


## Creating A Knowledge Management Framework for Assessment in Higher Education

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## Overview

- What is knowledge management?
- Role of knowledge management
- Student learning and assessment
- Functional requirements for KM system
- KM and medical education
- Implementation strategies

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## The University of Central Florida *Stands For Opportunity*

- Established in 1963 (first classes in 1968), Metropolitan Research University
- Grown from 1,948 to 50,175 students
  - 42,833 undergrads and 7,342 grads
  - 12 colleges
  - 12 regional campus sites
  - 5<sup>th</sup> largest public university in U.S.
  - 89% of lower division and 67% of upper division are full-time
- Carnegie classification:
  - Undergraduate: Professions plus arts & sciences, high graduate coexistence
  - Graduate: Comprehensive doctoral (no medical) [Medical college approved]
- 95 Bachelors, 97 Masters, 3 Specialist, 28 PhD programs, 1 MD program
- Largest undergraduate enrollment in state
- Approximately 1,258 full-time faculty; 10,198 total employees



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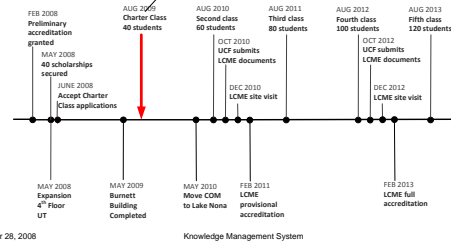
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## UCF College of Medicine

- Approved May 2006 Full tuition and living expense scholarships for charter class



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## Knowledge Management?



[kmlisc.blogspot.com/2007\\_05\\_01\\_archive.html](http://kmlisc.blogspot.com/2007_05_01_archive.html)

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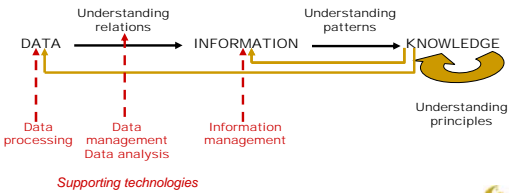
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## Knowledge Management Is . . .

- General definition (Sensky, 2002)
  - Identification and analysis of available and required knowledge, and
  - Subsequent planning and control actions to develop the knowledge assets so as to fulfill individual/organizational objectives
- Process of transforming information and intellectual assets into enduring value—it connects people with the knowledge that they need to take action, when they need it (Kidwell, Vander Linde, and Johnson, 2000)



## Data, Information, and Knowledge



(after Kidwell, et al., 2000)



## Dimensions of Knowledge

- Tacit vs. explicit
  - Tacit knowledge—subconscious, internalized, perhaps unaware
  - Explicit knowledge—held consciously in mental focus and may be communicated to others
  - Challenge of KM is to convert tacit knowledge into explicit codified knowledge in order to share it
  - KM must permit individuals and groups to internalize and make personally meaningful the codified knowledge they have retrieved
- Other dimensions
  - Embodied vs. embedded
  - "New" knowledge vs. "established" knowledge

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## Challenges for Knowledge Management

- Explicit knowledge
  - Tangible
  - Visible
  - Public
  - Can be accessed by third persons
  - Once shared, it belongs to everybody
  - Can be seen "above the water"
- Tacit knowledge
  - Intangible
  - Invisible
  - Private
  - Can be accessed on the first-person basis only
  - Hidden "underwater"



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## What is Knowledge Management?

- Discipline within an organization that ensures that the intellectual assets of an organization are shared
- The processes of gathering, analyzing, storing and sharing knowledge and information within an organization
- A range of practices of an organization to create, secure, coordinate, combine, retrieve, represent, and distribute knowledge
- Integrated system for accumulation, integration, manipulation, and access of data across multiple groups or organizations—supports collaboration

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## Barriers to Knowledge Management

- Organization
  - Lack of structures to facilitate knowledge processes
- Technology
  - Limits on ability to share knowledge
- Individual self-interest
  - Underlying assumption for most models of social exchange
  - In two-party relationships, pursuit of self-interest is dominant intention
  - Engrained in organizational practice
  - Becomes behavioral norm for individuals and organization

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## Role of Knowledge Management

- Process of transforming information and intellectual assets into enduring value— **it connects people with the knowledge that they need to take action, when they need it** (Kidwell, Vander Linde, and Johnson, 2000)

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## Roles of KM in Higher Education

- Research
  - Research interests and results
  - Funding opportunities
- Curriculum development
  - Curriculum revision repository
  - Teaching and learning with technology
  - Knowledge banks in curricular areas
  - Assessment techniques
- Student services
  - Student services portal
  - Career placement services portal
- Administrative services
- Strategic planning (after Kidwell, et al., 2000)

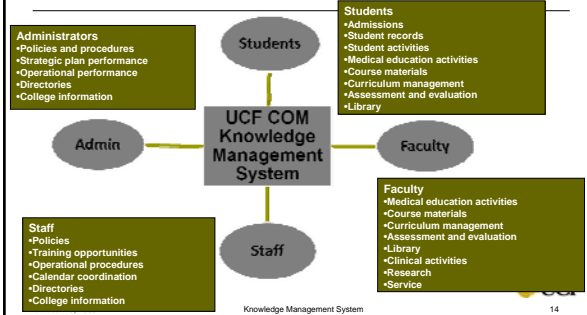
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## COM Knowledge Management Vision: Create a Knowledge-Rich Environment



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## College of Medicine KM Goals

- Support students
  - Mobile devices, document searches, online educational resources, electronic student records, formative and summative assessments, computer-based exams, collaboration tools, surveys
- Support medical education and clinical faculty
  - Educational materials, library resources, poster production, instructional design, assessment support, instructional technology support, collaboration tools
- Support research faculty
  - Library resources, research data sets, data mining tools, poster production, collaboration tools
- Support administration
  - Reporting tools, canonical data sets, benchmarking, KPIs, analytical models, decision support, planning support, surveys and assessments

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## Initial Projects

- Curriculum development
  - Faculty share calendar and share curriculum content
- Curriculum management
  - Session materials, meta data, content searches, CurrMIT exports, accreditation reports
- Curriculum delivery
  - Calendar view, session materials, content searches, assignments, ABCs
- Assessment system (potential national model)
  - Multiple methods (exams, surveys, audience response, clinical skills, cases, rubrics), mappings to subjects and objectives, customized reports

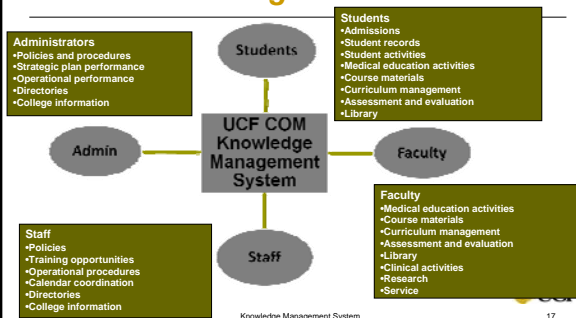
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## Overall Vision: Create a Knowledge-Rich Environment



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## Assessment

- Why do assessment?
- Who wants it?
- Who needs to do it?
- Where do we use the term "assessment" in higher education?
  - Assess student learning
  - Assess student development
  - Classroom assessment
  - Assess the quality of programs
  - Assess the quality of support services
  - Assess university or college performance

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## Assessment Concepts

- **Summative**—for making decisions about resources, people, institutions
  - Accountability
  - Competency
  - Performance evaluations
  - Program review
- **Formative**—for better understanding and improvement
  - Student learning
  - Institutional Effectiveness
  - Program review

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## Assessment for Continuous Quality Improvement

- It is a **formative** evaluation process designed to support improvement
- It is continuous



- It is focused on improvement
  - Student learning
  - Student development
  - The institution and its people

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## Levels of Assessment

- Classroom assessment
  - ✓ Assessment of individual students performance at the course level by an instructors
- Course assessment
  - ✓ Assessment of how well a course is meeting student learning outcomes
- Program assessment
  - ✓ Assessment of how well an academic program is meeting student learning outcomes
    - Assessment of how well an educational support program is meeting its objectives
- Institutional assessment
  - Assessment of campus-wide issues or programs

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## Assessment and Student Learning

- Both formative and summative assessment affect student learning (intended and unintended consequences)
- Assessment provides direction and motivation for future learning
- Assessment process should provide timely feedback from assessments to be effective
- Use multiple methods and variety of environments and contexts to capture different aspects of performance

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## Assessment Methods—M.D. Program

- Standardized exams (NBME)
- Computer-based exams
- Quizzes
- Audience response system
- Team-based learning assessments
- Patients logs
- Surveys
- Narrative evaluations
- Portfolio reviews
- Review of assignments using rubrics
- Structured observations
- And more...

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## KM and Assessment: Functional Requirements

- Students
  - How am I doing? –timely formative feedback
  - Where do I need to focus improvement efforts? –corrective action
  - Where can I get help? When?
- Faculty
  - Are the students learning what they are supposed to learn? –real time overall assessment
  - What is the interaction with other faculty members? –interaction effect, missing materials, etc.
  - How effective are teaching approaches? –results by method
- Administration
  - What kind of student assistance is needed? Where?
  - What curricular improvements are needed?

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## Criteria for KM-Assessment System

- Well-defined student learning outcomes
  - Program
  - Course
  - Session
- Assessments linked to SLOs
  - Each question linked to specific session SLOs
  - All SLOs mapped up to program level
- Technology to capture measurement results
  - Analysis
  - Communication and collaboration
  - Timely reports

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## Medical Education (M.D. Program)

- Accreditation
  - Liaison Committee on Medical Education
  - Requires learning objectives at program and course levels
- "When you have seen one M.D. program, you have seen one M.D. program"
  - Significant variation in program structure and delivery
  - Multiple courses vs. modules
  - Didactic lectures vs. problem-based learning, and lots in between
  - First two years—basic science; second two years—clinical experience (some programs mix them)
  - Multiple instructors ("parade of stars")

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## UCF M.D. Curriculum

The table displays the curriculum for the M.D. program, organized by year and semester. It includes course numbers, titles, and credit hours. The courses are color-coded by semester: Year 1 (Spring), Year 2 (Fall), Year 2 (Spring), Year 3 (Fall), and Year 3 (Spring). The grid shows a progression from basic science and pathology in the first two years to clinical clerkships and electives in the final two years.

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## UCF M.D. Curriculum Characteristics

- Year 1
  - Integrated basic science (human body) modules—normal function
  - Early clinical and research experience
- Year 2
  - Organ-system modules—integrated basic science and pathology
- Year 3
  - Traditional clerkships (students in medical facilities under instruction by practicing clinician) with basic science integration
- Year 4
  - Clerkships and electives mostly in medical facilities

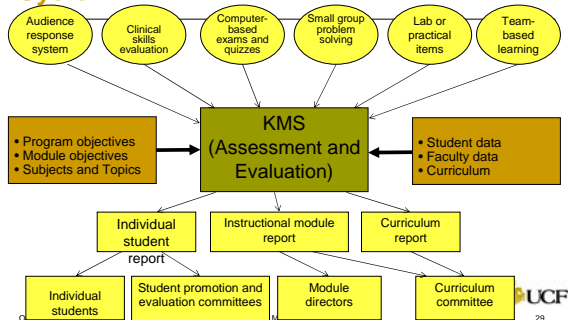
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## Knowledge Management—Assessment System



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## Implementation

- Labor intensive
  - Faculty—defining SLOs, mappings, developing SLO related assessments (EACH question)
  - IT—system design, capturing functionality, integration of multiple systems (course materials, curriculum management, portfolio, quizzes, exams, audience response)
- Culture change for faculty
  - Articulating tacit knowledge
  - Develop willingness to share
  - Collaboration and feedback across courses/modules

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## System Design of Curriculum

- Student learning outcomes definitions
  - Program SLOs drive curriculum content
  - Course/module SLOs support subset of program SLOs
  - Sessions result from need to cover course/module SLOs
- SLO mappings
  - Identify cognitive levels
  - Define topic area/discipline
  - Identify content level
  - Identify teaching methods
- Define assessment methods

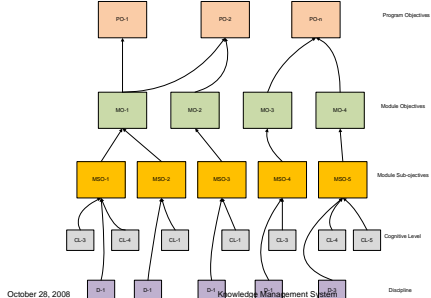
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## Objectives Mappings



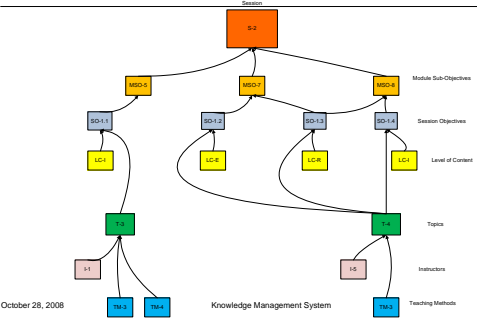
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## Session Mappings



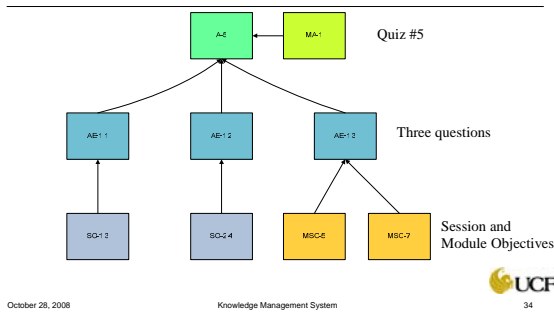
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## Assessment Mappings



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## Sample Content Topics

Content Topic	From Curr/MIT LCME Curriculum Checklists (Hot Topics)	Abbreviation
Biochemistry		
Biostatistics	X	
Communication Skills	X	
Community Health	X	
End-of-life Care	X	
Epidemiology	X	
Evidence-based Medicine	X	
Family violence/abuse	X	
Health Care Financing	X	
Health Care Quality Review	X	
Health Care Systems	X	
Home Health Care	X	
Human Development/Life Cycle	X	
Human Sexuality	X	
Medical Ethics	X	

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## Sample Teaching Methods

Teaching Method	From Curr/MIT LCME Curriculum Checklists (Educational Methods)	Abbreviation
TM-1 Autopsy	X	AUTO
TM-2 Case	X	CASE
TM-3 Case-based	X	CBAD
TM-4 Case-based Lecture	X	CBLE
TM-5 Case-based Small Group	X	CBSG
TM-6 Case-based, small group, tutorial	X	CBGT
TM-7 Chief's flow	X	CHBO
TM-8 Classroom Response System		CRSY
TM-9 Clerkship Experiences	X	CLX
TM-10 Clinical Correlation	X	CLCO
TM-11 Clinical Demonstration		CLDE
TM-12 Clinical Skills Development	X	CLSD
TM-13 Collaborative Learning		COLL
TM-14 Community Encounter / Community-based Work	X	CEBW
TM-15 Computer-assisted Instruction	X	COAI
TM-16 Conference	X	CONF
TM-17 Demonstrations	X	DEMO
TM-18 Discussion	X	DISC
TM-19 Dissection	X	DISS
TM-20 Dramatization/Role Play	X	DRPL

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## Sample Assessment Methods

### Assessment Methods

	Assessment Method	From CurrMIT LCME Curriculum Checklists (Assessment Methods)	Abbreviation
AM-1	Attendance	X	ATTN
AM-2	Chart Review	X	CHRV
AM-3	Classroom Response System	X	CRSY
AM-4	Computer Exams	X	CPEX
AM-5	Computerized case simulation to test decision-making	X	CPCS
AM-6	Conferences	X	CONF
AM-7	Drawing Pictures	X	DPIC
AM-8	Essay Questions	X	EQUE
AM-9	Exams	X	EXAM
AM-10	Fill-in Questions	X	FIQIE
AM-11	Final Examination	X	FNEX
AM-12	Group Presentation	X	GRPR
AM-13	Lab Exam	X	LABE
AM-14	Laboratory Practical	X	LABP
AM-15	Matching Questions	X	MIQUE
AM-16	Midterm	X	MIDE
AM-17	Multiple-Choice Exam	X	MCEC
AM-18	Narrative Evaluations	X	NEVA
AM-19	NBME Shelf Exam	X	

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## Sample Module Objectives

### HB1 Module Objectives revised 9-23-2008

- HB-1.1: Identify functional groups unique to proteins, nucleic acids, lipids, and carbohydrates, and apply the underlying principles as to how these biomolecules bind and communicate with one another in health and disease.
- HB-1.2: Interpret the roles of metabolism of proteins, carbohydrates, lipids, and nucleic acids in normal physiological function and the changes that occur in disease processes.
- HB-1.3: Explain the interrelationship of the biochemical principles which underlie pharmacodynamics (what the drug does to the body) and pharmacokinetics (what the body does to the drug).
- HB-1.4: Demonstrate comprehension of DNA structure, transcription, and recombination mechanisms, as well as RNA translation and protein synthesis. Explain how gene expression, regulation, and repair processes are involved in human health and disease.
- HB-1.13: *Role of the Lifelong Learner.* Demonstrate proficiency in the access, evaluation and use of medical databases, literature, and online information resources essential to the evidence-based practice of medicine.
- HB-1.14: Apply basic principles of evidence-based medicine through analysis of current literature and demonstrate an ability to apply these new findings to medical diagnosis.
- HB-1.15: *Role of the Clinician.* Demonstrate ability to obtain patient information and use decision support resources to apply the data in making a medical decision related to

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## Partial Schedule

HB-1 Molecules in Cells (Week 1 of the module)					
Week 1	Monday 8/17	Tuesday 8/18	Wednesday 8/19	Thursday 8/20	Friday 8/21
8:00	Benchmark benchmarks Intro to Practice of Medicine (P1)	Intro to 5-1 Intro expectation History of Scientific techniques	Intro to Cell Signaling molecular communications (P1)	Cellular Signaling (Small Group) (P1)	
9:00	Intro to Molecular Recognition BIO-CHEM (P1)	P1 Small Groups	Types of Research (P-1) Scientific method (types of research)	Transcription 1 CB SL	RNA Interference and microRNAs (Small Group) (P1)
10:00	DNA, RNA, Chemical Structure BIO-CHEM (P1)	P1 Small Groups	Types of Research (P-1) History of research	Transcription conts. CB SL	NOVA Special on Engineering GEN
11:00	DNA Replication and Recombination BIO-CHEM (P1)	P1 Small Groups	Types of Research (P-1) Bench to Bedside Panel discussions	Post-Translational Gene Regulation, and RNA turnover BIO-CHEM (P1)	OPEN
12:00	LUNCH	LUNCH	LUNCH	ABC of (pre)genetic data into knowledge LUNCH	LUNCH
1:00	Human Genome Project (HGP) GEN	DNA Damage and Repair (P1) Know	Medical Informatics: What to get? (P1) Know and Technology (P1) Know	HCN codes & info (P1) Know and Technology (P1) Know	Genetics (P1) Know

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## Session Objectives and Topics

Module Name (Role of the Lifelong Learner)  
Session Title (Medical Informatics, what is it? DIKA and Karyotypes)  
Session Date and Times (Wednesday 8/19/08 1-2PM)  
Instructors

Session Objectives showing link to Module Sub-objectives

Session Objectives	Module Sub-objectives
Demonstrate proficiency in the access, evaluation and use of medical databases, literature, and online resources essential to the evidence-based practice of medicine.	HB 1.13

Topics with link to discipline

Session Topic	Discipline
Utilize different resources (e.g. medical databases, literature, online information) to obtain and synthesize information essential to the process of evidence based practice of medicine	Informatics

Teaching method(s): lecture and hands-on

Level of Content: ?

Types of Assessments: Clicker question

List of Supporting Materials: Link to online EBM tutorials, reading assignment before class

Potential Cases: Case on Down Syndrome

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## KM-A Operational Characteristics

- Student access to course materials, program, module, and session outcomes, prior to sessions
- Student access to summative and formative feedback on a daily basis (if there are new assessments)
  - Comparison with standards and perhaps peers
  - Alert if performance level is below expectations
  - Guidance to supplemental material to fill in the knowledge gap
  - Electronic access to faculty member for discussion
- Student ability to search for curriculum content by topic and learning objective

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## KM-A Operational Characteristics

- Faculty access to individual student results
  - Monitor students in difficulty
  - Examine class performance as a whole to identify learning or teaching shortcomings
  - Examine performance in related sessions and interact with other instructors
- Student Evaluation and Promotions Committee
  - Periodic reports on individual students to identify at risk students
  - Comprehensive reports at end of module and year
- Year and module directors access to summary reports
  - Student performance on learning objectives and topics
  - Coverage of learning objectives and topics

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## What about KM-A for other programs?

- Same principles apply
- Learning outcomes mapping
  - Program
  - Course
  - Session/lecture/lab
- Assessments
  - Linked to learning outcomes at each level
  - Formative and summative
- Access
  - Students—primarily formative feedback—specific
  - Faculty—current progress (formative) and reflection

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## References

- Sensky, T., Knowledge management, *Advances in Psychiatric Treatment*, (2002), Vol. 8, pp. 387-396
- Kidwell, J., Vander Linde, K., and Johnson, S., Applying Corporate Knowledge Management Practices in Higher Education, *Educause Quarterly*, (2000), No. 4, pp. 28-33
- Nahapiet, J., Gretton, L., and Rocha, H., Knowledge and relationships: when cooperation is the norm, *European Management Review*, (2005), Vol. 2, pp. 3-14
- Epstein, R., Assessment in Medical Education, *The New England Journal of Medicine*, (2007), Vol. 356, No. 4, pp. 387-396

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## Summary

- Knowledge management approach is ideal structure to capture comprehensive assessment information intimately linked to student learning outcomes
- Real-time nature of system allows meaningful feedback and allows student to take charge of own learning (life-long learner)
- Comprehensive mapping of SLOs leads to general review of curriculum content
- Integration of assessment with curricular details forces a more meaningful assessment process

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## Questions



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