

Outcome-Based Education and Curriculum Design

Uniformed Services University of the Health Sciences
October 11, 2011

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Competence - definition

- Competence – “The quality of being capable of performing an act or function”
- “having sufficient knowledge, skill, experience or capacity for some purpose”



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Competency - definition

“ Professional competence is the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and the community being served”

Epstein and Hundert
JAMA 2002; 287:226-235



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Competency

Competency is demonstrated when

- an individual's capabilities
- encounter tasks
- in a context (which may vary)

Competency is a Learner Outcome



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Outcome-based Education

Outcome
defines
Process



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Outcome-based Education

Outcome (competency) defines:

- Content
- Instructional methods
- Time allocation and sequence
- Learning strategies
- Assessment strategies



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Outcome-based Education 3 key components

- 1) Communication of explicit learning outcomes and standards that must be achieved
- 2) Learning experiences designed and directed to facilitate the desired level of achievement of the learning outcomes
- 3) Assessment processes that ensure that individual students have achieved the learning outcomes and standards



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Outcome-based Education Key Components

- 1) Communication of explicit learning outcomes and standards that must be achieved

Learning Objectives



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Competency

Competency is demonstrated when

- an individual's capabilities
- encounter tasks
- in a context (which may vary)



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Objectives – 3 Elements

- Behavior – What the learner should be able to do (Capability)
- Performance criteria – describe the criteria for acceptable performance (Task)
- Conditions – The conditions, if any, under which the learner is able to do it (Context)



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Behaviors - Bloom's Taxonomy

Bloom's taxonomy is an excellent source of verbs that describe learning outcomes as behaviors or capabilities



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Bloom's Taxonomy

- 3 interrelated and overlapping domains of learning behaviors:
 - Cognitive (Knowledge)
 - Psychomotor (Skills)
 - Affective (Attitudes, Values)
- Hierarchy – simple to complex
- Must first learn simple to learn complex



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Progression of Cognitive Domain

- Knowledge
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation



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Progression of Cognitive Domain

- Fact
- Understanding
- Application



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Progress of Psychomotor Domain

- Imitation
- Manipulation
- Precision
- Articulation
- Naturalization



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Progress of Psychomotor Domain

- Imitation
- Practice
- Habit



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Progression of Affective Domain

- Receiving
- Responding
- Valuing
- Organization
- Characterization (by Value Complex)



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Progression of Affective Domain

- Awareness
- Distinction
- Integration



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Objectives – Bloom’s Taxonomy

Bloom’s verbs describe learning behaviors.

But what criteria of performance are required to demonstrate competency ?

Under what conditions, if any, should the behaviors be demonstrated ?



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Competency and Mastery

- **Competency** – the minimum standard of performance
- **Mastery** – the continuous highest standard of performance

Competence → → → → Mastery



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Dreyfus Model of Skill Acquisition

- **Novice**
- **Advanced Beginner**
- **Competent**
- **Proficient**
- **Expert**

Mind Over Machine



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Levels of Professional Development of Knowledge and Performance

- **Novice** – identifies and uses rules of thumb
- **Advanced beginner** – connects rules to common aspects of the plan
- **Competent** – able to plan an approach and execute a plan
- **Proficient** – regularly uses evidence-based work and makes work efficient
- **Expert** – capable of using intuition where empirical knowledge does not exist

Mind Over Machine



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Dreyfus Levels to Medical Education

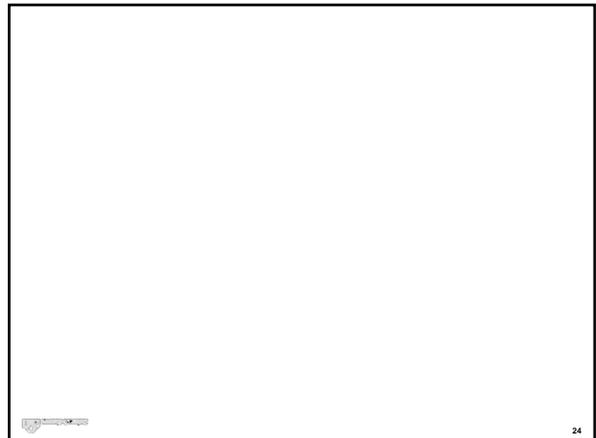
What level is appropriate for:

- **Undergraduate Medical Education?**
Advanced Beginner to Competent
- **Graduate Medical Education?**
Competent to Proficient
- **Continuing Medical Education?**
Proficient to Expert

How can educators ensure that programs achieve competency across the continuum?



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Outcome-based Education Key Components

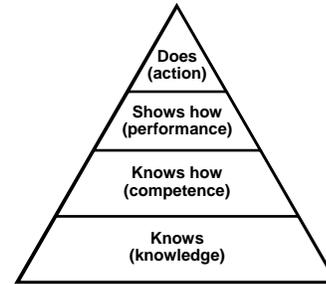
3) Assessment processes that ensure that individual students have achieved the learning outcomes and standards

“Assessment drives learning”



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Framework for Clinical Assessment

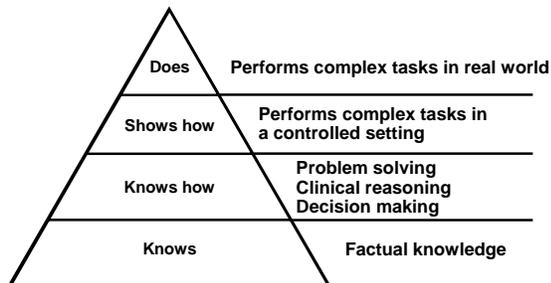


Miller: Acad Med 65(9):563



CP120562B1

Assessment Strategies

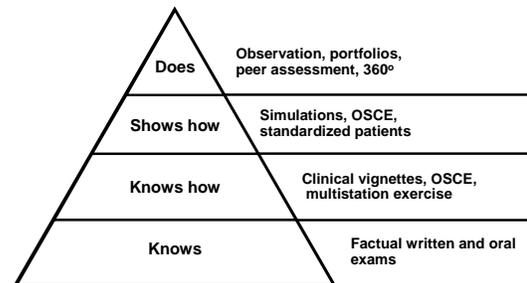


Miller: Acad Med 65(9):563



CP120562B4

Assessment Methods



Miller: Acad Med 65(9):563



CP120562B5

Assessment

Some learning behaviors are not measurable or observable

“...no assessment method can provide all the data required for judgment of anything so complex as the delivery of professional services by a successful physician.”

Miller: Acad Med 65(9) S63-S67, 1990



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Assessment strategies

- We must move up the assessment pyramid to succeed at Outcome-based education
- Formative Assessment drives Mastery Learning and Outcome-based Education



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Assessment vs Evaluation

Assessment – analysis and use of data to make decisions about improvement

Evaluation – analysis and use of data to make judgments about performance



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Student Assessment and Evaluation

- Formative assessment – feedback that “forms” the development of the learner
- Summative evaluation – summarizes the achievement of the learner - grading
- Diagnostic assessment – identifies student deficiencies for remediation



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Formative Assessment

3 components of Formative Assessment

- Constructive feedback
- Direction to facilitate desired learning
- Encouragement to create a supportive learning environment



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Self-Regulated Professional

As educators, we should:
engage our learners in self-assessment
encourage self-direction
foster the development of self-regulation

Faculty mentors should model these behaviors and help develop these skills



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Mentoring for Self-Regulation

- How are you doing in school? How are you progressing on your goals? (self-assessment)
- What opportunities for improvement have you identified? (self-direction)
- What plans do you have for working on these improvement opportunities? (self-regulation)
- Provide feedback from actual performance and progress on previous self-improvement plans. Provide direction as appropriate.
- How can we help? (support)



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Outcome-based Education Key Components

- 2) Learning experiences designed and directed to facilitate the desired level of achievement of the learning outcomes

Curriculum



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Compact of Learning

Our responsibility, as educators, is to design effective learning experiences, direct the learning, ensure that the standard of learning has been achieved, and demonstrate the behaviors of Professionalism



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Compact of Learning

Our students responsibility, as learners, is to achieve the learning outcomes and demonstrate the same behaviors of Professionalism



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Goals of Learning Activities

What do we want students to do with the knowledge, skills, and attitudes they learn?

- 1) Retain them → Retention
- 2) Apply them to new “on the job” situations (or new contexts) → Transfer



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Evidence-Based Education

We should integrate existing knowledge from the neurobiology and science of learning into the design of learning experiences and the curriculum

Acad Med 2011;86:415-420



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Prior Knowledge and Experience, and Meaning

- Learning is strongly influenced by meaning
- “Construction of knowledge” is organizing and storing new information in a meaningful context
- Learners incorporate meaning into new material by relating it to prior knowledge and experience



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Prior Knowledge and Experience, and Meaning

- Retention and transfer improve if new material is related to prior knowledge and experience
- Learning in the same context (clinical) in which application will occur constructs knowledge to support practice



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Implications for Curriculum Design

Prior Knowledge and Experience, and Meaning

- Students will learn basic sciences more effectively if they understand the relevance to patient care or current research theory or efforts
- Construct rigorous cases to reinforce the essential importance of basic science to clinical reasoning and problem solving



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Implications for Curriculum Design

Prior Knowledge and Experience, and Meaning

- Readiness assurance testing – testing prior knowledge before new learning activities (from Team-based Learning)
- Assign pre class work that activates relevant prior knowledge and experience



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Dual Coding Theory

“Dual Coding Theory” – Humans process information by 2 channels, and store information in 2 corresponding formats

- 1) auditory-verbal
- 2) visuospatial



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Dual Coding and Knowledge Representation

- Information stored in both auditory-verbal and visuospatial formats improves retention and transfer of learning more than information stored in either format alone



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Implications for Curriculum Design

Dual Coding Theory

- Combine auditory-verbal and visuospatial formats to present materials
- Have students construct graphics and concept maps to organize information and depict relationships of concepts especially if primarily verbal
- Have students write verbal descriptions or summaries of information especially if primarily visuospatial



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Active Learning and Retention

- The more actively involved a learner is in learning activities, the greater the retention of learning



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Retention and Involvement

We remember

- 10% reading
- 20% listening
- 30% seeing pictures

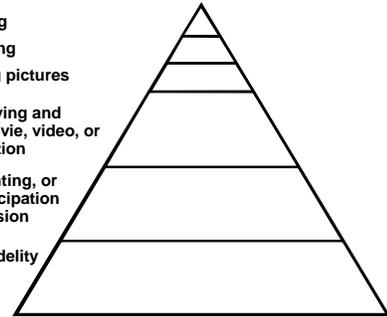
50% observing and hearing movie, video, or demonstration

70% presenting, or active participation in a discussion

90% high fidelity simulation, doing

Our involvement

Passive



Active

CP12116502

“Tell me, and I will forget.
Show me, and I may remember.
Involve me, and I will understand”

Confucius 450 B.C.



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Active Learning and Cognition

- Active learning achieves higher level learning comprehension, application, analysis “transforming” → “knows how”
- Passive learning results in shallow processing and lower level learning “transmitting” → “knows”
- Understanding is an interpretive process in which students must actively participate



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“What is important is not just the ‘performance’, but the understanding of why they are doing what they are doing, and what they are learning from it.”

Keith Morrow 1997



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Implications for Curriculum Design Active Learning and Cognition

- Ask students to compare and contrast concepts or apply concepts in different contexts
- Pose deep reasoning questions or problems to engage and direct the learner
- Encourage learners to ask questions and allow sufficient time to answer and discuss



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Implications for Curriculum Design Active Learning Methods

- Problem-Based Learning
- Team-Based Learning
- Case Method Teaching – Discussion
- Application of Knowledge Exercises
- Simulations
- “Debriefing”



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Motivation to Learn

- Adults learn best in a supportive environment
- Praise which focuses on the process of learning motivates the student and improves learning of difficult tasks
- Formative Assessment
- Constructive corrective feedback



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Implications for Curriculum Design Motivation to Learn

- Stimulate curiosity by asking probing questions of important concepts
- Team learning activities provide support for learners
- Provide formative feedback by praising and constructively critiquing the process of student learning → “Coach”



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Stress

- Moderate levels of stress can facilitate synaptic potentiation in brain circuits involved in memory and reinforce learning
- High levels of stress inhibit memory brain circuits and interfere with learning
- Balance learners challenges with support



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Interference

Interference – when “other” information or activities interfere with learning new information



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Implications for Curriculum Design Preventing Interference

- Reduce interference by monitoring
- Workload of simultaneous courses
 - Similar information presented in disjointed, inconsistent, contradictory manner
 - Frequent summative testing – “binge and purge” information for grades



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Practice at Retrieval

- “Practice at retrieval” – the learner accesses memory to retrieve information
- Information that is frequently retrieved becomes more retrievable
 - Practice at retrieval is the single most important variable in promoting long term retention and transfer



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Practice and Time

- Spacing practice over longer intervals of time is preferable to mass practice over a shorter or limited time
- “*Distributed practice*” (practice distributed over time) results in better long term retention and transfer



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Implications for Curriculum Design Practice at Retrieval

- Important concepts should be integrated into the learning experiences repetitively over time to provide distributed practice at retrieval



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Testing is Practice at Retrieval

- “Testing effect” – Tests improve retrieval of information but only for information that was recalled for the test, not for all information studied for the test
- Testing enhances learning and retention



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Implications for Curriculum Design Testing as Practice at Retrieval

- Examinations should be constructed with “Key concept questions” as testing effect will enhance retrieval
- Important concepts should be tested over time to provide practice at retrieval
- Provide “key concept” review questions to guide studying and exam preparation



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Practice and Context

- Practice at retrieval occurs within a context
- Altering the context for retrieval increases the transfer of learning across multiple contexts



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Implications for Curriculum Design Multiple and Varied Contexts

- Use multiple and varied contexts for learning experiences
- Mix different types of problems and solutions in the same learning experience



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Learning and Context

- Learning occurs most effectively when it occurs in the context of future tasks
- Context facilitates construction of knowledge that supports practice
- Contextual learning facilitates retrieval, application and retention
- Cases provide real world context



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Patients as Cases

Patients or (Cases) are the “unit” of :

- Clinical work
- Clinical teaching
- Consultation
- Continuing education
- Clinical examinations
- Clinical memory – expertise

Cox. Med Ed 2001; 35, 862-866



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Learning and Context

“It is a safe rule to have no teaching without a patient for a text, and the best teaching is that taught by the patient himself ”

Sir William Osler



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Case-based Teaching

Case-based teaching

- a meaningful problem
- that requires authentic action on the part of the learner
- in the process of understanding
- and resolving the problem.



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Learning and Context Educational Benefits of Cases

A Case is

- A patient based context for discussion
- That allows students to recall previous knowledge and experience
- Assess limits of their knowledge
- Learn from others
- Engage in collaborative inquiry and
- Formulate questions that lead to learning, understanding and problem solving



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**“A good case
takes a routine event
and
explodes its complexity”**

C. Roland Christensen
Harvard Business School



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Implications for Curriculum Design Learning and Context

- Meaning, learning, retention, and transfer of basic and clinical sciences will occur most effectively if learned in a patient or case based context
- Cases are simulations of real patients and should be used as often as possible



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Implications for Curriculum Design Learning and Context

Learning occurs best in the context of meaningful service to real patients

There is no substitute for early, longitudinal, and high quality clinical experiences

Our patients are the best teachers throughout our careers



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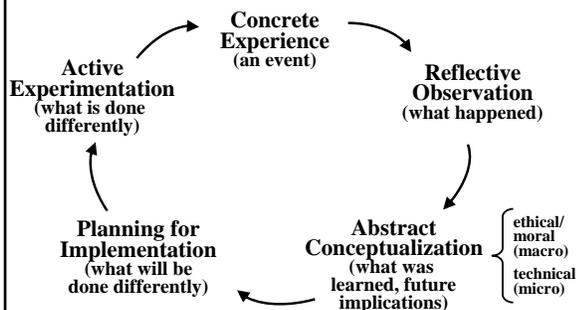
Implications for Curriculum Methods for Contextual Learning

- Case method learning
- Standardized patients
- OSCE
- Simulation and Debriefing
- Clinical Teaching (Microskills, SNAPPS)



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Experiential Learning (Reflective Thought and Action)



Barnett, 1989 77

Experience

- Experience alone can be a poor teacher
- Experience with formative and corrective feedback (“guided practice”) is the best teacher
- Authentic experience, similar in content and context to the real world, is most effective



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The currency of mastery is distributed,
deliberate (or guided) practice



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Deliberate Practice

- Identify well-defined task
- Appropriate level of difficulty
- Informative feedback
- Opportunity for repetition
- Opportunity to correct errors

Ericsson. Psychological Review. 1993



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Implications for Curriculum Design Experience

- Guide or “coach”→ Deliberate Practice
- Correct misconceptions, erroneous thinking, faulty behaviors→ Formative Assessment



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Clinical Education

“ Health Professions students and their faculty should learn in clinical settings that reflect the best achievable patient care”

AAMC Institute for Improving Clinical Care



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Exemplary Clinical Education

- Active, experience-based learning
- Interdisciplinary teams, collaboration
- Learning in context of meaningful work
- Teachers as coaches
- Reflection

Interdisciplinary Professional Education Collaborative



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Clinical Education - Residents

- Residents are in the best position to guide student practice
- We should develop residents as educators who understand the learning objectives, expectations and responsibilities of students, and the criteria for performance evaluation



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Faculty as Role Models

- Faculty are role models in an apprenticeship system
- We must be what we want our students to become



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“3 R’s” of New Curriculum

- Rigor
- Relevance
- Relationship



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Thank You
Best Wishes



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