent self-directed learner of mathematics in a real-world context from their life
   Factor: application to a new context

10. Consistently produce an orderly problem solving process with the accompanying validation
    Factors: their documentation of their process

11. Confident, competent, and comfortable in computing basic expressions using precise mathematical language and rules by hand and computing tools
    Factors: accuracy in doing calculations across any course content with documented validation
    Factors: the growth in comfort and confidence through writings over time

12. Consistently chooses the best mathematical approach to real-world problem as well as during academic settings

13. Easily teach others the fundamental mathematical concepts and processes to beginning students in a peer tutoring environment
    Factors: measure level of learning of the student being taught
    Factors: effectiveness of teaching approach and quality of articulation of the mathematical concepts or processes

14. Very persistent during the difficult learning challenges by seeking additional resources and alternative approaches to achieve learning success
    Factors: the time spent with alternative sources
    Factors: The number of different sources used

15. Appreciates the value of mathematics and learns it with robust curiosity by asking questions, exploring solutions independently and expressing pleasure in accomplishment.
    Factors: Interest and inquisitiveness level in mathematics
    Factors: helpfulness in sharing knowledge with others

16. Risk taker, responds favorably to assessment, deals with evaluation productively and is aggressive in seeking mastery in common educational environments
Knowledge Table

**Key Concepts**

- fraction/mixed numbers
- Properties of 1 & 0
- Order numbers – Number Line
- Percents
- Exponents
- Variables
- Geometric areas
- Place values

**Contexts**

- Use of Negative numbers in Computation
- Translating English language to symbolic rates vs. ratios
- Applications in personal life
- Applications in other courses

**Processes**

- Problem Solving
- Solving for a variable
- Order of Operations
- Long Division
- Round numbers
- Add & subtract fractions of like fractions
- Add & subtract fraction unlike fractions
- Multiply fractions
- Multiplying whole numbers
- Divide fractions
- Subtracting whole numbers
- Adding whole numbers
- Add & subtract decimals
- Multiply decimals
- Divide decimals
- Converting decimals to fractions to percents
- Sorting numbers
- Solve a proportion
- Substitution
- Reducing fractions
- Unit rate
- Converting mixed numbers to improper fractions
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<th><strong>Tools</strong></th>
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Schedule

WEEK 1
1. Distribute and discuss the course syllabus and course outcomes.
2. Lecture on Chapter 1 (Whole Numbers) to focus on:
   a. 1.1 (Understanding Whole Numbers).
   b. 1.2 (Addition of Whole Numbers). [This addresses CO #1.]
   c. 1.3 (Subtraction of Whole Numbers). [This addresses CO #1.]
   d. 1.4 (Multiplication of Whole Numbers). [This addresses CO #1.]
   e. 1.5 (Division of Whole Numbers). [This addresses CO #1.]
   f. 1.7 (Rounding and Estimation).

WEEK 2
1. Give the Module One Test.
2. Begin lecturing on Chapter 2 (Fractions) to focus on:
   a. 2.1 (Understanding Fractions).
   b. 2.2 (Simplifying Fractions).
   c. 2.3 (Improper Fractions and Mixed Numbers).
   d. 2.4 (Multiplication of Fractions and Mixed Numbers). [This addresses CO #2.]

WEEK 3
1. Complete the lecture on Chapter 2 (Fractions) to focus on:
   a. 2.5 (Division of Fractions and Mixed Numbers). [This addresses CO #2.]
   b. 2.6 (The Least Common Denominator and Building up Fractions).
   c. 2.7 (Addition and Subtraction of Fractions). [This addresses CO #2.]
   d. 2.8 (Addition and Subtraction of Mixed Numbers and Order of Operations). [This addresses CO #6.]
2. Have students review for the Module Two Test.

WEEK 4
1. Give the Module Two Test.
2. Begin lecturing on Chapter 3 (Decimals) to focus on:
   a. 3.1 (Decimal Notations).
   b. 3.2 (Comparing, Ordering, and Rounding Decimals).
   c. 3.3 (Addition and Subtraction of Decimals). [This addresses CO #3.]
   d. 3.4 (Multiplication of Decimals). [This addresses CO #3.]
   e. 3.5 (Division of Decimals). [This addresses CO #3.]

WEEK 5
1. Complete the lecture on Chapter 3 (Decimals) to focus on:
   a. 3.6 (Converting Fractions to Decimals and Order of Operations).
   b. 3.7 (Applied Problems Using Decimals).
2. Give the Module Three Test.
3. Begin lecturing on Chapter 4 (Ratio and Proportion) to focus on:
   a. 4.1 (Ratios and Rates). [This addresses CO #4.]
b. 4.2 (The Concept of Proportions). [This addresses CO #4.]

WEEK 6
1. Complete the lecture on Chapter 4 (Ratio and Proportion) to focus on:
   a. 4.3 (Solving Proportions). [This addresses CO #4.]
   b. 4.4 (Applied Problems Involving Proportions). [This addresses CO #4.]
2. Give the Module Four Test.
3. Begin lecturing on Chapter 5 (Percent) to focus on:
   a. 5.1 (Understanding Percents).
   b. 5.2 (Changing Between Percents, Decimals, and Fractions). [This addresses CO #5.]

WEEK 7
Complete the lecture on Chapter 5 (Percent) to focus on:
1. 5.3 ((A) Solving Percent Problems Using An Equation). [This addresses CO #5.]
2. 5.4 ((B) Solving Percent Problems Using A Proportion). [This addresses CO #5.]

WEEK 8
1. Give the Module Five Test.
2. Lecture on Chapter 9 (Signed Numbers) to focus on:
   a. 9.1 (Addition of Signed Numbers). [This addresses CO #6.]
   b. 9.2 (Subtraction of Signed Numbers). [This addresses CO #6.]
   c. 9.3 (Multiplication and Division of Signed Numbers). [This addresses CO #6.]
   d. 9.4 (Orders of Operation With Signed Numbers). [This addresses CO #6.]
   e. 9.5 (Scientific Notation). [This addresses CO #6.]

WEEK 9
1. Give the Module 6 Test.
2. Use any additional time to re-take any Modules not yet passed with 85% accuracy.

WEEK 10
Continue re-testing of the Modules as necessary.

Evaluation System

Assessment System

Resources and Materials
Policies and Procedures

1)

Faculty Responsibilities

In this course, the instructor will provide guidance, opportunities, and mentoring individualized for each student on improving a selected set of learning skills and improved use of a selected set of educational techniques and tools. The instructor will provide in-depth consulting on 10 inquiry questions during breaks, evenings, and with email. The assessments made will be modeling the high quality of performance desired by the students. The instructor will provide some help in locating additional resources as needed by the participant. Any technique the student wishes to see modeled, the instructor will model it, if given advanced warning and if at all possible.

Performance Criteria for Instructor

1. Will perform every technique or tool asked for given a request with minimal time warning.
2. Will assess personal performance of student or his/her work product when asked till reach their limit.
3. Will provide quality consulting on issues or current problems.
4. Will mentor on specific learning skills defined at the beginning of the institute.
5. Will provide quality evaluation of performance to model evaluation process.

Student Responsibilities

1. Illustrate professionalism as an educator.
2. Constantly strive to improve personal performance.
4. Full effort in preparation, performance during the institute, managing your implementation plan, and assessment of your entire effort.
5. Emotionally engage is the challenge of personal growth and all the things necessary in making continuous quality change in personal performance in non-conducive environments.

Reasons for this Course
Work Products


Course Culture & Processes

This institute models the learning environment of Process Education. It is student-centered. It requires the learner to take ownership of their own learning early on and the facilitator challenges the learner to constantly improve their performance over the duration of the event and after. Key processes are not just covered but extensively used during the event, including: all forms of assessment like self-assessment, peer assessment, structured reflections, instructor assessment, mid-term assessment, etc; learning processes such as information processing, critical thinking, and problem solving. Language development is critical and students are expected to understand and be able to rephrase the meaning of any word introduced in their own language. It will have many time-pressured learning activities, where student in cooperative learning teams, and be required to perform in front of the rest of the institute. You will role-play many situations, required to articulate understanding to others, and help others solve their problems. Communication is critical and you will be required to take extensive recordings and be able to summarize at any point in time.

Personal Benefits

This course has for many educators been a significant experience in their professional development. It most likely will alter your educational philosophy significantly. It will shift to you more of the shared responsibility when there is a failure in obtaining a positive learning outcome for your students. It will increase your engagement with your students. It will excite you about the future educational opportunities. It will also make you feel more challenged in meeting the society’s needs for quality education. It will make you desire more personal development in many areas, both professional and personal. It will leave you with an experience you will constantly reflect back on for at least the next three years and probably more.
October 24, 2002

Program Office
Lumina Foundation for Education
30 South Meridian Street
Indianapolis, IN 46204-3503

Dear Sir or Madam:

This fall, Baker College launched the first phase of an innovative basic mathematics program aimed at significantly increasing student retention rates and improving student success. This program, developed in collaboration with Pacific Crest educational consulting company, is expected to boost degree completion rates and promote the future success of students in the fields of business, engineering and technology, health sciences, education and human services.

The anticipated outcomes of this program specifically include:

1. a 50% reduction in the attrition rate of basic mathematics students over the three-year pilot program, and
2. a 50% higher success rate in subsequent mathematics courses by students who completed the basic mathematics pilot course over those who did not take the course.

Baker College

Baker College is one of the country’s premier career colleges. Composed of eight campuses, a center for graduate studies, an online college, and a business and corporate
services division, it is the largest private college in the state of Michigan. With one of the country’s largest online educational programs and more than 100 master’s degree, bachelor’s degree, associate’s degree and certificate programs, Baker College serves a wide variety of students preparing to become tomorrow’s business leaders, engineers, health care workers, teachers and technology specialists.

Baker College’s mission as an institution—to provide quality higher education and training, which enables graduates to be successful throughout challenging and rewarding careers—has remained consistent throughout years of rapid growth. This fall has again seen record-breaking enrollment, with the number of registered students exceeding 25,000 for the first time in the 91-year history of the College.

Unlike “traditional” colleges and universities, the employment of our graduates is our primary focus. It is a great source of pride that 99.6 percent of Baker College graduates are employed. As a result, every Baker College action—from curriculum design, to student service offerings, to management decisions—is planned with the needs of two groups in mind: our students and the employers who will hire them.

To meet the needs of these two customer groups, we are constantly developing new educational programs and innovative delivery methods. Baker College now offers classes at every degree level in traditional classroom settings, via a network of video-based distance delivery facilities, and through the Internet. Every year, we work a little harder to prepare our students for successful careers by introducing new programs, constructing new facilities, and embracing innovative technology that has allowed us to deliver our curriculum across the country and around the world.

As a “right-to-try” institution, Baker College offers every interested student the opportunity to receive a high-quality education that will open the door to a meaningful and satisfying job.

Basic Mathematics Program

Higher education institutions across the United States have found insufficient mathematics skills to be a significant barrier to academic success. To help students overcome this hurdle and continue on the track toward challenging and rewarding careers, Baker College has adopted a new program to improve student retention and performance in basic mathematics.

In September 2002, Baker College invested $6000 in a Developmental Mathematics Curriculum Design Institute facilitated by Pacific Crest for a team of faculty and
administrators from four Baker College campuses: Auburn Hills, Clinton Township, Flint and Jackson. The purpose of this Institute was to form a system-wide project team charged with improving student performance in basic mathematics via new techniques involving the use of technology, assessment, and active learning. To kick off the program, the current basic mathematics course was examined, prerequisites were determined for students entering the subsequent course, minimum standards in mathematical competency were articulated and learning outcomes were developed. A new collaborative plan of action for improving student success and retention in basic mathematics was created.

Modeled after a plan designed for the Transitional Studies Developmental Mathematics program at the University of Louisville, the initial 3-year program will consist of a series of activities intended to grow faculty understanding and skills in facilitating students’ learning. This comprehensive faculty development program will promote retention, understanding, and success in basic mathematics, helping students remain in school to ultimately achieve their educational goals.

Over the next three years, Pacific Crest will work with Baker College to carry out and fine-tune the basic mathematics program through ongoing curriculum review and staff development. The following action plan of activities and events was designed to improve the quality of basic mathematics course outcomes.

1. **Customize a Set of Curriculum Materials:** These materials will be based on two main objectives:
   
   a. To increase the number of students who complete basic mathematics (to halve the failure rate in three years)
   b. To increase the quality of learning that takes place for those students taking the course

2. **Provide Ongoing Faculty Development:** This training will build the facilitation and assessment skills of instructors with respect to mathematics learning skills through events including:
   
   a. 2 two-day coaching sessions per term (Fall 2001 through Spring 2005)
   b. 1 day team meeting after each term (when no other event is scheduled)
   c. Developmental Mathematics Teaching Institute for all participating mathematics faculty (December 2002)
d. Advanced Teaching Institute for Developmental Mathematics (Summer 2003)

e. Learning to Learn Camp for non-successful students (Summer 2004)


3. Provide Ongoing Assessment and Coaching in the Classroom: As a follow-up to the annual faculty development event, classroom visits will be made each term to provide instructors with timely feedback and to address current problems.

4. Implement a Learning to Learn Camp: Designed for the least prepared students and those who have failed the course at least twice, this program will help students build a strong foundation for success.

5. Create an Ongoing Project Team: Two project co-directors will facilitate communication, have faculty share discoveries among the four campuses, integrate technology effectively, incorporate reflective practice by faculty and students, constantly assess the project’s movement towards its outcomes, identify and research key issues, and finally provide the motivation and rewards for the participating faculty.

The successes and lessons learned at the end of this pilot period will be shared with a national audience at a Conference on Best Practices on Baker College’s campus.

Summary of Request

We believe that Baker College’s new basic mathematics program goals echo Lumina Foundation for Education’s dedication to leadership development and commitment to issues regarding educational retention and degree or certificate attainment. For this reason, we invite Lumina Foundation for Education to play an important role in this exciting new program.

The total cost of the basic mathematics program will be $111,400. Baker College has paid $6,000 to open the program with the Developmental Mathematics Curriculum Design Institute, and has earmarked additional funds totaling just over half of the remaining balance.
We ask that Lumina Foundation consider a contribution of $50,000 to help promote the academic preparedness of tomorrow’s graduates. This amount will be allocated to securing the leadership and expertise of Pacific Crest’s designated project co-director; sponsoring team meetings following each academic term that will focus on staff development, program review and enhancement; and supporting the Basic Math and Advanced Teaching Institutes, at which all participating math faculty will receive key development opportunities.

We thank Lumina Foundation for Education for its consideration of this request. Baker College is prepared to submit a full proposal and additional information about this program upon request. In the meantime, please feel free to contact me at 810/766-4303 or barbara.honhart@baker.edu if you have any questions.

Sincerely,

Barbara A. Honhart, Ph.D

System Vice President for Academics
Peek Coaching – Rose 8:30 Class

Areas of Focus

1. Level of Effort
2. Thinking within Learning
3. Leveraging of team learning

Strengths

1. Paired learning that then validated their process of working through a fraction calculation by teaming a pair with another pair. The conversation of describing what they did provides new perspective to the other group and helps to elevate both teams understanding of what went on. The energy among the team increases as the dynamics increased.
2. Challenging the level of thinking $2/3 + 9$ – what does that really mean – the tendency to go to a formula, without thinking – the challenging of critical thinking changes the level of thinking in a classroom.
3. The use of public performance – having students go up to the board – this helps other students assess the thinking and performance and verify their own understanding.
4. The dynamics of switching from public (large group) back to small group is very effective in helping group dynamics.
5. Constantly analyzing the issues of learning and performance to help students to determine what are the issues they need to address. E.g. notation, common mistakes, In the appendix of the new edition provide a summary of the common or most frequent mistakes and the reasons for it? TI – lets brainstorm that list (currently there is an activity)
6. Willingness to model exactly at the same level of the students the thought processes that need to be addressed. This models documentation, key issues of thought, neatness, form, and conventions of language.
7. The second division problem you gave them a chance to work through before doing it in front of the class – this gives them a reading of where they are in solving a problem.
8. The dynamics of the environment is very conducive to students responding and talking about what is going on – the more communication the more the thinking is involved.
9. Asking the student – how do you check it – this forces more thinking about how do you validate your calculation in each situation.
10. The consistent rotation of team in presenting and the peer pressure of all team members to present involves all students into the process.
Improvements

1. The language of feedback should eliminate as many negative words as possible – e.g. right or wrong was used. (why we get into trouble) – language of success and not the language of non-success.
2. Having two students go up to the board allows them to share the risk and verify their own thinking – assign a spokesperson and a validator.
3. Have the students verify and challenge each other and replace your role as quality control – let them question and challenge each other – put each student team on the spot by having them commit to either verify or challenge an answer.
4. Being able to communicate what they are doing when they are doing it – have a second person to articulate what someone is doing as the other is thinking through it on the board.
5. Need to determine what the students in the room are thinking and learning when something is modeled on the board – have the students take time to explain to each other what they did.
6. When you do a problem on the board – give the students 60 seconds to think through the problem and identify the top issues that cause them to make errors.
7. Simultaneous reporting where two teams put up their responses thus get to validate and have the class validate and leads to discussion of why things are different.
8.

Insights

1. First class in the morning is always much quieter in energy and start-up thus need means to engage students minds. The energy after the public performances were much higher in energy after 30 minutes.
2. What a culture of all females mean – the dynamics change – risk taking and confidence changes.
3. The natural culture of a classroom is to have the faculty member to constantly do the thinking – assessing, explaining understanding, asking questions, diagnostics, and challenging – the students are so willing to step back and let the faculty member do this.
4. Around week 7, there were 13 students on time. Additional person came 25 minutes late. 2 more people came in 35 minutes late – one of the students left after 45 minutes. 2 more came in at 45 minutes late (males) another came in at 48 minutes late. Another came in 52 minutes late. (Was there school on Nov 11?) Another came in 65 minutes after the start (21 total for the day)
5. The role of rules that are memorized, versus understanding why things work – e.g. multiplication of fractions – do we need common denominators (yes or no), do we flip?, do we cross multiply, do we add are all questions going through the mind –
Question is what is multiplication? What is an expression? (Couldn’t remember how to do it!) When do we flip? When do we reduce?

6. The students have a nice set of professional demeanor – Wanda articulated her calculation with quality and followed up by the next person modeling that communication.

7. Mental math was needed throughout the daily session – mostly single digit calculations with a few multiple digit calculations – none needed to be done by a calculator, but absolutely were done quickly by the students or the instructor.

8. A lot of language by instructor and students about remembering stuff. Do mathematicians remember stuff or understand stuff?

9. What is the ratio of males to females at Baker college 1 to 2 or 1 to 3 or 1 to 4?

10. The addition of zeros to number in science drive them crazy in relation to the significant digit issues..