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Message from Editor-in-Chief

Peter G.M. de Jong, Ph.D.
Editor-in-Chief

Welcome to this 20-2s issue of JIAMSE. This is the first issue of JIAMSE published under my editorship since I took office on July 1st 2010. Thanks to the work of the previous Editor-in-Chief, Dr. Uldis Streips, the Journal has increased its number of issues per year and is now able to connect to an increasing number of authors interested in publishing their work. As we are experiencing a growing reputation within the USA, my mission will be to make our Journal well known to an international audience. I hope I can count on your help in this mission by publishing your own scholarly work in JIAMSE and by suggesting to your colleagues to become a reader of the Journal either through membership in IAMSE or by an individual subscription.

The first issue I present to you as Editor-in-Chief is the special issue dedicated to the IAMSE annual meeting. The program of the meeting was again interesting and challenging as the meeting participants shared their expertise and ideas with others. This year's issue however is a little different than previous years. In addition to the abstracts of all poster presentations, we have also included the invited contributions of all three keynote presenters from the meeting: Dr. Mennin, Dr. McGee and Dr. Schuwirth. I believe these contributions are very important for all meeting attendees to review, but also for all other readers who were not able to attend the meeting. Furthermore, we have two Innovations by the two Outstanding Poster Award winners of this year, Dr. Carnegie and Dr. Thompson. Their work was rated as the best and most promising presented at this year's meeting and I am therefore very honored to present their work to you.

I hope this issue of JIAMSE will give you a nice overview of the work presented at the IAMSE meeting in New Orleans.

Peter G.M. de Jong, Ph.D.
Editor-in-Chief

Message from the 2010 Program Chair

Poster Abstracts of the 14th IAMSE Annual Meeting
New Orleans, July 10-13, 2010

Welcome to the research proceedings from the 2010 IAMSE Annual Meeting. IAMSE promotes the teaching and educational scholarship of the sciences basic to medicine, and its members work throughout the year to further this aim via webcast seminars, the association's online journal, colleague-to-colleague mentorship, and the annual meeting.

The Fourteenth Annual Meeting of IAMSE took place from July 10-13 in New Orleans, Louisiana, USA. Close to 200 colleagues from 20 different countries registered for this annual conference on teaching medical sciences. The program of the IAMSE 2010 meeting was interesting and challenging. Three internationally known keynote speakers and three platform presenters spoke about the state of the art in the field of teaching and learning, technology, curriculum development, and assessment. Stewart Mennin (Brazil) introduced the audience to Complexity Science and the way it can be used to help students learn in a complex world. James McGee (USA) talked about ways in which faculty can optimally prepare to teach Millennial Generation Learners. Finally Lambert Schuwirth (The Netherlands) spoke about the future of assessment in which assessment for learning will be more important than assessment of learning. Furthermore, in 35 sessions and almost 90 poster presentations, meeting participants shared their expertise and ideas with others.

At this IAMSE meeting, the winners of the prestigious Master Scholar Award and Master Teacher Award have been announced. Both awards recognize an IAMSE member who has a distinguished record of educational scholarship, including educational research and/or dissemination of excellent and scholarly approaches to teaching and education. More details are presented further on in this issue. Also, Vaughan Kippers (Australia) received the IAMSE Fellowship Award for completing the ESME Certificate Program and the IAMSE Fellowship Program. The ESME program (Essential Skills in Medical Education) is accredited by AMEE and approved by an international advisory board. It has been designed around a set of competencies that all practicing teachers should possess. Dr Kippers is the first graduate from this combined faculty development program.

This issue of JIAMSE will give readers an opportunity to review a brief overview of the keynote lectures and the abstracts of the posters and E-demos, including contributions of the recipients of the Outstanding Poster Awards. I encourage you to take some time to review the wealth of valuable information presented in this issue of the journal, and hope that you will join us at a future meeting.

Susan J. Pasquale, Ph.D., MT-BC, NMT
Chair of the 2010 Program Committee

KEYNOTE LECTURE

Teaching, Learning, Complexity and Health Professions Education

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"Complexity thinking is impossible to define with any precision as it deals not only with change, dynamic change, ever going, but with transformative change. Definitions require stability, the very element complexity neither has nor aspires to have. Instead complexity asks us to see, to deal with a world in continual flux; but a world that does have patterns to it, patterns that bind and structure through their interplay. In short, complexity seeing/thinking asks us to envision our world and events within that world in terms, not of 'things' but of process. In so doing, we are moving from a science that studies particles to the new sciences of chaos and complexity that study the interactive relations between and among particles, events, happenings." [1]

INTRODUCTION

The purpose of this paper is to disturb the way we think about teaching and learning and to offer a view of health professions education from the perspective of complexity thinking. To discuss complexity and the profound shift it makes with current thinking it is helpful to recall that prior to the 16th century it was believed, in the Western world, that all things on earth and in the heavens were guided by a divine hand.[2] Galileo, Newton, Copernicus, Descartes, and Bacon, among others, challenged and changed the status quo. Exploration and the gathering of evidence through experimentation, together with the rise individualism helped give birth to the scientific and industrial revolutions.[2] Descartes wrote that everything should be broken down into its smallest component parts in order to understand the whole.[2] This has had a profound and lasting effect palpable today in health professions education where mechanistic explanations still prevail and reductionist approaches to curriculum rooted in Cartesian and Newtonian linear causality are common. [1-3] This is the dominant paradigm of western science and society. It is how we organize our schools. It is how we teach.

Complexity Thinking

In marked contrast, the vast majority of social and biological events exist in conditions of nonlinear flux and turbulence. Some nonlinear examples include health and illness, the weather, the stock market, the nervous system, ecosystems, social dynamics, teaching and learning to become a health professional. It is difficult, if not impossible, to understand these things by breaking them down into their component parts. Understanding emerges instead from studying the nature of the interactions among the components, the agents.[3-10] "Complexity is the result of a rich interaction of simple elements" that only respond to the limited information each of them are presented with. When we look at the behavior of a complex system as a whole, our focus shifts from the individual element in the system to the complex structure of the system. The complexity emerges as a result of the patterns of interaction between the elements. [8] Complexity 'science' then is the study of nonlinear dynamical interactions among multiple agents in open systems that are far from equilibrium. A brief description of a familiar scenario in health professions education is useful.

Table 1. Selected teaching and learning activities from a complexity perspective.

Teaching and Learning Activity	Complexity Perspective
Frame learning, set the scenario, providing boundaries that are permeable. Help to focus discussions. Use context as that which weaves us together. Indicate and point out differences.	Reduce the degrees of freedom and the number of contingencies for learners. Promotes self-organization.
Share your observations as co-evolution. Pose questions. Reflect on your own uncertainties and frontiers.	Promotes self-organization. Functions as a control parameter.
Support reflection and feedback.	Recognize collective variables that emerge from self-organization (i.e., learning).
Promote informed creativity with reflection and feedback. Provide iterative variability (many variations of similar experiences) consistent with the development of expertise.	Identify liberating constraints

Small-group, discussion-based learning is a good example of a complex system[9] (Table 1). There are many people interacting and exchanging information. Each person is also a complex system made up of still more interacting complex systems at different levels. The group meets in a place that is open, people can enter and leave, air, heat and moisture are exchanged. Shared assumptions about the group tasks and expectations about learning provide ill-defined boundaries for the interactions of participants. Each person embodies a different history and experience that structurally enables them to sense and identify gaps in their understanding, "the need to know". Learners strive to reach the frontiers of their understanding through individual and collective exploration, exchange and collaboration. Doubts and questions function to push the group to the edge of uncertainty where the possibility for self-organization is greatest.[11] Self-organization is a process whereby new structures, patterns and properties arise (emerge) in complex systems under particular conditions without being externally imposed on the system.[3,8] Learning in complex systems is a self-organized adaptation to changing circumstances.[12]

As teachers we should understand learning as a dynamical and self-organizing process requiring continuous feedback from multiple diverse interactions. Reflection and feedback promote learning (self-organization). An increased emphasis on formative assessment in health professions education is a healthy development. Traditional education systems refer to knowledge as a noun, as an 'it', a commodity that can be conferred, managed and measured. In a dynamical system, knowing is a verb, an emergent interactive process. The complexity perspective describes learning more as a matter of keeping pace with one's evolving circumstances and less about acquiring and accumulating information.[12] Learning requires a constant revision of memories and the capacity for action (understanding).[12] Teachers need to use more metaphors. Effective teaching makes use of metaphors for the description of complex events because metaphors both constrain and liberate learners. They attract diverse learners to a collectivity while simultaneously tolerating the ambiguity of creative freedom necessary for connections with the metaphor.

Table 2. Conditions that promote self-organization with examples

Conditions That Promote Self-Organization	Examples In Health Professions Education
Many agents interacting locally	Students, teachers, sources of information, social interactions, cellular and system interactions, co-evolutionary interactions at the local level
Dynamical and non-linear, recursive interactions	Reflection and feedback that alter subsequent events
Open, fuzzy boundaries, far from equilibrium	Meeting places, shared assumptions and rules for working together, expectations about learning. Dissipative systems, the exchange of energy.
Differences, Gaps, Gradients	The need to know. Questioning and exploring at the frontier of understanding.
Emergence	Formation of new patterns, new ideas, understanding
Trajectory and attractors	Patterns over time and space that can be relatively stable or not and that embrace, pull and hold other agents close to it (attraction). How people self-organize during laboratory exercises, repeatedly sit in the same seat in a lecture hall, recognition of 'normal' heart sounds.

Relationship-Centered Learning

A complex system is sensitive to initial conditions which, although small, can have profound effects on the exchanges between multiple agents leading to self-organization and new patterns. The quality of the exchange between things becomes more important than the things themselves. Teaching and learning are seen as relational and co-evolutionary along a spectrum of "…varying degrees of relative stability, coexisting with, entwined with dramatic, transformative change."[1] There has been an evolution from teacher-centered to learner-centered methods of teaching and learning over the past 40 years. More recently, Suchman[13] has introduced patient-centered care and Gergen[14] has written about reducing the separation between people through what he calls 'relational being'. Caring for relationships between people becomes essential in the caring professions. Relationship-centered learning embraces both students and teachers and recognizes and honors the social nature of learning. Conversation and dialogue are seen as a recursive exchange process where understanding emerges in the space between people rather than within them. Learners are simultaneously process, product and producer.[12] Relationship-centered teaching values difference and diversity, authentic responsive participation, shared decision-making, collaboration, partnership, and awareness of self and other.[14,15] The role of the teacher becomes one of co-evolution rather than the giver of information. Authenticity is expanded beyond the degree of fidelity to

the complexities of the workplace to include the quality of the learning relationships that take place between people.

Implications for Teaching

Content expertise may not result in effective teaching just as a great football player may not necessarily be an effective coach. In the complex environment of teaching and learning for the health professions, every moment is a potential teachable moment. Teachers need to be flexible and patient to be comfortable with and skilled at relationship-centered teaching. If interactive learning is to be transformative, there must be ample time for the exchange of differences and time and space for reflection, formative assessment and feedback. The development of expertise and permanent education[16] requires frequent and sustained iterative variability with a collective determination of learning needs for the common good.

Central to relationship-centered learning is the restoration and strengthening of caring as integral to the process of education of those who must care for others. Seeing the world from the point of view of complexity requires ambiguity and humility "…the striving for certainty, a feature of western intellectual thought since the times of Plato and Aristotle, has come to an end. There is no one right answer to a situation, no formula of best practices to follow in every situation, no assurance that any particular act or practice will yield the results we desire."[1] We are on the cusp of a major shift in thinking with profound implications for what we do as teachers and learners in the 21st century and beyond.

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KEYNOTE LECTURE

Preparing Healthcare Faculty for the Millennial Generation

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"We are shaped by what our technology enables us to do, see, experience and more than anything communicate"

Marshall McLuhan (1911-1980)

INTRODUCTION

If Marshall McLuhan lived long enough to observe the effect of Internet-based communication technology on society and education, even he would be surprised. Technology's impact on the millennial generation of learners who grew up with the Internet is even greater than the effects of television McLuhan observed, studied and wrote about in the 1960's and 70's. The millennial generation, those born between 1984 and 2000 are, more than any prior generation, influenced by new communication technology – text messaging, social networking, wikis, blogs, social media and other Web 2.0 technologies – shape both their approach to life in general and learning specifically.

Here I aim to describe how learning and the teaching healthcare in 2010 and beyond is fundamentally different as a result of technology and its impact on learners changes the role of the modern educator. Recommendations for effectively applying and managing eLearning and Web 2.0 technology are included. I will not attempt to judge whether or not specific technologies have a positive or negative effect on learning but rather, strive to understand how millennial learners are different and how the faculty that teach them might prepare.

Defining the Millennial

Let us begin with an attempt at defining the millennial generation from the perspective of the healthcare educator. This generation does not know a life without the Internet and communication technologies like email and text messaging. Just as McLuhan determined through observation and study that the new technology of the day, television, changed the way people interacted, the effect of Internet technology on the millennials appears even more profound.

"We shape our tools and then our tools shape us."

Marshall McLuhan (1911-1980)

The defining characteristics of millennials, most worthy of our attention, are communication, collaborating and creating. Millennials more than anything use new technology to communicate. They fully expect to be constantly connected to each other and an entire world of information via convenient technologies. These are

primarily text messaging using cell phones and social networking on MySpace, Facebook and newer websites like Orkut and hi5. As one first year medical student told me, "if you're not on Facebook, you don't exist." A recent Pew study reveals that 90% of teenagers sleep with their cell phone in or next to their bed (compared to 65% of adults). To them, personal connection with a worldwide community is a fact of life and not limited by the time and cost barriers of yesteryear's letter writing and long-distance phone calls.

The unique characteristics of millennials extend beyond their technologies. Neil Howe, in his book "Millennials Rising, The Next Great Generation" reported how millennials describe themselves as "optimists" and "team-players" when surveyed. He also observed that this generation is on track to be the most affluent and the best educated, while at the same time the most diverse with 36% of American millennials being non-white. As the children of the baby-boomers, the last dominant generation, millennials are greater in number and well poised to be the next dominant generation.

Millennials and Their Technology

At least 97% of millennials own their own computer and 94% have a cell phone based on surveys by Junco and Mastrodicasa. These are staggering numbers when compared to the preceding generation. Other characteristics based their surveys include heavy use of instant messaging (76%) and multitasking (92%). In contrast with their baby-boomer parents, millennials rely primarily on the Internet (34%) and television (40%) as a source of news and current events.[1] Print media simply is not consistent with their instant, personalized, on-demand approach to information gathering.

Healthcare Education and Millennials

Inevitably, changes in communication technology impact the classroom. Since the days of Aristotle and Plato, the classroom served as the primary delivery mechanism for sharing of knowledge and the development of intellectual skills. Fast forward more than two thousand years and the classroom still plays a significant role in education. This model, of one teacher co-located with many students in a classroom is still quite efficient for the teacher. This broadcasting approach to teaching was a designed out of necessity but not particularly efficient for the learner. For students who have lived their entire life with handheld, highly distributed, asynchronous communication technologies, the classroom is an archaic communication model. To be tethered to one place, one expert and one cohort of colleagues is simply too limiting when compared to how millennials learn and interact outside the classroom.

Consider the evolution of the "note-taking service" used in medical schools that in my day (1980's) was revolutionized by inexpensive personal computers used to transcribe recorded lectures and copying machines that replicated the notes that were distributed via mailboxes. Those early days of accessing curricular material outside the classroom evolved to what is now an expectation that school administration record the audio and sometimes video of every lecture and synchronize it with the presentation slides and provide via the Internet within minutes of every lecture. And, provide these lectures to students in multiple digital formats for playback on personal computers, handheld devices and smart phones.

Millennials do not see themselves restricted to a school's core teaching faculty, textbooks and library. No longer are these the sole source of knowledge, rather Wikipedia, MedScape, online textbooks, UpToDate, and YouTube videos, for better or worse, broaden the medical student's scope of influence. Spontaneous, unsanctioned websites emerge where students collaborate around study topics, share mnemonics, study guides and quiz each other much as pre-millennials did with in-person study groups. For millennials learning is not restricted to the "class" or the "room."

Web 2.0 and Education

Web 2.0 is a broad and somewhat ill defined term depending on context and perspective. For our purposes, Web 2.0 refers to web-based technologies (websites, software applications, databases) where the *user* is the center of attention. User-generated content predominates – YouTube videos, Wikipedia encyclopedic entries, blogs and social networking forums typify this breed of website. They harness collective intelligence and as a result, get better the more people use them. They employ a decentralized, egalitarian approach to content production, editing, and organization. With Web 2.0 everyone with an Internet connection, an inexpensive video camera, and something to say can be "world famous for 15 minutes" validating Andy Warhol's 1968 prediction of the future.

One of the more popular YouTube video series related to medical education is one created by a first year Harvard medical student who chronicles his trials and tribulations via homemade video broadcasts. Even more surprising than the star's candor is the degree to which his viewers share their own emotional experiences with each other. These all-digital connections with complete strangers demonstrate how millennials and others do not require face-to-face or real-time contact to interact around deeply personal matters.

What is not to like?

Collaboration, access to seemingly infinite knowledge, personal interaction with individuals worldwide thanks to easy and cheap communication technology – must result in positive effects on learning and training for this next generation of healthcare professionals, right? Recently a few cognitive scientists and sociologists have raised a cautionary flag.

Nicholas Carr, in his provocative article "Is Google Making Us Stupid" aggregates data from various cognitive science and sociology studies suggesting that instant access to vast amounts of information via Google and other search engines may be negatively affecting our ability to focus and learn deeply.[2] Informal interviews with both baby boomers and their progeny the "echo-boomers," raises concerns that we all may be losing our ability to concentrate on a single subject for an extended period of time. Web technologies favor speed and quick answers over in-depth analysis of complex subjects. As one observer put it, "Internet knowledge a mile wide and a half an inch deep."

A few years ago I began referring to students and trainees as the "cut and paste" generation after noticing that some had a habit of cutting excerpts from Wikipedia, MedScape and elsewhere in electronic medical record and pasting them into their own electronic reports verbatim. More disturbing was that these reports lacked any original thought and analysis, or even paraphrasing. Obviously this habit can have negative effects on the traditional clinical education model. Recently our academic medical center had to institute a formal "cut and paste policy" to restrict mindless replication within the electronic medical record.

What is an educator to do?

Some may interpret improved access to knowledge and information and the decentralization of content production and organization as threats to the value of teachers. To the contrary, educators are needed more than ever. Bloom's taxonomy of cognitive skills provides the theoretical framework demonstrating a hierarchy necessary to reach expertise. At the bottom of his taxonomy is Knowledge, then he steps up a pyramid with progressively higher skill levels of Comprehension, Application, Analysis, Synthesis and finally Evaluation as one strives for expertise. Millennials' Internet tools and information resources vastly expand access to the bottom level of the taxonomy, knowledge. Some sophisticated eLearning and web-based educational programs may help learners with comprehension, but very few target higher-level cognitive skills. Acquiring the ability to apply knowledge to real-world problems, analyze complex data, synthesize new solutions and evaluate problem-solving and decision-making still require interaction between learner and teacher.

A new job description is emerging for the teaching faculty of the millennial generation. To adapt, modern educators' skill set should extend to things like 1) digital knowledge skills, 2) applying interactive eLearning tools to teach higher cognitive skills, and 3) instilling the motivation in learners to think critically, learn deeply and seek novel answers.

Digital knowledge skills

Easy access to large amounts of ever-changing medical knowledge means that educators can shift some of the time and energy previously spent distributing knowledge (lectures, textbooks) and dedicate more teaching time to how to efficiently manage digital knowledge resources and apply knowledge using advanced cognitive skills (simulation, team-based learning, project-based learning). More than ever, students still need teachers to help them comprehend knowledge, apply it and know when and how to act on it.

Efficient use of databases of indexed, peer-reviewed research data like that contained in Medline requires a different skill set than searching Google and using encyclopedic community knowledge found in Wikipedia. Students need to understand the underlying data structures, how the different search engines work along with the advantages and disadvantages of the search results from each.

eLearning for comprehension, application, analysis, and synthesis

Educators of the millennial generation can spend more time teaching them how to *use* digital information and knowledge to solve problems, reach new levels of understanding and discover innovative approaches to research and healthcare. eLearning tools and Web 2.0 technologies are familiar to millennial learners and can assist in acquiring these cognitive skills.

For example, comprehension can be assessed with simple question and answer sessions in small groups, possibly focused around a real or simulated clinical case study. Online quizzes and virtual patients (computer-based clinical simulations) are used for formative evaluation allowing the student and teacher to recognize areas of deficiency and move on to the next topic when competency is demonstrated.

A specific example of Web 2.0 technology used to formatively assess competency is what our faculty call "Course Director Blogs." Each course director has his or her own dedicated web page where he or she posts daily reflections on the course and students submit questions and comments for all to see. Another is the University of Vermont's student-run wiki where they collaboratively organize the course materials and contribute user-generated study guides and links to resources that supplement the core curriculum.

At the University of Pittsburgh we teach students to critically analyze and apply knowledge from the medical literature as part of a longitudinal individual scholarly project. Students electronically select their own research or academic project, find a mentor, develop a proposal for peer-review and when approved, collaboratively pursue their academic project both online and offline. Higher-

level cognitive skills are acquired in the course of completing their mentored scholarly project by setting specific goals and deliverables.[3]

While first generation eLearning tools were shown to be similar in effectiveness when applied to traditional learning tasks such as knowledge transfer, when used to teach higher-order cognitive skills such as analysis and application, some active eLearning programs exceed traditional methods.[4] Virtual patients (computer-based clinical simulations) are a good example of how digital learning applications can teach things like clinical reasoning, a skill that is otherwise difficult to teach in the classroom or with traditional linear text-based instruction.[5,6] Also, computer animation has been shown effective for teaching complex procedural and motor skills.[7] A recent literature review concluded that when eLearning provides adaptive, personalized feedback it could outperform conventional methods.[8] These are the approaches to teaching that an always-connected, digitally savvy millennial student expects from a modern faculty member.

Motivation to think critically, learn deeply and seek new answers

The role of the modern educator extends beyond imparting knowledge and skills to instilling positive motivating attitudes in millennial learners. Despite advances in technology, *learning is still hard*. As in the past, teachers need to inspire and motivate learners to seek out the *best* knowledge, *higher* understanding and achieve *unique* solutions. Access to quick, superficial answers may make this part of a faculty's job harder than ever. More than ever, educators need to motivate students to learn deeply and develop the necessary critical reasoning skills to become life-long learners. This can be accomplished through personalized feedback, individual mentoring, and demonstrating how expertise leads to improved clinical outcomes. As in the past, the educator must serve as a role model for the millennial generation.

CONCLUSIONS

Millennial generation students are different – in large part due to the communication technologies that shape their everyday lives. The Internet, text messaging, social networking and social media, offer both advantages and disadvantages to the learner and teacher. Despite easy access to vast digital knowledge and availability of eLearning technologies like simulation and adaptive learning, the road to expertise is still a hard one. By understanding the unique characteristics and needs of millennial learners and embracing the valuable aspects of the technologies they know so well, modern educators can help them become the next great generation of healthcare professionals.

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KEYNOTE LECTURE

From Assessment of Learning to Assessment for Learning

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Most of us are educated in a setting in which assessment is mainly used to test whether students have acquired sufficient knowledge and skills during the course to proceed to the next module. This "assessment of learning" is basically placed outside the educational process. "Assessment *for* learning" on the other hand seeks to establish assessment programmes that are inextricably connected to the educational process.[1, 2]

With the "assessment *of* learning" concept a number of assumptions and practices have become dominant. First, there is notion of the stable and generic traits. Traditionally, medical competence was defined as the combination of knowledge, skills, problem solving skills and attitudes. Much of the developments in assessment have been aimed at developing the single best instrument for each trait. Yet, one could wonder whether all aspects of medical competence are best modelled using such a stable trait notion. Suppose we would apply this notion to the construct 'blood pressure' and we would take the blood pressure of 10 patients every half hour for 24 hours. If we would then find consistent differences between the 10 patients but not variability within each patient, we would logically conclude that the measurement is unreliable, simply because blood pressure is assumed to vary from time to time. Standard reliability theory, however, would yield a perfect reliability coefficient

A second notion is the tendency to treat individual items as meaningless; they only acquire meaning through their contribution to the total. Especially in the discussion on killer stations in OSCEs this issue becomes salient: should someone who miserably fails the resuscitation station in an OSCE be allowed to pass for example by performing very well on a communication skills station and vice versa.

A third important point is that statistics are mainly used to optimally eliminate information. In any test information from the given answers (from which one can tell for example what mistakes were made) is reduced to a pass-fail decision (from which one can only infer whether enough correct answers were given). Such dichotomous information is not very useful when one wants to provide the students with information to guide their learning activities, i.e. in assessment for learning.

The consequence of this is that many assessment programmes seek to use one single best instrument for each trait instead of using a variety of instruments each with their own strengths and weaknesses; a typical 1:1 relationship.

Currently the trend is towards defining medical competence as a combination of competencies. Many official bodies have issued their own competencies-document or defined competency-domains. (e.g.,[3,4]) The risk is now that an assessment programme seeks the single best instrument for each competency domain. From an assessment for learning perspective, however, this is ill advised. Instead the programme should be set up such that information relevant to a competency domain is extracted from parts of one test and is triangulated with information of another test. Information as to why a student failed the resuscitation station would be triangulated for example with his performance on cardiac anatomy and/or physiology items from a written test or with observations on cardiac examination in a practice setting. This may seem complicated, but is much more meaningful than combining the results with the performance on a communication skills station. Also, this is analogous to what every clinician does on a daily basis; combining

information from various sources to determine not only whether the patient is ill or healthy, but also what additional diagnostics to order and what therapeutic actions to start. This is exactly what the issues in assessment for learning should be:

- is there sufficient information about a student or should (hypothesis-driven) extra information be collected;
- what educational intervention or remediation is most indicated for this student, and,
- what is the prognosis for this student?

But for this we have to learn how to combine information based on the content of the items and not based on their format (no clinician ever calculates the average of all the lab tests s/he ordered).

I do not want to imply that this is easy, but it is doable. It will require a radical change in our teacher training programmes with respect to assessment though. But more importantly, it first requires further research. Fortunately, in the field of provision of feedback much has been done already, but there are many other terrains which are still quite open. (cf.[5])

A first terrain is the quality of programmes of assessment. There is shared opinion that the quality of each assessment instrument is a trade-off between various quality criteria (such as reliability, validity, educational impact, cost-effectiveness and acceptability), but there is still very little known on what constitutes quality of assessment programmes. Baartman et al. have defined outcome criteria for the quality of assessment programme, and Dijkstra et al. have created a model and defined design criteria for quality of assessment programmes.[6-8]

A surprising poorly charted territory is what aspects of an assessment programme influence student learning and teacher teaching and by what mechanisms. This is surprising because there is such strong shared opinion about it. Cilliers has done important initial work to gain more insight into the sources of the impact, the mechanisms through which it works and its possible consequences.[9,10] It appears to be a highly individualised process, in which the individual motivational aspects play an important role.

It is one thing to describe the concessions we have to make using the prevalent psychometrical approaches and perhaps be critical about them, but it is another to come up with feasible alternatives. Fortunately the wheel need not be reinvented completely. Interesting work has been done in the 1960s en 1970s from a domain sampling framework.[11] Re-exploring these methods, refining them and extending on them (e.g., drawing on qualitative research methodology) can be helpful.[12,13] After this, the next essential point on the research agenda is how to choose the most appropriate psychometrical approach for each of the parts of the assessment programme.

This brings us to the final and most important topic for further research, namely the use of human judgement in assessment. Our initial thoughts may be that human judgement is fallible and should therefore be eliminated from the assessment process, but this is impossible.[14] A multiple-choice test, for example, may capture the student responses in a numerical way, but its topic, its content, its blueprint, the specific topics for the items and the specific wording are all culminations of human judgement. There are biases in human judgement that we should probably try to counteract (for example, framing related biased, pseudo opinions, strategic behaviours), but some are inevitably part of human decision making as a measure of reduction of cognitive load.[15,16] Naturalistic decision making theories and expertise development theories can help us understand how to improve the judgements of teachers and assessors.[17-19] First studies looking at human judgement in assessment as a diagnostic classification task, and thus as an expertise issue, show that the characteristics of judgement in assessment are highly similar to those in diagnostic expertise.[20,21]

In summary, the whole change in thinking about assessment in the educational environment has led to dramatic changes in concepts and a whole new exciting research agenda.

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INNOVATION

2010 Poster Award Winner

CDM Questions: Software Allows Students to Practice New Question Style Online before Summative Exams

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Clinical decision making (CDM) questions are now included in the summative examinations of the University of Ottawa undergraduate medical curriculum beginning with the very first midterm exam. However, students need practice in applying their new knowledge within the context of clinical situations before tackling this new questions style in formal exams. Quandary[R] (http://www.halfbakedsoftware.com/quandary_download.php) is an action maze software that was used to develop weekly online formative exams for Foundations, the first major unit of the medical curriculum. This software supported the construction of interactive practice exams in both French and English that prompt students to keep trying each question until they have found all of the correct answers while simultaneously receiving instructional feedback for each choice made, be it correct or incorrect. Of particular relevance to CDM questions, Quandary allowed an unlimited number of answer choices and correct answers per question and included a flexible scoring system that provided instructional guidance regarding the relative value of each correct answer and the seriousness of critical misconceptions.

The exams were first created in English as word documents, using tables to organize the presentation of the cases, the case-specific questions and answer choices, the scoring, and the explanatory feedback. Each weekly exercise consisted of a mix of CDM, multiple choice and true/false questions. In total, 12 exercises (15-20 questions each) were created, one for each week of Foundations. The exercises were translated into French and then both sets of exercises were inserted into Quandary and made available to students via One45[R], the curriculum mapping software used for all course materials. Student use of the formative exams during the weeks approaching the final exam was tracked via Google Analytics.

Students welcomed the opportunity to self-test and extensive use of the formative exams was noted during the two weeks before the Foundations final exam (Table 1).

Dates	Number of Visits	Mean Visit Duration (min)
December 7-13	189	6.32
December 14-17	286	11.3

Table 1. Traffic to Anglophone formative exams (n-112) during the 11 days leading up to the Foundations final summative exam (exam day = December 18).

In conclusion, the flexibility of Quandary supports the development of interactive CDM questions that are useful for the medical curriculum. Students use feedback-oriented interactive exercises to self-assess, without penalty, their ability to apply new knowledge (both basic and clinical sciences) within the context of healthcare scenarios before writing critically-important summative exams.

INNOVATION

2010 Poster Award Winner

Concept Mapping as a Team-Based Learning application Exercise in a First Year Medical Biochemistry Course

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A challenge encountered in the implementation of team-based learning (TBL) in a medical school biochemistry course, has been to develop clinical case-based application exercises to assure that students were making connections between biochemical and clinical concepts. We chose to add concept mapping to the application exercise because concept mapping has been shown to foster meaningful integration of basic and clinical science information as well as facilitate group and collaborative learning. The course is divided into 6 modules during which all students complete the readiness assurance process, followed by the team application exercises which focused on clinical cases. For the concept mapping exercise, teams generated a concept map relating the clinical aspects of the case to alterations in biochemical pathways. Teams used their maps to answer multiple choice questions (MCQs) that served as the basis of faculty-led discussion in a large group setting. Concept maps were graded using a rubric that provided the basis for peer feedback from another team during class and for faculty grading after class. The best maps were posted online.

Course grades are based on scores from team application exercises, concept maps, individual readiness assurance tests, team readiness assurance tests, MCQs or essay questions on block exams. MCQ block exam questions were drawn from a secure question bank. The difficulty of 72 identical questions from block exams was compared between the year with no concept mapping and the following year with concept mapping. We found that the average percentage of students answering MCQs correctly increased (65.2 to 72.7%; $p<0.001$) and the increase was greater for low scoring students than high scoring students (7.7 vs 4.5%; $p<0.05$). Also, student post-course survey results indicated an increase in time spent preparing for class ($p<0.001$), perceived gain of factual knowledge ($p<0.001$) and reported connection of basic biochemistry to medicine ($p<0.01$). There were no differences between the average Grade Point Average and average Medical College Admission Test scores for the two classes.

The addition of case-based concept mapping to the application exercises of a team-based learning model was associated with improved performance of first year medical students on MCQs, increased student engagement and the perception of improved knowledge and understanding.

2010 IAMSE MASTER AWARDS

At the IAMSE Annual Meeting in July 2010 in New Orleans, Drs. Haramati and Schmidt received the prestigious Master Scholar Award and Master Teacher Award. Both awards recognize an IAMSE member who has a distinguished record of educational scholarship, including educational research and/or dissemination of excellent and scholarly approaches to teaching and education.

Aviad Haramati, PhD, professor of Physiology and Biophysics at Georgetown University School of Medicine, Washington DC, is this year's Master Scholar awardee. In recognition of his accomplishments with medical education, Dr. Haramati received his undergraduate education from Brooklyn College, and his doctorate from the University of Cincinnati College of Medicine. He began his career at the Mayo Clinic in Minnesota, and came to Georgetown in 1985. He has published more than 200 articles, abstracts and other publications and is the recipient of numerous teaching awards, including nine Golden Apple Awards from Georgetown University, the Kaiser-Permanente Excellence in teaching of the basic sciences, the Arthur C. Guyton Teacher of the Year award by the American Physiological Society, and the Alpha Omega Alpha Robert J. Glaser Distinguished Teaching Award from the Association of American Medical Colleges. Dr. Haramati has spearheaded many efforts to improve medical education nationally and at Georgetown University, especially with regard to making the teaching of basic science more effective and relevant to the development of health professionals. Recently, he led a broad NIH-funded initiative to integrate complementary and alternative medicine into the school of medicine's curriculum. His most recent efforts involve the intersection of science, mind-body medicine and professionalism. He currently works with a number of medical schools deans and educators in North America, Europe and Israel. As a founding member of IAMSE and its first president, it was with great honor that the association recognized Dr. Haramati for his achievements in advancing medical education.

Thomas Schmidt, PhD, professor of Physiology and Biophysics at Carver College of Medicine at the University of Iowa, is this year's Master Teacher awardee. Dr. Schmidt has served for 25 years as the director or co-director of a critical component of the medical curriculum at the Carver College of Medicine at the University of Iowa. He continually provides innovative updates to the students' integrative understanding of normal structure and function of the human body. Dr. Schmidt has also been recognized by the American Physiological Society with the Arthur C. Guyton teacher of the year award. This is a huge honor bestowed on the best of the best indicating that tom's expertise is recognized at the national and international level. The accolades continue. In 2006 Dr. Schmidt was named the Dr. Harold A. Myers distinguished professor in medical education and the next year was appointed assistant dean for student affairs and curriculum clearly, he is recognized as one of the top medical physiology teachers in the country.

ABSTRACTS

From the 2010 IAMSE Annual Meeting

Categorized by Theme

ASSESSMENT

ASSESSMENT AND TRACKING OF BASIC SCIENCE KNOWLEDGE DURING PRECLINICAL AND CLINICAL YEARS

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While there has always been a desire and need to track and assess the progress of medical students through their preclinical years, this need may become even greater as the COMLEX (and USMLE) affect changes to their series of licensure examinations.

PURPOSE
As changes in these examinations are made, and the Level 1 is combined with Level 2, in a "Phase 1" examination, it is becoming incumbent that the individual schools track and assess student progress to assure that students meet, or exceed, minimal competency to enter their clinical clerkship.

METHODS
To aid in this process, we are developing an assessment tool that primarily tests basic science knowledge. This assessment examination contains 200 items which deal with cell biology, biochemistry, physiology, pharmacology, pathology and microbiology. It is planned that students will sit for this assessment examination, 1) immediately upon matriculation, then 2) at the end of the first year, 3) at a point during the second semester of the second year, and finally, 4) during the Spring of the MS 3 year, prior to sitting for the "Phase 1" examination. Items will be appropriately altered in order to minimize reader bias.

RESULTS
On initial assessment, given the diversity of the medical college population, we expect a low average score, somewhere in the 30-40% average, a large range, and a high standard deviation. During follow-up testing, we expect the average scores to rise, the range to shrink, and standard deviation to decrease, as the students, in general, become more homogeneous, and ready to enter the clinical clerkship years. The final assessment will test our expectation that the students will be able to retain, and build upon, their preclinical knowledge base during their initial year of clerkships.

ASSESSMENT – E-Demo
Poster Award Winner

CDM QUESTIONS: SOFTWARE ALLOWS STUDENTS TO PRACTICE NEW QUESTION STYLE ONLINE BEFORE SUMMATIVE EXAMS

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PURPOSE
Clinical decision making (CDM) questions are now included in the summative exams of the University of Ottawa undergraduate medical curriculum. QuandaryR, an action maze software, was used to develop weekly online formative exams for Foundations, the first major unit of Year 1. The goal was to give students practice with CDM questions while simultaneously providing feedback on their learning.

METHODS
The exams (French and English) were created in tables with basic science and clinical learning objectives guiding the creation of questions, answers, and feedback. The exercises were then inserted into Quandary and the scoring customized to reward correct answers, penalize seriously incorrect choices and block repeated selection of a correct answer. The software allowed unlimited numbers of choices and correct answers per question. Each student received feedback for every answer (correct or incorrect) and could retry each question and each exam as often as needed. Student use of the exams was tracked via Google Analytics.

RESULTS
Students welcomed the opportunity to self-test and increased use of the practice exams was noted during the two weeks before the Foundations final exam. For example, with regard to the Anglophone stream (112 students) and the weeks 5-10 exams, 189 visits occurred during December 7-13 with an average visit time of 6.32 minutes. Traffic further increased during the subsequent week (December 14-17; exam day was December 18) to reach a total of 286 visits and an average time per visit of 11.34 minutes.

CONCLUSION
The flexibility of Quandary supports the design and online provision of practice CDM questions. Instructional feedback encourages learning while students self-assess their application of new basic science knowledge within the context of clinical scenarios.

ASSESSMENT

USING AN AUDIENCE RESPONSE SYSTEM FOR LARGE GROUP TESTING AND SESSION EVALUATION

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PURPOSE
Audience Response Systems (ARS) or 'clickers' are widely used in higher education. Students appreciate the use of clickers as it activates and motivates the audience. Most teachers use ARS to interact with the audience and to adjust their teaching on the spot. However, the system is also useful for formal testing and evaluation purposes.

METHODS
At the Academic Medical Center Amsterdam, the system has been used to perform formal testing in students. In the fourth year course 'Oncology' an exam was taken in 200 students. In contrast to normal lecture procedures, the clickers were handed out personalized to associate each person with the right set of responses. The exam consisted of 15 multiple-choice questions. The questions were projected on the screen for about 1 minute per question. Within that period the students had to answer the question using their clicker, while changing answers was allowed as long the voting for that particular question had not been closed. The responses of the students were not displayed in public. At Leiden University Medical Center, the system has been used for evaluating educational conferences and symposia. In general, participants of such meetings have to answer several questions at the end of a session for evaluating purposes. In this setup, randomly provided clickers were used instead of paper forms. The questions were projected on the screen for about 30 seconds per question. Participants answered the questions using their clicker. The responses of the audience were not displayed in public to avoid unpleasant feedback for the speakers under evaluation.

RESULTS
Clickers are suitable to perform an exam or evaluation in a large group setting. The participants feel comfortable with the technique. It is highly beneficial that the results are available immediately after the session saving a lot of time in performing statistical analyses. In case of formal testing, the personalization of clickers and fraud prevention needs solid preparation. In our setup, some students did try to talk with each other and to copy other students' answers. In case of session evaluation, the use of the clickers results in a much higher response rate than normally with paper evaluation forms.

CONCLUSIONS
Audience Response Systems can successfully be used to perform formal testing in students and evaluation of speakers and sessions in symposia.

ASSESSMENT

REPETITIVE TASK BASED LEARNING TO MEASURE COMPETENCE IN DIAGNOSTIC REASONING

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PURPOSE
Training programs at the residency and fellowship level are required to measure and document multiple areas of clinical competence. These metrics should be convenient and demonstrate quantifiable improvement in most trainees over time. However, the "toolbox" to measure clinical competency is limited, particularly for complex behaviors such as diagnostic reasoning. We have introduced a core curriculum based on the presentation of multiple unknown clinical cases, the majority of which are diagnostic dilemmas. In this pilot study, we devised a simple scoring system to quantify competence in diagnostic reasoning.

METHODS
Fellows in infectious diseases were presented 2-3 unknown cases per week over two years. 70% of cases were seen at this institution. All cases were presented as unknowns and grouped into teaching blocks for 2-3 months (e.g. neurologic infections). Course content was delivered using Moodle, a web-based course management software system. Fellows were allotted 30 minutes per case, worked separately, and were allowed access to reference materials. Answers were submitted in a standardized short-essay format. For each case, the fellow listed his/her "top 3" differential diagnoses, outlined the pros and cons of each diagnosis, and then chose the single best diagnosis. Grade "1" was assigned if the actual diagnosis matched the fellow's top choice; grade "2" if the actual diagnosis was within the top 3 diagnoses; grade "3" if the actual diagnosis was not within the top 3.

RESULTS
Each trainee completed an average of 190 cases over two years (n = 10 fellows, 2007-9). Year 2 fellows had significantly more grade 1 and 2 responses vs. first year fellows (84% versus 40%, $p < 0.05$). In 7 of 8 teaching blocks the number of grade 1 and 2 responses increased from the first week to the final week. The rate of diagnostic error (grade 3 responses) fell for all trainees in a linear fashion. 90% showed individual increases in grade 2 responses from year 1 to 2.

CONCLUSIONS
Repetitive task based learning is a potential metric for measuring competence in complex tasks, such as diagnostic reasoning.

ASSESSMENT

WHAT DO THEIR PEERS THINK? A QUALITATIVE ANALYSIS OF A REQUIRED FOURTH YEAR TEACHING MONTH

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PURPOSE
To address national concerns that curriculum reform has paid insufficient attention to communication, reasoning and analytical skills in the third and fourth year of medical education, and to reinforce longitudinal integration in the four year curriculum known as the Vermont Integrated Curriculum, fourth year students at the University of Vermont College of Medicine are required to complete a teaching or research project. The purpose of this study is to determine what impact the teaching assistants (TAs) have had on their peers who received their support. A qualitative analysis of all student evaluations was performed to determine impact.

METHODS
First and second year medical students completed course and TA evaluations commenting on the effectiveness of each TA. The TA evaluation data was collected for the first year that the teaching requirement was in effect (2007). TA evaluations were collected from all students (first years n=105; second years n= 103) for each of the teaching assistants (n= 52). Two researchers independently categorized all qualitative comments and met to verify categories. A second set of independent researchers met to categorize all qualitative comments and those categories were used to verify and amplify the original set. Categories were named, defined and illustrative quotes pulled to exemplify each.

RESULTS
The comments found in these evaluations focus on three broad categories: Teaching, Advice, and TA Attributes. The Teaching category is further divided into effective and ineffective styles. Definitions for each category have been fully developed and include specific quotes from student evaluations.

CONCLUSION
The fourth year teaching assistants had a positive impact on the education of their first and second year peers. The impact included curricular gains (such as increased student retention of material) as well as nonacademic gains (such as providing mentorship for medical education).

ASSESSMENT

A 3-PRONGED APPROACH TO WEEKLY FORMATIVE ASSESSMENTS: INDIVIDUAL AND GROUP QUIZZES, PLUS FEEDBACK

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PURPOSE
As part of restructuring and integrating our curriculum we sought a new method for regular, formative student assessment and providing feedback.

METHODS
At 8:00 AM every Monday our students take a quiz consisting of 30-40 vignette MCQs on laptops using Respondus Lockdown Browser and Blackboard/WebCT. At 9:00 AM the individual quiz closes and a second copy of the same quiz opens. The students have 35 minutes to re-take the quiz in teams of four. At 9:35 AM the group quiz closes and a third version of the quiz appears for 15 min. with answers and explanations. The final quiz score is 90% from the individual and 10% from the group. Scores are exported from Blackboard into Excel spreadsheets that calculate the statistics for each item and discipline.

RESULTS
As predicted, the group scores are significantly higher than individual scores (94 ± 4% vs. 80 ± 5% for 21 quizzes). By first discussing the answers and then viewing faculty feedback, students have the opportunity to learn what they missed from the previous week. Questions that receive low scores on the group quizzes are flagged as either faulty questions or material that students have not mastered. Appropriate faculty are then alerted to re-teach this material during the upcoming week. While there was initial faculty pushback at having to provide explanations for each question, most now realize that this forces them to critically evaluate and improve their questions. We discovered that the Lockdown browser software does not prevent students from capturing the quiz questions. We now provide laptops for students to take all of their quizzes and final exams on.

CONCLUSIONS
Seeing the same quiz 3 times within 2 hours has been an effective and efficient way to provide formative weekly feedback on knowledge acquisition.

ASSESSMENT

DEVELOPMENT OF A COMPREHENSIVE CURRICULUM EVALUATION

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PURPOSE
Like so many other schools, the University of Virginia (UVA) School of Medicine is undergoing curriculum reform. The design and development of a curriculum calls for a parallel system of program evaluation. This poster details the design and development of the curriculum evaluation at UVA.

METHODS
With this in mind, the Curriculum Evaluation Community (CEC) was assembled in the Spring 2009. The participants of the CEC were chosen to represent several roles within medical education at UVA. Additionally a network of consultants provides input and feedback to the CEC. The first task of the CEC was to define the logic model for the UVA curriculum in order to provide a framework for the development of subsequent evaluation questions. The logic model used by the Curriculum Evaluation Community contained the following five basic elements - Inputs, Activities, Outputs, Outcomes, and Impact. Once the Logic Model was developed, the CEC interviewed stakeholder groups from around School of Medicine to determine what questions and concerns were most prevalent. A content analysis of these interviews found five main areas of concern: pedagogy, faculty development, accreditation concerns, student assessment and other. This list was refined with further input from stakeholders and a final list of evaluation questions developed reviewed by the Curriculum Committee.

RESULTS
The final Curriculum Evaluation questions was divided along 1) the goals of the curriculum design that were specified by the Curriculum Committee, 2) the areas of concern identified by stakeholder input and 3) implementation time lines. Plans for collecting data to speak to each of these questions is underway.

CONCLUSIONS
A comprehensive plan of program evaluation is vital to the success of curriculum reform and renewal. This process should be developed concurrently with the curriculum and involve all stakeholders.

ASSESSMENT
Award Nominee

EMOTIONAL INTELLIGENCE AND PERFORMANCE IN MEDICAL SCHOOL: A PRELIMINARY ANALYSIS

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PURPOSE
The MCAT is moderately successful at predicting success in the pre-clinical years of medical school, but loses value as students begin seeing patients. Emotional intelligence (EI) has been linked with interpersonal skill; measures of EI might enhance our methds of predicting performance in the clinical arena.

METHODS
First and second year medical students completed the Mayer-Salovey-Caruse Emotional Intelligence Test (MCSEIT), the Wong & Law Emotional Intelligence Scale (WLEIS) and a standard personality test, the Neuroticism-Extroversion-Openness personality test (NEO). We then correlated these scores, GPA's and MCAT scores with rank in class, scores on the licensing examinations and overall performance on our Clinical Practical Examination (CPX).

RESULTS
MCAT score and undergraduate GPA correlated significantly ($p<0.05$) with class rank and licensing examination scores, but not with overall performance on the CPX. None of the measures of EI assessed by either the MCSEIT or the WLEIS correlated significantly with any of the examined outcome measures. A number of the sub-domains measured by the NEO, however, showed a significant mild to moderate correlation with the strictly objective measures of performance. Extroversion and Openness were correlated with rank and step scores. Conscientiousness was correlated with rank. Neither the overall score nor any of the sub-scores of the MCSEIT, the WLEIS or the NEO were significantly correlated with overall performance on the CPX.

CONCLUSION
Based on these preliminary data, it appears that EI does not predict performance in medical school as measured by rank in class, score on licensing examinations or overall score on our CPX. Personality measures seem to have a modest predictive value for some objective outcomes.

ASSESSMENT
Award Nominee

DO LOW CRITICAL THINKING MEDICAL STUDENTS REALLY EXHIBIT POOR ACADEMIC PERFORMANCE?

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PURPOSE
Two previous studies demonstrated positive correlations between critical thinking (CT) skills measured using the Watson-Glaser Critical Thinking Assessment (WGCTA) and academic performance during the first two years of medical school. However, these studies were limited to testing of a single class of medical students and did not separately report the performance of high and low critical thinkers.

METHODS
This paper reports on the initial findings of a multi-year study of the CT skills of medical students at our institution and the relationship between WGCTA performance (administered during freshman orientation) and academic performance on all first year in-house exams in three successive matriculating classes (2008-2010) (n = 458; >95% participation).

RESULTS
Our data confirm that significant positive correlations exist between CT skills and academic performance in the first year curriculum, though this varies with individual courses. Students in one year showed significantly less correlation than the other two, indicating some year-to-year variability. Surprisingly, although a subset of students with relatively low CT skills (bottom quintile) exhibited low academic performance, the majority of students in this category were relatively high academic performers. Most low academic performers consisted of students with average CT skills (middle three quintiles).

CONCLUSIONS
Our medical students exhibit a wide range of CT skills and include a group with relatively low CT skills. Despite confirming positive correlations between CT skills and academic performance in year one courses, this study reveals that a significant number of low CT students are actually high academic performers. Comparisons with previously published studies will be discussed.

ASSESSMENT

Award Nominee

PREDICTING AT-RISK STUDENTS USING A DIAGNOSTIC PROFICIENCY EXAMINATION

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PURPOSE
Getting off to a strong start in medical school lays a strong foundation for the preclinical curriculum. However, it is often difficult to predict student performance based on incoming records. Thus, we wanted to develop a tool that could help identify students who were potentially at risk for early struggles.

METHODS
Our study took place in Molecular Foundations of Medicine (MFM), the first scientific block of the preclinical curriculum. MFM includes biochemistry, cell biology, genetics, and tissue biology. Students were given a mandatory 50 question on-line exam the first day of class to assess their backgrounds in areas covered by MFM. Students were informed that scores would be used only to assess scientific backgrounds and would not be part of their MFM grade.

RESULTS
The proficiency exam was a strong predictor of student performance in MFM. Over a 3-year period, there was a strong positive correlation ($P < 0.0001$) between proficiency exam scores and final scores in MFM. $67.6 \pm 4.2\%$ of students who scored below average on the proficiency exam also scored below average in MFM. Moreover, $73.4 \pm 7.2\%$ of students who scored in the lower third and $87.7 \pm 4.0\%$ of students who scored in the bottom 10 on the proficiency exam scored below average in MFM. Viewed differently, $83.3 \pm 5.7\%$ of students who scored in the bottom 10 in MFM also scored below average on the proficiency exam.

CONCLUSION
Information derived from the proficiency exam allowed early intervention and helped guide decisions regarding academic support for students. Feedback from at-risk students indicates that early assistance positively impacted their learning, helped them pass MFM, and reduced anxiety. We believe that the exam is a valuable tool to aid our students with their transition to medical school.

ASSESSMENT

EFFECTS OF THE CHANGE IN CALL STRUCTURE ON THE OVERALL PEDIATRIC CLERKSHIP EXPERIENCE

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PURPOSE
The educational value of the night call structure for medical students is not well studied. This study examines the effects of the change in call structure on cognitive skills, number of general pediatric patients seen by medical students, and overall satisfaction with the pediatric clerkship.

METHODS
The intervention was a change from a scheduled 5 times a month day call (6AM-10PM) in 2008-09 academic year to a continuous 5 night calls (6 PM -7AM) in 2009-10. Included in the study were 43 students who completed their pediatric clerkship during Nov-Feb 2008-09 and 36 students from Nov-Feb 2009-10 time period. For both groups, cognitive performance scores from the National Medical Board Exam; data on the number of new admissions seen by medical students from medical records; and data on medical students' overall satisfaction with the clerkship experience using a 5-point Likert scale were collected at the end of each rotation. Students' perceptions of time residents spent teaching was also obtained by surveys collected weekly from the medical students in the academic year of 2009-10.

RESULTS
Preliminary results from unpaired t tests yielded no statistically significant differences between the two different call structures indicating that the change in call structure did not have any negative impact on cognitive skills, exposure to number of general pediatric patients, or students' satisfaction with the pediatric clerkship. Students' perceptions of time residents spent teaching medical students was not statistically significant either.

CONCLUSION
While no negative impact has been found in the overnight call experience, introducing the night call experience for medical students provides a consistent, uniform exposure to residents and general pediatric patients.

ASSESSMENT
Award Nominee

PACE: AN ALTERNATIVE MEASURE OF STUDENT QUESTION RESPONSE TIME

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PURPOSE
At some point in a medical education program, the assessment of learners' achievement may need to address specifically the extent to which learners can access and apply specific knowledge and skills quickly and accurately. In this poster we focus on time assessment because person-level measurement in this domain is relatively underdeveloped.

METHODS
The protocol utilized in this research has been approved by our Institutional Review Board. The data was collected from a single didactic multiple choice examination of 101 questions administered by computer to 167 second-year medical students in a proctored setting. Individual test taker's item response time was recorded to the nearest second for each test item and analyzed in SPSS, QMPE, GENOVA, and Winsteps.

RESULTS
Student response times in a conventional non-speeded multiple-choice test, at both the global and individual question levels, closely approximated lognormal distributions. We propose a new measure, pace, which is derived from the survival function of these distributions, for analysis of individual person response times. These pace estimates could be used both to rank and compare students; pace also performed maximally compared to other parameterizations in generalizability and dependability studies. While pace was very weakly related to person ability, there was no detectable relationship to question parameters of shift, natural logarithmic mean, or natural logarithmic standard deviation. That is, pace was a person-dependent, question-independent measure. Pace measurements were also successfully used as covariates in models for estimation of person response time to specified questions and person accuracy in response to specified questions.

CONCLUSIONS
The analysis of pace can contribute significantly to comprehensive evaluation of student performance in both the speed and ability domains and is a requisite to best practice in testing and assessment. The proposed poster presentation will afford an opportunity to present and discuss practical implications of this new measure, pace.

ASSESSMENT

INTEGRATING BASIC SCIENCES INTO THE CLERKSHIP YEARS: DEVELOPMENT OF AN ASSESSMENT METHOD

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PURPOSE
The CASE INQUIRY+ (IQ+) program at CWRU SOM returns students to the Medical School on Friday afternoons during their core clerkships to 1) reflect on their experiences in a safe environment 2) integrate concepts of emerging knowledge and sciences basic to medicine into clinical case discussions, and 3) practice Clinical Skills. In the context of our immersive clinical experiences, a credible assessment process was needed to support student interest and accountability. Traditional approaches such as preceptor feedback were of limited value in this effort.

METHODS
Students work in teams of 4 to develop IQ+ teaching sessions for their peers based on the session template of reflection, case discussion, expert consultation, and Clinical Skills practice. They receive peer and faculty feedback on their cases prior to running the teaching session for a different group of peers. Assessment observations are focused on case material, presentation, group function and individual contributions of student presenters.

RESULTS
To date, 58 student-written cases have been run and assessed. Topics selected represent a broad array of clinically relevant subjects with important connections to sciences basic to medicine. Analysis of feedback from peers and group members has informed subsequent sessions. Faculty observers have provided specific feedback to both individuals and groups on preparation, participation, and achievement of the goals of the IQ+ curriculum.

CONCLUSION
We designed an assessment approach for a longitudinal clerkship curriculum that relies on student effort and ownership of teaching sessions. This has enhanced student investment in the educational program and provided a framework for giving formative and summative feedback to students.

CLINICAL SKILLS
Award Nominee

COLLABORATION AMONG CLINICAL AND BASIC SCIENCES FACULTY IN A SKILLS SESSION FOR SECOND YEAR MEDICAL STUDENTS THAT TAUGHT BEST PRACTICES FOR DIAGNOSING VAGINITIS

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PURPOSE
To teach second year medical students microscopy skills that are clinically relevant to the care of women.

METHODS
A skills lab was begun 2 years ago to prepare students for a Clinical Learning Center Simulation of an Annual Well Woman Encounter. Clinical faculty had expressed concern over general discomfort and lack of skills in students when performing wet mounts associated with the work-up of vaginitis. Collaboration between microbiology, clinical sciences and the simulation center resulted in a process that enabled the institution to provide live microbiologic specimens, specifically T. vaginalis and C. Albicans for a structured experience in best practice performance techniques recommended by the CDC for diagnosing vaginitis. In addition basic microscopy skills, pH and whiff tests were performed.

RESULTS
120 second year medical students participated in the 40 minute session with successful completion of: basic review of microscopy; best practices preparation of wet mount studies; and identification of two unknown 'vaginitis' specimens through completion of a Vaginitis Differential Diagnosis grid based on microscopic findings pH and whiff test results.

CONCLUSIONS
Collaboration among clinical and basic sciences resulted in an innovative approach to an educational deficit identified in student preparation for clinical practice environments. Although there is a movement away from using microscopes in medical school, it is used daily in the practice of the majority of general Obstetrician-Gynecologists in the United States. Since vaginitis is the most common presenting complaint in Women's Medicine, facilitating students' ability to make the correct diagnosis has the potential for benefitting large numbers of women when students enter practice.

CLINICAL SKILLS

MEDICAL STUDENT KNOWLEDGE AND COMFORT WITH LUMBAR PUNCTURE AND THE POWER OF A STANDARD TEACHING MODULE

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PURPOSE
A standard method for teaching Lumbar Puncture (LP) skills is not described in the medical education literature, although LP is required in clinical practice (Wigton, 2007). We therefore created and implemented a Standardized LP skills Teaching Module (TeachLP) for medical students. The purpose of this study is to measure the impact of TeachLP on student knowledge and comfort with the LP.

METHODS
Twelve medical students, five fourth-year and seven third-year students, from Tulane University School of Medicine neurology clerkship were selected for the pilot group of this study. Each student completed a pre-training questionnaire about exposure and comfort with the procedure, and a pre-knowledge test. Students then completed TeachLP, which incorporates lecture and practical experience on an LP mannequin simulator. Participants were assessed using a procedure checklist, a knowledge post-test, and post-training questionnaire. De-identified data was uniformly analyzed with coding by one researcher. This study received IRB approval.

RESULTS
All 12 student responses were included in results. Before completing TeachLP, student-reported comfort in performing an LP was 1.9 on a 5 point Likert scale (median and mode of 1). 11/12 desired an opportunity to learn. Average pre-test knowledge score was 68%, with poor safety knowledge. After completing TeachLP, student-reported comfort in LP performance doubled to 3.9 (5 point scale; median and mode of four), and all stated the training was beneficial. Knowledge test scores also improved an average of 25%, from 13.58/20 pre-test to 18.65/20 post-test. Safety knowledge improved most. Procedure checklist also reflected competency.

CONCLUSIONS
This pilot study showed that most students are uncomfortable with, and largely uninformed about most aspects of the LP procedure. However, using TeachLP one can significantly improve students' knowledge and confidence, while additionally acquiring LP procedural skills. A larger study is ongoing and may be helpful in generalizing these conclusions to other students.

CURRICULUM

INTEGRATED CASE DEVELOPMENT AND INTERDISCIPLINARY FACULTY COLLABORATION

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PURPOSE
To promote interdisciplinary faculty collaboration through the development of integrated case content (clinical medicine, medical arts, basic science).

METHODS
Six to ten core clinical and basic science faculty met weekly for 2-3 hours over the course of 20 weeks to brainstorm and develop integrated patient cases and accompanying discussion questions for Phase I of a newly integrated medical school curriculum. Case content included: patient history, physical examination, laboratory, imaging, gross and histopathologic data. The clinical problem provided the context for all faculty to develop content and questions. The case was posted at the beginning of each week for students to review. Faculty supervised students who met in small groups (8) every Friday to analyze the case and answer the questions.

RESULTS
The process of case development has become the cornerstone for successful integration of all content areas into our new curriculum. Fourteen integrated cases were developed for Phase 1. Faculty found that the process improved coordination of their teaching. Baseline Phase I survey data indicated that 100% of the core faculty found the integrated cases to be an effective teaching method and 87 % felt faculty collaboration was useful. Additionally, students qualitatively identified the integrated cases as the most valuable component of the curriculum.

CONCLUSIONS
The process of interdisciplinary, integrated case development appears to enhance collaboration among faculty and provides an educational activity that is valued by students. This process warrants further study.

CURRICULUM

AN INTEGRATIVE APPROACH TO TEACHING CLINICALLY ORIENTED EMBRYOLOGY

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PURPOSE
To understand congenital defects one must know embryology. We have found that combining embryology with pathophysiology in an active learning, clinical presentation context is an effective way to teach clinically oriented embryology.

METHODS
This integrative approach requires a basic scientist (embryologist) and a clinician who collaborate as co-lecturers / co-discussion leaders. For example, the focus of a recent 2-hour class at our institution was "Congenital Heart Disorders: Left-to-right Shunts". This class followed others in which students received instruction on the clinical presentations of chest pain and abnormal heart sounds, followed by heart anatomy, physiology and embryology. Among the shunts covered in this class were atrial septal defects (ASD), patent foramen ovale, ventricular septal defects, and patent ductus arteriosus. For ASDs, the embryologist presented a brief review of atrial septal development and asked students to discuss how each of the 3 types of ASD (primum, secundum and venosus) might arise. The clinician then used diagrams of the circulatory system to guide students to deduce ASD symptoms and signs. The other shunts were then sequentially discussed in a similar fashion.

RESULTS
The efficacy of this active-Learning approach is excellent as evidenced by high student attendance, attention and participation in class, and by positive student evaluations.

CONCLUSION
Integrating basic and clinical science is effective when basic scientists and clinicians present complementary information together in a clear clinical context that involves active participation of students. This approach is effective for teaching pathophysiology along with any other basic science discipline.

CURRICULUM
Award Nominee

DOES ONE SEMESTER LESS OF PRECLINICAL STUDIES ADVERSELY AFFECT UNDERSTANDING OF CLINICAL PROBLEMS?

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PURPOSE
The new Karolinska curriculum is theme-based and integrated with basic science and clinical science side by side throughout the 11 semesters. Semester 1 to 4 are principally basic science with 10 percent clinical and semester 5 to 11 clinical with 10 percent basic science. One consequence is that the preclinical studies are now one semester shorter than in the old curriculum when students enter the first major clinical course in semester 5 (clinical medicine). In 2009 half the number of students in clinical medicine were from the old curriculum and half from the new but both taking the same course. This offers a unique opportunity to compare the new and old curriculum within the same course in respect to the effect of shortened preclinical stage.

METHODS
The two groups of students were integrated in the course following the same schedule irrespective if they were semester 5 or semester 6 students. The tests in internal medicine taken during the course as well as the students evaluation questionnaires were the same for all students but after correction and compilation they were separated thus permitting comparison of the two groups. At this time 2 of 3 exams in internal medicine have taken place.

RESULTS
The test results for the 2 first exams in internal medicine were almost identical for the two groups of students. When analyzed by subject this also held true as well as when individual questions in the test were analyzed. There is no difference in teacher evaluations of the two groups clinical rotations. In student evaluations of the course there was a trend towards semester 5 students preferring lectures whereas term 6 students preferred clinical case seminars.

CONCLUSION
Integration of clinical- and basic science also means that students meet clinical training earlier in their studies with less preclinical studies and training. The two groups of students in this study differ by 1 semester in their preclinical training but show similar results in theoretical exams and in evaluations of practical skills training.

CURRICULUM

PREPARATION FOR CLINICAL CLERKSHIPS: COMPARISON OF TWO PRECLINICAL CURRICULA

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PURPOSE
Third-year clerkship directors rated students' preparation for clerkships in the new, integrated pre-clinical curriculum higher in medical knowledge than in the discipline-based curriculum. We wanted to determine if faculty ratings and clerkship performance supported this finding.

METHODS
At the end of the first clerkship rotation, clerkship directors rated students' level of preparation on ACGME competencies. Faculty rated students on the competencies using a clinical performance rating form (CPR). Internal Medicine, Pediatrics and Surgery were chosen for comparison because their CPR forms were collected electronically. USMLE subject exam scores and clerkship grades were also compared.

RESULTS
For medical knowledge, directors rated students in the integrated curriculum significantly higher than students in the discipline-based curriculum. Overall, there were no significant differences between curricula on any faculty rated CPR competency. Students in the integrated curriculum were rated higher in practice-based learning in Internal Medicine. They were rated lower in practice-based learning and systems-based practice in Pediatrics and lower in practice-based learning and professionalism in Surgery. There were no differences between the curricula on clerkship grades or subject exam scores.

CONCLUSIONS
Although directors indicated that students in the integrated curriculum were better prepared in terms of medical knowledge, faculty ratings, exam scores and grades did not support this finding. The lack of agreement may reflect method variance. Directors used a general gestalt rating for each competency, while faculty were asked specific questions within each competency. Further, subject exams and clerkship grades were mostly objective while the ratings were subjective.

CURRICULUM

INTEGRATED BASIC AND CLINICAL SCIENCE CASE REVIEW USING HUMAN PATIENT SIMULATION

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PURPOSE
Human patient simulators are often simply used for clinical scenarios. However, human patient simulators can be integrated into basic science curriculum via patient case studies. This research focused on the use of human patient simulators during components of cardiovascular and respiratory basic science case studies.

METHODS
Second year osteopathic medical students performed history and physical exam skills on human patient simulators in group settings of 4-5 students. During these encounters, a faculty member guided the students through correct communication and physical examination techniques. In addition, the faculty member reviewed basic science step one board review material pertinent to the case presentation, including pharmacology, microbiology, pathology, and physiology. Before the encounter, the students were given a pre-test of the concepts they would cover during the case. After the encounter, the students were given a post-test and a questionnaire.

RESULTS
The results of the post encounter questionnaires showed 100% of the 51 students thought the experience was worthwhile and would repeat the experience if given the opportunity. The students rated the value of the session 9.7/10. Pre-test scores showed an average of 38% while the post-test average increased to 86%.

CONCLUSION
Basic and clinical science integration with human patient simulators enhances student participation, learning, and understanding of complex case material. By expanding the project to more organ systems and to larger group settings, more students will receive greater integration of basic science course material with clinical hands on simulated training.

CURRICULUM

DEPARTMENT OF SCIENCE EDUCATION: AN INTEGRATED FRAMEWORK FOR LEARNING WHAT, HOW MUCH AND WHEN

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PURPOSE
In many traditional medical schools pre-clinical science faculty are selected from basic science departments and serve as short term educators. Cross departmental faculty may also come together as an Academy of Medical Educators. In our new approach we created an identity and consciousness, within a departmental setting, that promotes collaboration and scholarship. Departmental goals reflect and complement the cultures of our university, health system and the community.

METHODS
Core departmental faculty act as multidisciplinary content experts, both within the standard basic sciences and outside, from anthropology through medical narrative. With no traditional basic science courses, all are presented longitudinally, at the appropriate level, with primary exposure then revisits to refresh and advance. Faculty monitor progress of their primary discipline and collaborate to promote interdisciplinary integration. Recruitment, which was based on these fundamental principles, allowed candidates to be selected not just for their knowledge, but for their enthusiasm and an ability to think longitudinally and out of the box.

RESULTS
As the medical educator community became aware of our new approach to science education, considerable excitement became evident. Recruits were well aware of the wave of changes sweeping across medical school communities in the US, and how this was exemplified in our new approach to creating a unified home of sciences that had a broad reach beyond traditional disciplines.

CONCLUSIONS
The right people, imbued with our way of thinking, were willing to take a chance and move in a new direction, away from traditional approaches such as large group lecture teaching, to facilitation of student generated learning in an integrated cross disciplinary department.

CURRICULUM – E-Demo

TEACHING ANATOMY IN AN INTEGRATED UNDERGRADUATE MEDICAL CURRICULUM: EXPERIENCES FROM THE UNIVERSITY OF KANSAS, SCHOOL OF MEDICINE

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PURPOSE
In 2006, the KUSOM instituted a technology- and module-based, integrated medical curriculum. The curriculum begins with Foundations of Medicine (FOM), Genetics and Neoplasia, Inflammation and Immunity and progresses through systems during the first year: Cardiopulmonary, Gastrointestinal Nutrition (GIN), Renal/Endocrine, and Reproduction and Sexuality. In the second year, the modules are: Musculoskeletal, Brain and Behavior (B&B), Blood and Lymph, Infectious and Parasitic Diseases, Medicine Across the Lifespan (MAL), and Integration and Consolidation.

METHODS
Tablet PCs are used to integrate technology components and learning concepts, providing 24/7 access to all curricular content. Lectures decreased by 40% and are podcast using Camtasia Relay. Lectures were replaced by small group, e-Learning, and formative activities. Histology and cell biology labs begin in the first year FOM module and continue as integrated histopathology laboratories using digital videos, virtual microscopy, and electronic quizzes. Human Anatomy begins with thorax dissection in Cardiopulmonary and continues in GIN (abdomen), Reproduction and Sexuality (pelvis), Musculoskeletal (extremities), and B&B (head and neck) modules. Human Anatomy uses team dissection, cadaver teams, a radiological anatomy website, and lectures for content dissemination. Embryology is introduced in FOM, focusing on concepts of early development and is subsequently integrated into appropriate systems/modules. For 2010, key basic and clinical embryology concepts were reviewed in MAL with clinical cases. Neuroscience is now integrated with head and neck anatomy and behavioral sciences in the B&B module using clinically-oriented labs and small groups.

RESULTS
A few early technical problems have been overcome and student satisfaction with the curriculum has been high.

CONCLUSION
The tablet PC can be used effectively to integrate anatomical content in an electronic curriculum which includes traditional human anatomy, neuroscience, and histopathology labs coupled with state-of-the-art media.

CURRICULUM

DEVELOPING A MODEL TO INTEGRATE EVIDENCE BASED MEDICINE INTO A CROWDED CURRICULUM

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PURPOSE
Adding new material into a crowded curriculum without sacrificing existing course content and adding faculty contact hours can be a challenging task. Kirksville College of Osteopathic Medicine (KCOM) developed a model to integrate evidence based medicine (EBM) content into its curriculum and add a new course.

METHODS
KCOM instituted a faculty development workshop series using Diffusion Theory to gain faculty support to accelerate infusing EBM concepts into a full curriculum and cultivate cultural change. KCOM used a pretest-posttest design without a control group, actuated multiple quality circles, initiated a curricular mapping tool guide EBM planning, and brought in neutral third party faculty from an allopathic partner school to lead discussions. Faculty attitudes, confidence levels, and courses that included EBM applications were measured.

RESULTS
Data collected from the workshop series found 94% of faculty agreed to find ways to incorporate EBM into their classes. Summative evaluations revealed a statistically significant increase ($P<.001$) of faculty teaching EBM concepts within two years of launching the project. Faculty advocated, without prompting, to reallocate hours and for the formation of foundational EBM course which was implemented one year after the first workshop. This resulted in all incoming KCOM students being taught EBM skills in Quarter One, an improved faculty culture, and no change in faculty contact hours.

CONCLUSIONS
Evidence suggests that a faculty development model emphasizing a “bottom to top” approach is effective in achieving workplace culture changes and seamless curricular transitions. Results demonstrate that a consensus building model is conducive to engaging faculty, garnering support, and effectuating curricular change.

CURRICULUM

INTERPROFESSIONAL TRAINING: ELECTRONIC HEALTH RECORDS, EVIDENCE-BASED MEDICINE & MEDICAL INFORMATICS

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PURPOSE
Health professionals in hospitals and private practices will soon need to use electronic health records (EHR). Thus, UAMS recognized that undergraduate health-related students must learn EHR skills to enter the workforce. Standardization of EHR language will facilitate translational research, so training in Medical Informatics (MI) & Evidence-Based Medicine (EBM) is needed.

METHODS
UAMS identified strengths and weaknesses of our existing curricula based on competencies from the Joint Work Force Task Force Training: Health Information Management and Informatics Core Competencies for Individuals Working With EHR, & Competency M8 in Scientific Foundation for Future Physicians. Each college will identify core objectives their students will master in EHR, EBM & MI. Students will use EHR, EBM & MI starting with their first patient care encounters in an interdisciplinary environment & in college specific curricular activities. Mock patient EHR will be used in classes, clinical simulations, and standardized patient learning activities. Web-based instructional modules will be used to supplement face-to-face training. Sharing of expertise and educational modules will minimize duplication of time and effort. Clinical librarians will participate in EBM and MI training. All first year classes would be introduced to EHR issues via an interdisciplinary seminar series. The Center for Clinical Skills Education will use the patient database for interdisciplinary OSCE encounters.

RESULTS
Program evaluation will be followed by the creation of enduring materials and expansion of the program. The evaluation and assessment plan will focus on evaluation of the materials in terms of usability, efficacy in producing knowledge, attitude, and behavior change toward use of EHR, MI, and EBM.

CURRICULUM

TOWARDS A COMPREHENSIVE E-BOOK FOR DELIVERING LEARNING MATERIALS IN A CLINICAL PRESENTATION-BASED CURRICULUM

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PURPOSE

The Paul L. Foster School of Medicine is a new medical school located in El Paso Texas, just completing its inaugural academic year. The curriculum for the first two years is based on ~120 clinical presentations that represent signs and/or symptoms that would lead individuals to seek medical care. Each clinical presentation begins with an 'inductive scheme' session presented by an expert physician followed by 3-4 days of relevant basic and clinical science. This is followed by a related 'medical skills' session that focuses on acquiring interpersonal and diagnostic skills through the use of simulation technologies and standardized patients. Finally, a physician-run 'worked case example' small group session reinforces the acquired knowledge and skills by thorough review of several actual clinical cases. While this curriculum provides a highly dynamic and integrated presentation of basic science and clinical material, organizing and searching through the sometimes bewildering assortment of learning materials has proven daunting to the student. The goal of this project is to provide user-friendly software that will enable the student to efficiently navigate a comprehensive set of integrated learning materials, learning objectives, self-assessment items and web-based interactive tutorials.

METHOD

Currently we are using the iLios curriculum management software developed originally by the University of California at San Francisco School of Medicine. This software is linked to a comprehensive database containing learning objectives, session-related materials (e.g., PowerPoint and Camtasia files) and assessment items. The students access a calendar and relevant materials using the portal WebCT. However, the assigned reading is contained in more than 15 individual textbooks, a necessary complexity due to the integrated clinical presentation model. We are currently upgrading the iLios system, which will include enhanced student navigation software. This 'E-book' software will provide all of the previously available learning and assessment materials, and in addition provide all of the required reading materials in both web-based and printable formats. Links to clinical-presentation based interactive web-tutorials will be a prominent feature of the E-book. The navigation system is designed so that students can reach any place within the E-book within seconds. Furthermore, students will be able to bookmark and annotate individual pages, and create customized study portfolios.

RESULTS

A pilot E-book project, scheduled for completion in November 2010, will use a clinical presentation from the MS2 'Reproduction' unit to beta-test the functionality of the upgraded iLios software and interactive modules. We will solicit feedback from MS 2 students in our inaugural class during this testing phase.

CONCLUSION

We anticipate the completion of the enhanced version of iLios, the E-book, and corresponding interactive web-based modules in March 2011. This resource will improve student access to the content of our curriculum and provide faculty with additional opportunities to enhance integration.

CURRICULUM

A CONTEMPORARY METHODOLOGY FOR TEACHING CLINICALLY ORIENTED IMMUNOLOGY

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PURPOSE
Paul L. Foster School of Medicine is a new medical school with a clinical presentation-based curriculum where students learn basic science relevant to clinical science in the context of common patient presentations. Combining immunology and pathology in this context has emerged as an effective way to teach clinically-oriented immunology.

METHODS
This integrative approach requires an expert immunologist and a clinical pathologist who collaborate as lecture/discussion leaders. For example: the focus of a recent 2-hour session was "Vasculitis". Preceding sessions centered on the clinical presentation of abnormal pulse, providing instruction in the control of heart activity, vascular development and physiology. Our integrated immunology/pathology session focused on diseases causing large, medium and small vessel vasculitis. For each, symptoms, type of vascular involvement, epidemiology, immune mechanisms, gross pathology and histopathology were presented in an active interplay between clinical pathologist, immunologist and students. Clinical cases were provided to facilitate further discussion.

RESULTS
Effectiveness and students' perception of the usefulness of this active-Learning approach are excellent as evidenced by high attendance, attention and participation in class, positive evaluations and good scores on formative and summative evaluations.

CONCLUSIONS
Integrating basic and clinical science is effective when basic scientists and clinicians co-present complementary information in a relevant clinical context that involves active participation of students. This approach is effective for teaching immunology as well as other basic science disciplines.

CURRICULUM

DISTINCTION IN MEDICAL EDUCATION (DIME) AT ROBERT WOOD JOHNSON MEDICAL SCHOOL: 3 YEARS LATER

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PURPOSE
The Distinction in Medical Education Program (DIME), implemented in the 2007-08 academic year, is an enrichment program to recognize medical students who participate as teachers and tutors, as collaborators with faculty to develop course materials, as course representatives and student curriculum committee members, etc. The DIME program prepares medical students to teach and engage in educational scholarship. We hope it will promote careers in academic medicine.

METHODS
Requirements for achieving DIME include completion of an M1-M2 medical education elective, teaching experience, completion of an M3-M4 medical education elective, and completion of a scholarly project. DIME projects are mentored, and judged acceptable by a committee of faculty.

RESULTS
The non-credit elective in years 1 and 2 has enrolled 94 students, 39 students have completed the attendance requirement, and 16 have completed the elective. Twelve students have submitted a preliminary application for DIME. Two students have completed scholarly projects in education and will graduate with Distinction in Medical Education in May, 2010.

CONCLUSION
Several challenges have been addressed regarding the DIME Program during the first 3 years: (1) Student perceptions about rigor of DIME, and time it takes to plan and complete a scholarly project; (2) Identifying core and non core experiences in the M1-M2 DIME non-credit elective; (3) Recruiting faculty to mentor students, develop electives, and participate in other aspects of the program; (4) Deciding on criteria for judging scholarly projects. Faculty are working together to assure the success and continuation of the project.

CURRICULUM

INTEGRATING MICROBIOLOGY, IMMUNOLOGY AND INFECTIOUS DISEASES

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PURPOSE
The Paul Foster School of Medicine in El Paso, Texas is a new medical school that implements a scheme-based curriculum teaching basic scientific concepts through clinical presentations. We experimented by bringing together microbiology, immunology and infectious diseases.

METHODS
A study group consisting of faculty teaching microbiology and immunology, and infectious diseases specialists met regularly and discussed topics in microbiology and immunology that were to be presented to first year medical students. Integrated sessions were also created where in microbiology and immunology topics were covered starting with clinical case presentation followed by basic scientific concepts in microbiology and immunology and a final discussion that involved microbiology, immunology faculty and infectious diseases experts.

RESULTS
During group discussion and curriculum planning, the infectious disease specialist's expertise brought a different dimension and clinical perspective to the curriculum by influencing the direction and emphasis of the micro/immuno topics.

The integrated lecture sessions resulted in increased attendance. Rather than being presented as simple basic scientific concepts microbial causes of disease were presented in context of infectious diseases that they are causing followed by immune responses to the infection.

This approach generates a lot of interest by the students and results in a very lively discussion that touches not only on infectious diseases topics but also looks at them from public health perspective.

CONCLUSIONS
Microbiology, immunology and infectious diseases are disciplines that naturally blend and complement each other. Integrating infectious diseases expertise in teaching microbiology and immunology reinforces emphasis on clinically relevant perspective and prepares medical students for clinical learning.

CURRICULUM

FUNDAMENTALS OF MOLECULAR MEDICINE: MEDICAL STUDENTS' PERCEPTIONS

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The Fundamentals of Molecular Medicine (FMM) course is a component of the first year summer curriculum of the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University medical school. FMM is comprised of two sections: focus topic sessions and problem-solving sessions. The focus topic sessions emphasize research and clinical applications of basic science material through use of research tools, demonstrations of physician/patient interactions, and interactive seminars. The problem-solving sessions use a research based approach to acquire basic concepts in cell and molecular biology and biochemistry in an environment similar to problem-based learning.

PURPOSE
To determine if medical students' perceive that problem-solving sessions provide a format to learn basic science concepts, develop skills working in small groups, become more skilled in identifying basic science resources, and to link clinical symptoms to underlying basic science concepts.

METHODS
An electronic course evaluation was administered to first year medical students matriculating in years 2005-2009.

RESULTS
The vast majority of students agreed or strongly agreed problem-solving sessions enabled them to learn basic science concepts, develop skills working in small groups, and become more skilled in identifying basic science resources. The majority of students agreed or strongly agreed the problem-solving sessions enabled them to link\ clinical symptoms to underlying basic science concepts.

CONCLUSIONS
The problem-solving sessions provide a format for students to learn basic science concepts, develop small group skills, and begin the process of identifying credible basic science sources to answer clinically relevant questions.

CURRICULUM

DEVELOPMENT OF AN INTERPROFESSIONAL EDUCATION EXPERIENCE FOR MEDICAL AND PHARMACY CURRICULA

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PURPOSE
Provide a mandatory small group, interprofessional experience (IPE) for all year 2 medical (M2) & year 3 pharmacy (P3) students. One of the key goals is to develop skills and attitudes essential for effective health care team dynamics thus developing behaviors that will promote improved patient care and safety through recognition of health care team roles.

METHODS
First, all M2 & P3 students attend an introductory session which provides an overview of the purpose and logistics of the experience. During this session they interact with their Team of two P3 + two M2. Second, each team has a standardized patient (SP) session whom they interview collaboratively, admit to hospital, determine a preliminary diagnosis, treatment, and medication plan with appropriate documentation. Third, the same team sees the "same patient" in an acute medical scenario via either human simulator or SP. Fourth, all M2 & P3 students attend a debriefing session.

RESULTS
Students complete surveys regarding health care team roles & dynamics before and after the IPE. All SP sessions are recorded for student self-evaluation and review by faculty. Students are evaluated by the SP; student generated documentation is reviewed by faculty. The logistics of this activity are complex, including: coordination of M2 & P3 schedules, appropriate case development, SP training, overseeing 60 teams (10 at a time), and review of outcome data. The initial plan included graduate nursing students, unfortunately this could not be accommodated.

CONCLUSIONS
The IPE initiates the development of interdisciplinary skills earlier in the education of these health care providers, equipping them for collaborative care in their clinical transition years as promoted by the Institute of Medicine's Health Care Professions Education Summit.

CURRICULUM
Award Nominee

MODIFICATIONS OF BASIC SCIENCE CURRICULUM FOR IMPROVEMENT OF EDUCATIONAL OUTCOMES

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PURPOSE
Curriculum is often viewed as the heart of our medical education programs and has the most direct and crucial linkage with educational outcomes. Faculty and administrators analyzed the curriculum and proposed necessary modifications in an attempt to improve the educational outcomes for our diverse learners. Using longitudinally tracking, a series of curricular innovations were executed and assessed.

METHODS
Critical changes in the Basic Science curriculum entailed the reduction of total credit hours, expansion of Introduction to Clinical Medicine (ICM) courses, the implementation of block examinations and NBME Comprehensive and Subject Examinations. The total credit hours were gradually reduced from 104 in 2003 to 89 in 2008 by amalgamating some courses and eliminating the afternoon laboratory courses with the exception of Anatomy. The short, PBL formatted ICM courses and peer tutoring sessions have replaced the eliminated laboratories. The block examinations enforced students' daily, simultaneous learning of multiple subjects. The NBME Comprehensive Examination has become mandatory, although some NBME Subject Examinations have been administered as mandatory or optional. Additionally, mandatory mock Computer-Simulated Comprehensive Examinations have been incorporated.

RESULTS
A first time pass rate for the USMLE Step 1 was 57% with a mean score of 186 ± 25 in 2003. It has gradually been improved over 6 years. In 2009 the students have achieved a 94% first time pass rate with a mean score of 214 ± 20, a 28-point increase since 2003.

CONCLUSION
In view of successful educational outcomes, curricular innovation appears a key. All institutional stakeholders carefully evaluated curricular innovations for the possible synergistic impact of any academic changes. As endemic to the process, some resistance and fear of change among faculty and students were addressed. Among all modifications we have executed, we are certain that the curricular modifications played a significant role in the sustainable improvement that we have amassed on USMLE first-time Step 1 pass rates.

E-LEARNING

PARTICIPATION IN SUPPLEMENTAL ONLINE PHARMACOLOGY MODULES RESULTS IN LEARNING GAINS AND STUDENT ENGAGEMENT

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PURPOSE
PBL curricula present unique challenges for pharmacology education; learning opportunities may be overlooked in deference to other content learning goals taught in a more concentrated fashion.

METHODS
An online, supplemental pharmacology curriculum was developed for first-year medical students to increase knowledge and engagement. Fourteen online, self-paced modules were written collaboratively by faculty and students, and included a topic introduction, reading assignment, and self-assessment quiz. Pre-/post-tests and retired National Board of Medical Examiners (NBME) questions were used to assess pharmacology knowledge acquisition. Engagement was assessed via module quiz completions.

RESULTS
Student engagement was high: 92% visited the site at least once, with a mean of 34.3 visits (SD=33.7). Students completed a mean of 6.7/14 modules (SD=4.7); 16.6% completed all modules, and 9.2% completed none. Students exhibited statistically significant learning gains from pre-test to post-test in two curricular blocks during which the supplements were offered: Block 2, $t(32)=6.12$, $p<0.0001$, mean: 57.1%, SD=11.0%, to mean: 82.9%, SD=18.6% and Block 3, $t(19)=3.34$, $p=0.003$, mean: 52.9%, SD=20.8% to mean: 65.0%, SD=18.8%. Scores on NBME pharmacology questions were significantly correlated with the total number of module quizzes completed ($r=0.21$, $p=0.008$). However, these effects were not as specific to pharmacology-related questions as our previously reported results, in which module use predicted greater improvement on final exam essay questions related to pharmacology than on questions related to other topics. Consistent with our previous results, early module use was a stronger predictor of NBME scores ($r=0.24$, $p=0.002$).

CONCLUSIONS
The addition of brief, supplementary, introductory, online modules in pharmacology can lead to improved learning and student engagement.

E-LEARNING – E-Demo

IAMSE Fellowship

EMBEDDING BIOMEDICAL SCIENCES IN THE FINAL YEAR OF A MEDICAL PROGRAM

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PURPOSE
Learning during the first two years is based on discussions of clinical problems, during which there are 21 cases with a child as a patient. This educational philosophy is being continued into Years 3 and 4, where students are situated in one of the ten hospital-based Clinical Schools. Students complete nine 8-week Core Clinical Rotations (Clerkships) during these two years, plus an Elective. Clinicians would like students to revise their biomedical sciences in the clinical context, which requires web-based resources.

METHODS
Paediatric On-Line Interactive Education (POLIE), using Scenario Based Learning Interactive (SBLi), is an innovative web-based educational tool for final year students enrolled in Paediatrics & Child Health, comprising eight clinical problems. Embedded biomedical science components require students to explain mechanisms of action of clinical conditions and drug therapy, whilst feedback links to previous resources on this topic and emphasises clinical relevance.

RESULTS
One problem has been developed fully, with another seven under development. Participants involved in the trials have completed 31 Likert-style questions related to evaluation of issues including learning effects, achievement of learning objectives, and integration with other learning activities, and 14 questions related to self-reported performance such as confidence, clinical reasoning, and changes in behaviour. The results have been generally positive and have led to further improvements.

CONCLUSIONS
Web-based delivery allows the School to ensure core material is being presented to all students enrolled in the course, irrespective of their geographical location. A case-based format embeds relevant biomedical science into clinical work.

E-LEARNING

DIFFERENCE IN ATTITUDES TOWARDS ONLINE RESOURCES BETWEEN LONG-DISTANCE LEARNERS AND ON-SITE STUDENTS

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PURPOSE
From 2006-2009, Pathology instruction at the Indiana University School of Medicine – Evansville was conducted from 200 miles away in Lafayette, IN. The Pathology courses at both sites were taught concurrently with the Evansville students having access to lectures recorded in Lafayette, as well as live online conferences and infrequent visits by the instructor. Students from both sites had access to lectures recordings and several other online resources. Students were then surveyed to determine their preference in learning resources.

METHODS
At the end of the school year, students in Lafayette and Evansville were asked to complete a survey. Five Evansville students (33%) and seven Lafayette students (47%) completed the survey.

RESULTS
Evansville students relied heavily on the recorded lectures from Lafayette and other online resources. This included reviewing recorded lectures even when the material was covered in a live online session or instructor visit. Lafayette students, however, rarely viewed the recordings, even when they had to miss class. Evansville students suggested an "ideal" class would be 35% live, 42% recorded, 12% labs, and 13% other classroom activities. In contrast, Lafayette students thought the class should be 64% live, 23% recorded, 4% lab, and 12% other. Evansville students felt that 40% of lectures could be replaced by recordings and total class time could be decreased by 18%. Lafayette students thought that only 11% of lectures should be replaced by recordings. Neither group was comfortable with eliminating live interactions with the instructor.

CONCLUSIONS
Evansville students, who relied on recorded lectures for a significant portion of their course were very adept at using the course recordings. They preferred recorded lectures over live lectures to cut down on in-class time. Lafayette students, however, rarely used lecture recordings and placed a premium on in-class lectures. Replacing lectures with recorded instruction requires a significant shift in culture, but is well received once students become proficient at using the technology.

E-LEARNING

EFFECTIVENESS OF STEP-BY-STEP STUDY OF HUMAN LIFE SCIENCES' IN REMEDIAL EDUCATION

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PURPOSE
We have been producing 'Step-by-step study of human life sciences', which presents straightforward illustration and animation, two-choice quizzes and original explanatory model in small tree-structure steps, for beginners in life sciences. The effectiveness of the material in self-learning with online progress-monitoring was studied.

METHODS
Starting with students scheduled to enter a health care high education institution in the 2007 school year, through to the 2010 students, the basic level was presented with a booklet and an online version capable for randomizing quizzes for testing. In 2007, the material was used as a reference. From 2008, it was employed as a pre-entry assignment and an evaluation test immediately upon entering, consisting of the presented quizzes. Since 2009, Moodle was used as the online version and the self-study progress was monitored. In 2009, for those with bad progress, a post card was sent to encourage self-study. The 2010 students were assigned to take the randomized quiz tests every week for 14 weeks; for those with bad progress, self-study was encouraged using emails and phones each week.

RESULTS
The average score of the evaluation test immediately upon entering in relation to the percentage of the students who self-studied was 68.2/28.6, 80.7/67.6, 72.0/57.0, respectively for 2007, 2008 and 2009. After the 12th homework for the 2010 students, over 95% of the students self-studied. The score of the 2010 evaluation test will be presented at the meeting.

CONCLUSIONS
The material is effective for remedial education by self-learning, and the numerous weekly homework assignments combined with progress-monitoring promote self-learning.

CONTRIBUTORS
The material and contributors are published at http://life-science-edu.net.

E-LEARNING – E-Demo
Award Nominee

VPSIM: WEB-BASED AUTHORING OF BRANCHED-NARRATIVE VIRTUAL PATIENTS

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PURPOSE
Virtual patients are computer-based clinical simulations for education, training and assessment. This pedagogical approach supports a wide variety of educational scenarios including teaching and assessing clinical reasoning skills (1), filling gaps in the clinical experience (2), and engaging students in deliberate practice in a patient care scenario. However, VPs traditionally were difficult and expensive to create and distribute.

METHOD
vpSim (vpsim.pitt.edu) is a new software application for authoring, playing and administering virtual patient simulations over the web. This hosted web application or "software-as-a-service" allows educators to design, develop and deploy VP cases using only a web browser. No technical assistance, hardware or software installation is required. Cases are accessed either from vpSim's built-in LMS or integrated into third party software like Moodle. vpSim exports and imports cases based on the MedBiquitous VP standard allowing sharing and repurposing of cases across institutions. Authoring in vpSim employs a drag-and-drop graphical case map to quickly storyboard the steps and paths of complex branching cases. This map communicates dynamically with web forms for entering clinical data, multimedia, didactics, and questions. Learners play cases through a streamlined user interface to minimize cognitive load and focus on the clinical narrative and decision-making. Authors can design cases that provide adaptive, personalized feedback based on learner input and by tracking cost, score, time and patient status.

RESULTS
Educators and students from 10 institutions have used a beta version of vpSim to create and implement over 300 VP branching clinical scenarios for PBL, CME, independent learning and assessment. Version 1.0 was released March 2010. 1. Cook DA, Triola MM. Med Educ 2009;43:303-311. 2. Tworek, Coderre, Wright, McLaughlin. Acad Med 2010;85:155-158

E-LEARNING

SPOTLIGHTING BASIC HOSPITAL HYGIENE RULES THROUGH THE IMPLEMENTATION OF E-LEARNING

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PURPOSE
Patient safety has emerged as a hot issue in healthcare worldwide. Quick-scans in the Leiden University Medical Center revealed that behavior regarding basic hygiene falls short of expectations. It was felt important to teach students as well as hospital employees about basic hygiene rules to avoid healthcare-associated infections.

METHODS
Eight E-Learning modules have been developed on topics like hand hygiene, personal hygiene, accidental blood contact, cleaning & disinfection, personal protective equipment and isolation measures. These lessons have been incorporated as a compulsory part in the second year of the medical school curriculum. They are also incorporated in several Educational Programs for nurses, like IC-, HC-, MC-nurse and Cardiac Care nurse. During a large hospital campaign, all employees that work with patients or patient materials were encouraged to take these modules. New employees take the modules during their introductory program.

RESULTS
Almost all medical students of the second year course on Infectious Diseases and about 31% of the hospital employees actually took the E-learning lessons. Knowledge about basic hygiene rules has increased and students as well as employees state they know their way to the important protocols on patient safety better than before. Repeated quick-scans unfortunately did not show a significant long term improvement of behavior.

Participants felt that E-learning was an efficient way to study this topic, yet they complained about the time they had to spend taking 8 modules in total.

CONCLUSION/FUTURE DIRECTIONS
E-learning modules can provide proper training, but practice has to be maintained within the departments. To keep attention on a high level, we plan to repeatedly encourage employees to take certain modules at specific times.

INSTRUCTIONAL METHODS

MEDICAL STUDENTS' USE OF A LECTURE RECORDING SYSTEM DURING RECOVERY FROM HURRICANE IKE

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PURPOSE
In September , 2008, Galveston, Texas was hit by hurricane Ike. The city, including the University of Texas Medical Branch, was flooded by a storm surge that caused significant damage and loss of basic services. Although we were able to restart classes after 5 weeks, students had to deal with issues such as replacing personal items and finding suitable housing. To help alleviate anxiety and to acquire adequate mastery of curriculum content, we provided a lecture recording system (LRS) within two months of restarting classes so the students could conveniently review lectures. This abstract describes the students' attitudes toward LRS and the effect on perceived acquisition of course content.

METHODS
Data reports provided by the LRS software were used to determine the frequency of use of the system in 8 courses. In 6 of the courses, end of course surveys asked for student feedback on how effective LRS was in helping manage time. To determine whether the storm adversely affected student learning, end of course surveys asked students how useful the lectures were in helping master the course material, and examination scores were compared to scores in the immediate pre-storm year.

RESULTS
Most (85.5 ± 15.0%) of the students used the LRS. In response to the end of course survey, 81.5±8.6% (n=6 courses) agreed that LRS helped managed their time. In the courses using LRS, 79.8±13.5 % (n=8 courses) of the students agreed that the lectures were useful in mastering the material. This compares to 68.1±13.8 % (n=8 courses) agreeing in the previous iteration (pre-storm) of the course when LRS was not available (p=0.01). Mean examination scores were 82 ± 2.9 (n=11) and 82.3 ± 4.1 (n=11) pre- and post-storm recovery (difference ns).

CONCLUSIONS
Most students used the LRS and they felt that it helped them manage their time. With the LRS available, more students felt that the lectures helped them master the course material. Because examination scores were not significantly different than pre-storm examinations, LRS may have helped the students master the course material under adverse conditions.

INSTRUCTIONAL METHODS – E-Demo

PLAY-DOH™ IS A SIMPLE AND EFFECTIVE MEDIUM FOR TEACHING EMBRYOLOGY

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PURPOSE
The Educational Affairs Committee of the Am. Assoc. of Clinical Anatomists said, "An understanding of human developmental anatomy provides a fundamental framework for the accurate diagnosis and proper treatment of patients with congenital clinical entities, a significant population of any medical practice". Like most embryology instructors, I have searched perennially for effective strategies to instill students with a basic understanding of embryology. Play-Doh™ provides a simple and effective medium to convey this information.

METHODS
I use Play-Doh™ to: 1) Construct crude sculptures of embryos or organs at various stages of development. These are digitally recorded with a voice-over explanation and made available online as short movies (<5 minutes); 2) Construct the same sculptures and project them to an overhead screen during classroom lectures; and 3) Divide students into collaborative groups to construct the same sculptures during class. The effectiveness is evaluated with student satisfaction surveys and by their abilities to answer difficult USMLE-style questions.

RESULTS
Students report a high level of satisfaction regarding the ease with which they are able to learn embryology from Play-Doh™. They like having access to the online videos for pre-class preparation and pre-exam study. While no case-control studies have been done, more students seem to be able to correctly answer difficult questions following instruction with Play-Doh™.

CONCLUSION
Play-Doh™ (or any such sculpture medium) provides an inexpensive and simple approach to teaching embryology. Moreover, student satisfaction surveys suggest that these simple and crude sculptures may be more effective that computer animations in teaching embryology.

INSTRUCTIONAL METHODS

FACTORS INFLUENCING NEUROSCIENCE GRADES OF MEDICAL STUDENTS

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PURPOSE
Neuroscience has rapidly become an integral part of living and society. This growth necessitates a greater understanding and simplification of subject. New approaches (1)to medical education need to be incorporated into the curriculum to enable students to meet its evolving dimensions. These approaches must target not only the physical constructs of the material but also the bio-psychosocial components of both the learner and the educator. As described earlier by Bloom (2), but still fundamental to education today, learning should involve knowledge (cognition), attitude (affective) and skills (psychomotor). In other words, not only the head but also the heart and hand of our students need to be considered. The aim of this study was therefore to determine whether students' prior knowledge, attitude or study practice influenced their Neuroscience grades.

METHODS
A cross-sectional survey was conducted using an electronic self-administered questionnaire via Survey Monkey. The instrument was designed to gain information from third semester students that had previously done the Neuroscience course. Self-reported information on students' prior knowledge (MCAT scores), attitude and study practices towards Neuroscience and their final grades was collected. The data was collected during the months of June – August 2008. The study was conducted in collaboration with members from the Anatomy and Introduction to Clinical Medicine departments. Anonymity and confidentiality was maintained because names and identification were not requested and responses were not directly linked to addresses. Data was analyzed using correlation where $p < 0.05$ was determined as significant.

RESULTS
Students who spent more hours reviewing lectures on media site were more likely to have higher Neuroscience grades ($p=0.04$). Furthermore, students who entered medical school with higher MCAT scores were also more likely to have higher Neuroscience scores ($p=0.03$). However students' attitude did not affect their grades ($p=0.29$).

CONCLUSIONS
Media site is an effective learning resource for Neuroscience students. This method of delivery of the curriculum is apt for medical students who normally have arduous schedules. Furthermore MCAT score is a predictor of Neuroscience grades. References 1) Howe A, Campion P, Searle J, Smith H. (2004). Learning in Practice. New perspectives—approaches to medical education at four new UK medical schools. British Medical Journal, 329, pp. 327-331 (7 August), doi:10.1136/bmj.329.7461.327 2) Bloom BS (Ed). (1956) Susan Fauer Company, Inc.. Taxonomy of Educational Objectives. The classification of educational goals, pp. 201-207.

INSTRUCTIONAL METHODS – E-Demo

A BIOMEDICAL RESEARCH COMPETENCIES EDUCATION PROGRAM FOR MEDICAL STUDENTS

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PURPOSE
A novel curriculum increasing early career exposure to biomedical research for medical students has been developed and tested at the University of North Texas Health Science Center. The primary aim of the curriculum is to increase foundational competencies in clinical and translational research as a component of critical thinking in evidence-based medicine.

METHODS
This poster displays the model used to integrate basic biomedical research competencies into the medical school curriculum, and reports the learning outcomes.

RESULTS
A regression model based on self-efficacy theory, identifying factors predicting learning outcomes is presented. In the electronic demonstration component of this presentation we illustrate the differences between this curriculum model and a traditional medical statistics course with vignettes from the lectures, on-line web-based resources, and students' critical reviews of research articles.

CONCLUSIONS
A consortium of medical schools is collaborating to test this curriculum in multiple venues. This research education consortium is developing innovative approaches to measuring outcomes of the curriculum.

INSTRUCTIONAL METHODS

INNOVATIVE USE OF AN AUDIENCE RESPONSE SYSTEM IN MEDICAL EDUCATION

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PURPOSE
Electronic voting is an interesting audience response technology for classroom use. Using on-the-spot voting changes one-way interaction of a standard presentation into a two-way communication process that motivates and involves the audience to active participation and provides the teacher with immediate feedback on the students' level of understanding or their opinions. In the Medical Schools of the Leiden University Medical Center and the Academic Medical Center Amsterdam, wireless electronic voting has been implemented in the medical curriculum as a standard educational tool.

METHODS
Teachers use several applications for using voting in their lectures. Scenarios include basic knowledge tests at the start or end of a lecture to assess the students level of knowledge, screening tests to determine those topics students know less about, panel discussion tools to determine the audience's opinion and interactive lectures in which students have direct influence on the content to be presented.

RESULTS
Basic tests are generally used to find out the knowledge level of the students. If students perform poor on the test, the teacher can immediately adjust the lecture to fill in the gaps detected. In combination with a posttest, the actual increase of knowledge can be measured. Many teachers also use tests in the middle of their lecture. Using the technique at a moment where concentration may decrease helps students to stay focused and to increase retention time of information. Screening tests are used to deliver tailor made lectures. First, the teacher presents a test of about 20 questions. Based on the results, only the top-5 items with the least understanding will be discussed in class. This makes education more efficient. Addressing audience opinions in a lecture might also lead to very interesting effects. Because of the anonymity of the system, students can answer what they really think of have done, even the answer is not socially desirable. Finally, the audience can actively steer the direction of the lecture. Students choose between two options and the teacher will select the option that gets the majority of votes. A very special option is a lecture that describes a patient case. By voting one out of a list of possible clinical actions, the audience can simulate treating the virtual patient presented and will immediately be confronted with the implications of the chosen action.

CONCLUSIONS
Audience Response Systems can be used in many didactic ways to enhance the quality and efficiency of education.

INSTRUCTIONAL METHODS

ACTIVE LEARNING HANDS-ON APPROACH IN TEACHING ECG BASIC CONCEPTS TO PRE-CLINICAL MEDICAL STUDENTS

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PURPOSE
A lack of proficiency in electrocardiogram (ECG) interpretation in medical trainees and practitioners has been lately noted. Meanwhile pre-clinical medical curricula are moving toward active learning and clinical integration. We have designed and implemented an active learning hands-on laboratory to teach the basic physiological principles of ECG.

METHODS
The laboratory has been in place for 4 years (2006-2009) and is conducted using IQ mark digital ECG machines. Each year, the class of 54-56 students was divided into six groups. Each group performed two recordings, one with and one without software interpretation.

RESULTS
During the 4 years this lab has been in place student performance on ECG questions on the physiology NBME exam significantly improved compared to the 6 previous years (2000-2005) without the lab. The difference in the mean % of correct ECG questions between our students and the national average improved from -9.5± 0.5 to +1± 0.4 ($p < 0.02$) before and after the ECG lab, respectively. Furthermore > 85% of the class performed well on the in-house follow-up lab exercise. The lab was well received by the students with consistent provided positive feedbacks. The majority of the students > 88% rated the lab as extremely or very useful in helping them understand ECG concepts as well as for their medical education.

CONCLUSIONS
Active learning hands-on approach appears to improve student understanding of the basic ECG concepts. Implementing this approach early-on in the medical curricula may improve the competency of ECG interpretation skills in the student's future practices.

INSTRUCTIONAL METHODS

PRODUCING OBJECTIVE CENTERED PODCASTS FOR PREVIEW & REVIEW: A NOVEL FACULTY DEVELOPMENT TOOL FOR EFFECTIVE LECTURING

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PURPOSE
Lecturing is a complex communication dynamic that requires mastery of many skill sets. To improve the delivery of lectures we employed brief preview and review podcasts as a way to assist faculty in developing effective lectures focused on learning objectives.

METHODS
A series of preview and review podcasts, recorded with a USB microphone using Camtasia Relay software installed on a PC, were created to supplement lectures in cell biology and histology. Preview podcasts based on learning objectives were limited to 3 minutes and featured one objective at the top of the screen and an illustration below. Review podcasts were limited to 7 minutes and provided a framework for summarizing and studying the lecture. Preview podcasts were released at least one day prior to the lecture and review podcasts were released on the day of the lecture. An anonymous survey consisting of six questions was distributed via the course management system.

RESULTS
Sixty four responses (out of 170) were collected. Sixty percent viewed at least one preview podcast of which 20% found them somewhat helpful and 26% very helpful in focusing on what to learn. At least one review podcast was viewed by 56 % with 16% finding them somewhat helpful and 34% very helpful. One student comment suggested that “it would be good for other professors to do them because it would help them think about the big picture/point of their lecture and thus teach us more efficiently”. Another responded, “I hope that all teachers will do them in the future.”

CONCLUSIONS
The preview and review podcasts, although designed as an aid to learning, may actually serve to benefit the instructor. Podcasts do not fit the study style for many students; however, their utility for archiving lectures has been well established. The suggestion that more professors utilize preview and review podcasts has us currently exploring the applicability of this approach as a faculty development tool. The goal is to improve lecturing skills by focusing on learning objectives, clarity, brevity and the selection of excellent teaching visuals. These results represent a pilot study that we are in the process of expanding.

INSTRUCTIONAL METHODS

WHAT'S REALLY GOING ON? LEARNING RESOURCE UTILIZATION AND ACADEMIC PERFORMANCE

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PURPOSE
While the traditional lecture format is still the primary instructional strategy, student learning styles suggest a more varied approach to be useful. The aim of this study was to examine the pattern of use of available learning resources and their influence on academic performance.

METHODS
A survey was offered to the students in Yr 1 Physiology and Yr 2 Cardiovascular System course to assess the student use of learning resources and academic performance. Participation was voluntary and anonymous.

RESULTS
Average class attendance was approximately 50%. MP3 audio recordings were used by 37% of the students for > 75% of the classes. Instructor handouts, PowerPoint slides and Notepool were the three key resources used by the students. There was a significant influence of MP3 audio file use on class attendance and performance: high lecture attendance with lower audio file use and stronger students using the audio files less. A significant influence of lecture attendance and academic performance was noted with students who attended class regularly performing better. Finally, those students who regularly attended class were strongest in opposition to self-study modules replacing selected live lectures. Overall, 50% of the students were NOT supportive of self-study modules with only 19% favoring this format.

CONCLUSIONS
Medical students do not regularly attend lectures, but they are strongly opposed to replacing them with self-study modules. Audio recording of lectures is a resource valued by students, but used routinely by only about 40% of the class. Those students who use the audio files extensively tend to have weaker academic performance. Lecture attendance does significantly influence academic performance with those regularly attending class performing better.

INSTRUCTIONAL METHODS – E-Demo

VITAMIN JEOPARDY: AN INNOVATIVE ACTIVE LEARNING MODALITY FOR METABOLIC BIOCHEMISTRY

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PURPOSE
Active learning holds students responsible for their understanding, and shifts their emphasis from passive learner to active participant. In our Metabolic Biochemistry course, students are taught vitamins in a Jeopardy quiz team format (men vs. women) as an active learning modality. This format replaces two hours of traditional lectures.

METHODS
Students were provided pre-session learning resources (readings, recordings and study guides). Topics covered, both in previous lecture format, and in the present Vitamin Jeopardy session include: (A) water- and fat-soluble vitamins, (B) sources and recommended daily allowances, (C) metabolic functions, (D) vitamin deficiencies, and (E) vitamin toxicities. Using a hyperlinked Jeopardy board, a student chooses a multiple choice question from one of five different categories. Each student is given 15 seconds to answer the question using our audience response clicker system software. Results are tabulated, indicating the correct answer, and the % choices made by each team. The team with the highest correct response wins the points. The fastest responder of that team chooses the next question. This is repeated for 40 minutes. The best student from each team then competes in a "go for broke" final Jeopardy question.

RESULTS
The Vitamin Jeopardy session was recently completed. Metrics from the upcoming block exam will be discussed, compared to material previously taught by traditional lectures. Student evaluations were overwhelmingly enthusiastic and supportive, making lengthy dry material exciting, interesting, and memorable. Attendance dramatically increased.

CONCLUSIONS
This format has great potential for active learning, including class review sessions, quizzes, small group learning assignments, study guides and student assessment, as well as converting passive lectures into active sessions (as was the case for Vitamin Jeopardy, but also TBL or JiTT). As exam results are compared, the use of hyperlinked active learning resources, such as that created to teach vitamins, will undoubtedly increase in applications.

INSTRUCTIONAL METHODS – E-Demo

THE EFFICACY OF 3D INTERACTIVE ANIMATIONS IN TEACHING EMBRYOLOGY

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PURPOSE
Teaching embryology in a medical or dental school curriculum is difficult due to time constraints. However, embryology plays a large role clinical fields, including pediatrics, surgery, and primary care, due to the great impact of congenital malformations. The current lack of resources and learning time can be overcome by use of technologies that present the material in a clear, accurate, and interactive format. In this study, we investigated the impact of an interactive 3D animation module depicting facial development on medical student learning.

METHODS
The interactive animations were developed through a collaboration between medical school faculty, a medical student, and two biomedical artists. This production model is being examined as a basis for a collaborative curriculum between the CWRU School of Medicine and the Cleveland Institute of Art. For assessment of the impact of the animations on student learning, students were divided into two groups: those receiving the standard curriculum and those receiving the standard curriculum augmented with the interactive animations. Differences between the two groups were assessed using written pre- and post-tests, as well as focus group surveys and discussions.

RESULTS
Statistical analysis of the differences in test performance between the two groups showed that scores of the student group exposed to both the standard curriculum and the interactive animations tended to be increased over those exposed to the standard curriculum alone. Larger test group and focus group studies are currently underway.

CONCLUSIONS
Preliminary data suggests that interactive 3D animations may reduce the time required to deliver embryology content and may enhance the learning and retention of embryological concepts in medical and dental students.

INSTRUCTIONAL METHODS

TEACHING BASIC SCIENCE WITH HUMAN PATIENT SIMULATORS INCREASES KNOWLEDGE RETENTION

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PURPOSE
In addition to lecture, methods of teaching basic science during undergraduate medical training include evidence-based literature review (LIT), problem based learning (PBL), and human patient simulators (HPS). However, there is little evidence to demonstrate how the use of HPS compares to other forms of educational supplements in teaching medical students. This study was designed to compare HPS, PBL or LIT on learning and outcomes in the first year of medical education as compared to a control group (CON).

METHODS
Students were assessed over a 13 week period to monitor the understanding of 12 specific objectives in the areas of intestinal microbiology and physiology covered in the required didactic curriculum. Assessments occurred following normal curricular presentation of the objectives (pre-test), following participation in HPS, PBL, LIT or CON to assess immediate impact of the session on knowledge of the objectives (post-test), and 8 weeks following the post-test to assess long term retention of the covered objectives.

RESULTS
As anticipated, student performance declined over time for all groups. However, participating in the HPS experience significantly suppressed the observed decline in retention of the objectives by approximately 2 fold as compared to control.

CONCLUSIONS
Using human patient simulators provides an educational advantage for student retention of integrated basic science knowledge as compared to CON, PBL or LIT formats. The results of this study help define curricular mechanisms for improving student outcomes related to medical knowledge and provides a framework to assess the application and synthesis of medical knowledge.

INSTRUCTIONAL METHODS

SIMULATION ACTIVITIES CAN STIMULATE LEARNING IN A GROSS ANATOMY COURSE

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PURPOSE
Simulation Centers provide new opportunities for students to practice Clinical Skills and may offer unique ways for pre-clinical students to apply basic science knowledge through active learning solutions. We implemented simulation center (SimCenter) activities into the gross and developmental anatomy course and measured student and faculty perceptions regarding these activities.

METHODS
During each of the 3 blocks of gross anatomy, first-year medical students participated in simulation activities that correlated with dissections. These included: lumbar puncture and brachial plexus blocks during the musculoskeletal block, central lines/angiogram during the chest block, and airway intubation during the head/neck block. Clinical faculty supervised all activities. To evaluate this educational approach, students were asked to answer 6 questions reflecting on the value of their simulation experiences. Participating gross anatomy (GA) and clinical faculty (CF) were asked to complete a similar survey. Mean differences were analyzed using ANOVA.

RESULTS
Both GA (N=9) and CF (N=9) placed value on using simulation to enhance learning. While all faculty felt that dissection should be learned prior to simulation, basic scientists felt more strongly that learning through dissection should precede simulation (mean GA 5.00 vs. CF 3.67; $p<.05$). Overall, students (N=243) felt that simulation activities had the greatest impact on stimulating interest in learning gross anatomy (M=3.79/5.00) and helping them understand why learning the regional anatomy is important (M=3.98/5.00). Additionally, students felt that the airway intubation activity was more effective than the lumbar puncture and angiogram/central line activities in terms of understanding the gross anatomy, preparing them to perform the procedure, understanding informed consent, and enhancing performance on the block exam ($p<.05$).

CONCLUSIONS
Adding simulation activities to a gross anatomy course can enhance student interest in learning which may lead to better retention. Perceptions of basic and clinical science faculty may differ regarding how simulation activities can best be implemented.

INSTRUCTIONAL METHODS

USE OF DEBATE FORMAT FOR TEACHING EVIDENCE-BASED MEDICINE

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PURPOSE
With increased emphasis on physicians practicing evidence-based medicine (EBM), it is important that we challenge students to incorporate principles of EBM into their learning. To this end, a debate format was utilized with students in our Problem-Based Learning curriculum to help them learn to critically evaluate and synthesize clinical research literature.

METHODS
A general debate topic was chosen and each of three groups of students (7-8 students/group) was assigned a specific proposition related to this topic. Each group was required to research their proposition and find 3 primary research papers (not review articles) to support their proposition, which were then distributed to the other two groups. On the day of the debate, each group was given 10 minutes to present the evidence supporting their proposition, with each presentation followed by the other two groups presenting evidence refuting the proposition. The 1 hour debate was followed by a 1 hour session during which consensus opinions were generated by the groups. Each group was then required to write a consensus report on their proposition outlining the evidence for and against, as well as presenting a best practice recommendation.

RESULTS
The debate required considerable preparation and group engagement. Most student comments indicated that they found the activity to challenge their thinking and understanding in ways that could not be achieved simply by reading about the topic in textbooks.

CONCLUSION
The debate format helps students to learn the value of searching for answers from clinical research literature and brings to light the complexities of determining best clinical practices that are based on sound clinical research.

INSTRUCTIONAL METHODS – E-Demo
Award Nominee

MRISIM: TEACHING STUDENTS HOW MR IMAGES DEPEND ON TISSUE PROPERTIES AND DEVICE SETTINGS

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In order to appreciate different medical imaging modalities students have to understand on which tissue properties each modality depends. In MR images the pixel values depend on 3 different properties, the weights of which are determined in a complicated way by the settings of the MRI device. We have developed the simulation program MRISIM to assist students in understanding how this works.

METHODS
We have recorded the same MRI slice repeatedly with different TE and TR settings, both in patients and in normal subjects. From these recordings we have estimated the underlying tissues properties for each voxel: T1, T2 and hydrogen density. The program MRISIM allows the user to choose the TE and TR settings, and then constructs MR images on the basis of these settings and the tissue properties described above.

RESULTS
In a lab class environment students use MRISIM to construct MR images for a range of TE and/or TR values. The students use the program to observe how the pixel values of certain voxels change with these settings. They note how the pixel value depends on the MRI settings, and how this dependence differs for different tissues (i.e: the tissue properties differ for these tissues). In this way they learn how optimal contrast can be obtained for certain tissues. We have used MRISIM for several years now, and we have found that it helps students in grasping the complicated relation between MR images and underlying tissue properties.

CONCLUSIONS
MRISIM is a useful tool in instructing students on MR imaging. We are now collecting data for a wider group of patients. Furthermore, we are currently working on including fMRI into MRISIM. When ready, MRISIM will be made available without charge via the World Wide Web.

INSTRUCTIONAL METHODS – E-Demo

ECGSIM: HELPING STUDENTS TO UNDERSTAND THE RELATION BETWEEN THE ECG AND THE ELECTRIC ACTIVITY OF THE HEART

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PURPOSE
Learning to understand how the electric activity of the heart is expressed in the ECG waveform is not easy. The classic way to learn this is by studying text and figures in books, or listening to explanation by a teacher. The understanding of this relation is greatly improved if the student can use an interactive tool with which he can induce changes in the activity of the heart and observe their effect on the ECG.

METHODS
Our research has yielded a mathematical model that links the ECG at the body surface to the local transmembrane potential at the surface of the myocardium (both epicardial en endocardial). We have built the simulation package ECGSIM, in which this model is incorporated. It includes heart and torso geometries, reconstructed from MR images. The user may change the depolarization time, the repolarization time or the transmembrane potential amplitude in a region of the heart or globally, and observe immediately the result on the ECG.

RESULTS
By using ECGSIM it is easy to induce abnormalities such as bundle branch blocks and infarctions at various locations, and observe their effect on the ECG. We have observed that this helps students to understand what is going on, if they use ECGSIM in the context of a lab class with dedicated instructions. By now it has been used successfully in teaching by several groups all over the world. ECGSIM may be downloaded free of charge from http://www.ecgsim.org.

CONCLUSIONS
ECGSIM is an interactive tool that aids students to understand the ECG. It has already demonstrated its value in teaching. We are now engaged in a project to gather clinical cases and instructions to be distributed via the website.

INSTRUCTIONAL METHODS

MAKING THE CONNECTION BETWEEN THE BASIC SCIENCES AND THE PRACTICE OF MEDICINE – TOOLS TO FACILITATE LEARNING

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PURPOSE
In their evaluations, students complained about the condensed way 45 hours of medical biochemistry were taught indicating that lecturing only was not conducive to deeply understanding and retaining the material. Moreover, students voiced their opinion regarding the lack of connection between the basic sciences in general and the clinical relevance of the material taught in the first year.

METHODS
To address the above issues, we implemented a curriculum change in the Medical Biochemistry course. This curriculum combines teaching methods that have proven to assist students in acquiring a better grasp of basic sciences. Two-thirds of the assigned course time was dedicated to interactive lectures using an Audience Response System. The remaining time was dedicated to six workshop sessions based on clinical cases. A difference between the usual TBL and this method is that the questions of the equivalent IRAT and GRAT covered the lecture material to be illustrated by the clinical case. Another difference is that an additional individual quiz focusing on the clinical case was administered at the end of the session. Additionally, using Inspiration 8.0 software, each group was required to construct a concept map to visualize the group's understanding and knowledge. A rubric was used to evaluate students' work.

RESULTS
A comparison of the results of formative and summative assessments taken by DO13 students and those taken by first year students of the last four years at Touro University Nevada showed a significant increase in the understanding of the material: the entire class passed, with more than 74% of students earning grades of "A" or "B". A clear correlation between the GPAs and students' performance on Medical Biochemistry exams was demonstrated.

CONCLUSION
This curriculum change demonstrated that when connections between basic sciences and clinical relevance are established early in medical education, learners are better able to retain information and to acquire solid clinical reasoning skills. Concept mapping was crucial in engaging students.

INSTRUCTIONAL METHODS

BLENDED LEARNING IN MEDICAL EDUCATION: USE OF WEB-BASED LEARNING MODULES AND SMALL GROUP DISCUSSION FOR TEACHING HUMAN ANATOMY

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The teaching of human anatomy in the practical laboratory for 2nd year medical students was changed from didactic introduction to the subject to a blended learning model that included a brief students presentation followed by small group (7–8 students) discussions with rotating lab instructors. Students used a web-based structured learning modules (e-Learning) was introduced to facilitate existing face-to-face teaching to encourage more effective student preparation and then informed participation in an undergraduate anatomy laboratory-based course. Active learning was encouraged by group formation in the laboratory to examine the cadaver and solve some labeling exercise to test the group's e-Learning outcome. Tutor feedback was provided on student submissions of the exercise. Evaluation of the course was conducted via student questionnaires, individual student interviews, and analysis of student marks in examinations and of the e-Learning component.

Results were encouraging for the first implementation of such a curriculum modification. Results from further detailed surveys of student interactions and engagement and correlation analysis between student responses were also very supportive of the effectiveness of the course. There were a significant decrease in the number of failed students in the final examination in the new course with e-Learning and the previous year without e-Learning. various survey responses helped interpret results and strengthened arguments for e-Learning and suggested future improvements for student use of e-Learning. This mode of e-Learning used to support face-to-face learning activities in the laboratory can be adapted for other disciplines and may assist students in developing a greater appreciation and a deeper approach for learning from their practical class experiences.

INSTRUCTIONAL METHODS

CONVERSION OF A CASE-BASED LECTURE TO A VIRTUAL MICROSCOPIC TUTORIAL; A PRACTICAL APPROACH

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PURPOSE
Virtual microscopy is becoming a more accepted method of teaching microscopic anatomy and pathology to medical students in the first two years of their undergraduate medical education. We demonstrate a practical approach to converting a case-based pathology lecture with still images to a virtual microscopic laboratory tutorial designed for a smaller group setting.

METHODS
The clinical history, physical exam findings and ancillary studies presented remained similar; however, a corresponding virtual slide needed to be selected to match each pre-existing case. The University of Iowa has a publically available website with various virtual images sorted by organ system at http://kickstart.health.usf.edu/Iowa/. After a short introduction to the particular case and a low-power still image "tease" of the virtual slide, the students, in groups of 2-4, previewed the slides on their computer and answered questions about the microscopic findings. Afterwards, the laboratory instructors went over the low and high power findings with the students from still images taken of the virtual slides. A pre- and post laboratory questionnaire to assess the students grasp of the microscopic pathology and comfort with the virtual slides was administered.

RESULTS
Approximately one hour per case was required to convert formats. Of the second year medical students queried (N=105), 98.1% had used a microscope at some point in their lifetime with the mean use falling closest to > 10 times. Ninety-three percent of the respondents that had used a microscope before (N=100) preferred using virtual slides. More detailed analysis of the questionnaire will be presented at the meeting.

CONCLUSIONS
Although significant work may be required, conversion of a case-based pathology lecture to a virtual microscopic laboratory tutorial can be less time consuming then creating one from scratch. It may also prove to be a cost-effective manner in which to reduce large group contact hours. A future direction may be to have the laboratory instructor manipulate the virtual slide for the class before independent learning.

INSTRUCTIONAL METHODS

AN AUDIENCE RESPONSE SYSTEM ENHANCES LEARNING AND PROBLEM SOLVING SKILLS AT THE OMAN MEDICAL COLLEGE

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PURPOSE
Students enter the Oman Medical College after secondary education and take pharmacology in their 5th year. The curriculum, modeled after the western style instruction of US schools, is taught in English. Students are generally Arabic speaking with English as their second language. In order to promote classroom discussion with these students, who are generally reserved with respect to oral communication, a classroom response system (Turning Point - Turning Technologies, Inc.) was used which guarantees anonymity.

METHODS
The response system was generally used in sessions that occurred 1 to 2 days following the presentation of the material. MCQs constructed as clinical or experimental scenarios in the style of the USMLE were used.

RESULTS
Students evaluated the approach after two months. Fifty-four of 76 students completed a survey. Fifty-three agreed that Turning Point was helpful and encouraged its use. Students (75-87 %) indicated that the sessions helped them to recall drug names, to understand basic concepts, to prepare for problem solving questions on regular exams and to apply pharmacology in a clinical context. Eighty-five (85) % were more comfortable answering Turning Point questions (presumably due to the anonymity of the response) rather than responding orally to questions. Faculty reported that students who initially selected distractors applying rote memory began to use clearer reasoning skills. Also, the faculty felt that they had better insight into approaches for guiding students' learning.

CONCLUSIONS
Students and faculty became comfortable with this mode of instruction and recognized that the approach made communication more comfortable and promoted the integration of basic pharmacology into clinical problem solving.

INSTRUCTIONAL METHODS

GERIATRIC EDUCATION OF PEDIATRIC TRAINEES IN THE HIGH-FIDELITY SIMULATED PATIENT SETTING

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PURPOSE
As the geriatric patient population continues to expand there are ramifications felt in all areas of medical practice. In particular, pediatricians are affected by geriatric caregivers but have little specialized training in dealing with complex geriatric issues. The 2000 census found that there were 2.4 million grandparent caregivers in the U.S. with the highest proportion in the South. This project sought to educate pediatric residents in some of the particular complexities of geriatric caregivers. This abstract describes the project and its outcomes.

METHODS
This program has been in effect for nine months. Pediatric and anesthesia residents in their first year of training are invited to the simulation center for a didactic session. Faculty from the simulation center, the general pediatric division and the geriatric division developed a medical case in which a child under the care of a geriatric caregiver ingests a medication and presents for care to an emergency department. In the simulated setting the learners interact with geriatric caregivers who have a hearing impairment and other complex medical conditions. A standardized debriefing is held in which principles of communication with hearing impaired adults are discussed. Videotaped review can also be used to demonstrate superior behavior or help make clear areas for improvement.

RESULTS
23 learners have participated in the program to date. 100% of the learners felt that the topic was valuable and applicable to their profession and that they would be able to apply what they learned in their future work. 97% reported that they would either come back or recommend the experience to others. Learners reported that highlights of the experience were having elderly caregivers present to give immediate feedback and having geriatric content experts teach practical tips for improving communication. All participants commented on the importance of lowering pitch and minimizing distractions.

CONCLUSION A simulated patient/care-giver experience with a focused debriefing session is a novel curricular approach to teaching complicated geriatric strategies for pediatric trainees.

INSTRUCTIONAL METHODS

LEARNING CURVES AND LONG TERM OUTCOME OF SIMULATION BASED THORACENTESIS TRAINING

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PURPOSE
Simulation based medical education has been widely used in medical skills training. However, the effectiveness and the long term outcome of simulation-based training in thoracentesis require further investigation. The study aims to access the learning curves of simulation-based thoracentesis training and to evaluate its long term outcome.

METHODS
Fifty-two medical students were enrolled in this study. All participants attended 30 minutes didactic training, as well as a step-by-step demonstration of a thoracentesis on the simulator. All participants must pass a multiple choice written examination before practice with the thoracentesis simulators. Each participant would perform five supervised but unmentored thoracentesis on the simulator. The measurements were taken and recorded by the supervisor. Participant's performance was assessed by performance errors (PE), procedure time (PT) and participant's confidence (PC). Learning curves for each variable were generated. Long term outcomes of the training were measured by the re-test and clinical performance evaluation one year later.

RESULTS
Fifty-two (24 females, 28 males) third year of medical school students were enrolled. All the students had no prior procedures performance. The participants' assessment scores were summerized across the PE, PT and PC. Significant improvements in PE, PT and PC were noted among the first 3 to 4 test trial ($p<0.05$). A plateau for PE, PT and PC in the learning curve occurred in Trial 4. Long term outcome of the training were measured by the re-test on fifty participants at six months after initial training. There was no significant difference between the Trial 5 and retest ($p>0.05$). One year later, forty two participants of this study and thirty two residents (Post graduate year 1) graduated from other medical school performed thoracentesis on patients under the supervision of a senior faculty. Participants received simulation-based thoracentesis training had better performance than the residents without such experience ($p<0.05$). There was no significant difference in demographic date and pre-test score between these two groups.

CONCLUSIONS
This study demonstrated simulation-based thoracentesis training can significantly improve the individual's performance. The full effect of learning from the modular can be achieved by four practices. Simulation based training is helpful for long term retention of skills and can be partially transferred to clinical practice.

PROFESSIONAL DEVELOPMENT

OUTCOMES OF A PROFESSIONALISM CURRICULUM: THE PROFESSIONALISM INITIATIVE AT THE UNIVERSITY OF KANSAS SCHOOL OF MEDICINE

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PURPOSE
At KUSOM, our goal is for each student to graduate as a multi-tooled physician leader. Those tools, which must supplement the fundamental requirement of medical knowledge, are the core tenets of professionalism: altruism, accountability, excellence, duty, honor and integrity, respect and commitment. Each student should enter residency training well prepared to engage and grow from the challenges and opportunities a career in medicine offers.

METHODS
The KUSOM curriculum is systems-based with elements of professionalism as a component of each module and clerkship. The intent of the professionalism initiative is to develop a seamless professionalism curriculum that gives learners the tools to grow personally and professionally as they advance from medical school applicants to residents and eventually to become outstanding leaders of the health care team. Currently, the KUSOM conducts a number of activities to assist students in their personal and professional development: 1) First-year Orientation Events culminating in the White Coat Ceremony, 2) Dean's Hours, 3) Academic Societies programs, 4) Professionalism Small Group Discussions, 5) the Third Year Transition Ceremony, and 6) Introduction to Clinical Medicine. Professionalism is recognized through the Gold Humanism Society and the "Pride in the Profession Award" which recognizes a senior student who most appropriately characterizes the qualities of professionalism in medicine.
Additional elements of our professionalism initiative can be found at:
http://www.kumc.edu/som/professionalism.html

RESULTS
In the Graduation Questionnaire our students rank professionalism as a very strong component of their training. Some graduates even indicate that there is too much emphasis placed on professionalism. Our graduates also score very highly in the professionalism categories on their residency director surveys completed after the first year of residency.

CONCLUSION
A cohesive professionalism program has a positive impact on student attitudes and behaviors toward medical practice.

PROFESSIONAL DEVELOPMENT

FACILITATING COMMUNICATION AMONG BIOCHEMISTRY COURSE DIRECTORS

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PURPOSE
While medical schools have had departments of physiological chemistry or biochemistry since the time of the Flexner report, prior to 2008 North American medical biochemistry course directors had not formally organized. The current period of curricular change raises questions on the relationship of biochemistry to other disciplines basic to medical education. Meetings sponsored by the Association of Medical and Graduate Departments of Biochemistry (AMGDB) were held in 2008 and 2009 to address those issues. The nature of those meetings and the future of the Association of Biochemistry Course Directors (ABCD) formed at the first meeting are the subject of this report.

METHODS
An organizing committee solicited attendees through departments affiliated with the AMGDB, web searching and personal contacts. Meetings were held in Myrtle Beach, SC, using formats similar to those used at meetings of microbiologists teaching in medical schools.

RESULTS
In 2008 there were 77 attendees and 72 in 2009. Topics discussed included the role of biochemistry in integrated curricula, teaching modalities such as TBL, defining course content, resource exchanges and teaching basic science in years 3 and 4 of medical school. Topics for discussion at future meetings were identified. It was agreed that future meetings would be biennial.

CONCLUSIONS
Attendees were positive about the value of communication among biochemistry course directors. It was recognized that in integrated curricula there will be directors of courses in which biochemistry forms only a part of the material, but the importance of the discipline is such that there is a need for continuing dialogue, and this can be facilitated by meetings of a national and international nature.

PROFESSIONAL DEVELOPMENT

CIRC: A COMPUTER LAB WHERE FACULTY DEVELOPMENT, STUDENT-CENTERED LEARNING, AND TECHNOLOGY UNITE

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PURPOSE
Busy medical school faculty often think they don't have time to improve their teaching. As faculty developers in CIRC (Curriculum Innovation Resource Center) one of our jobs is to help faculty teach better, especially with learner-centered strategies and technology. Our task is to persuade them we have something valuable to offer and then do so efficiently and effectively.

METHODS
Because of the complex infrastructure of the pre-clinical courses, we meet with course directors and faculty to assist with development of printed and online course material. We provide a much-welcomed information clearinghouse and guidance in the form of coaching so they don't have to navigate the system alone. We are in a unique position to brainstorm and gather information on successful teaching strategies and share this information with others. In addition, both formal and informal course evaluations by students offer valuable suggestions for course improvement. We work with faculty to implement these changes by utilizing relationships we have developed with the many people, departments, systems, and technology support staff required for change. In other words, faculty come to us with their challenges and we help determine what resources are needed to address them.

RESULTS
We have conducted multiple coaching sessions with more than 100 faculty this school year. They appreciate the individualized guidance and focused attention we provide in these one-on-one sessions. Student feedback on formal course evaluations has also been positive about these teaching enhancements.

CONCLUSIONS
We plan to build on this successful coaching initiative by reaching additional faculty through a focused marketing campaign. As more people participate, the program will continue to improve.

STUDENT SUPPORT

USE OF A PARALLEL PROCESS PBL CASE TO INDUCE BEHAVIORAL CHANGE IN FIRST SEMESTER MEDICAL STUDENTS AT ROSS UNIVERSITY

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PURPOSE
The Ross University School of Medicine (RUSM) Department of Integrated Medical Education (IME) designed a PBL case using parallel process to address a need for increased use of student support services. Medical students may not recognize defects in their study habits, under-utilize student support services, and frequently disregard faculty recommendations for study and wellness habits until after they fail exams. We designed a parallel process PBL case to increase student awareness of these issues.

METHODS
All first semester students participated in a PBL case involving a failing, sleep-deprived, drug-using "RUSM student" who finally presents at the academic counseling center after failing two exams. The PBL case requires students to conduct an evidence-based review of medical literature as they research how sleep, alcohol, and drugs affect learning; explore the best study habits according to learning theory; and then conclude with self-reflection on academic performance and behaviors. Anonymous surveys were administered to 544 students and 42 facilitators, focusing on the effect of the case on student behaviors.

RESULTS
This current semester's survey results will be combined with those of the next cohort for presentation at the conference. Anecdotally, a number of students reported to their facilitators that the case has effected behavior change in their own study habits, sleep habits, and other mal-adaptive stress management tools such as self-medicating behaviors. Some students repeating the PBL course self-reported to their group their personal success after benefiting from RUSM student support services. Several students self-referred to the academic success program as a result of studying the case.

CONCLUSIONS
Offering students an opportunity to discuss and reflect on a fictional peer in a familiar situation may help them to adjust their behaviors and seek assistance early enough to prevent failure.

STUDENT SUPPORT

MENTORING MEDICAL STUDENTS IN RADIATION ONCOLOGY: POTENTIAL FOR APPLICATION ACROSS DISCIPLINES

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PURPOSE
Mentoring has been espoused as an effective tool for assisting the career and personal development of a mentee while simultaneously benefiting the mentor. To date, the literature has seen great focus on mentoring faculty, research fellows, and residents but relatively little on undergraduate medical students and in only a subset of disciplines (e.g. surgery, internal medicine, and emergency medicine). Radiation oncology has yet to be addressed in this context but would likely benefit from such a discussion. Furthermore, it may well serve as a springboard for discussion on implementing mentorship programs in other disciplines.

METHODS
We reviewed our formal and informal mentoring program in radiation oncology in order to identify successful mentorship paradigms in both the traditional and non-traditional curriculum.

RESULTS
In the traditional curriculum, we identified vertically-integrated radiation oncology mentorship through the undergraduate curriculum including: Introduction to Clinical Medicine (first-year), required Oncology Block (second-year), required Radiology clerkship (third-year), Advanced Clinical Anatomy, Introduction to Radiation Oncology and Clinical Cancer Research (fourth year). In the non-traditional curriculum, we identified several areas that enhance mentorship of medical students including the Medical Student Summer Research Symposium, the Student Oncology Society, one-on-one mentoring relationships through no-credit research, and rotations external to our school such as the Simon Kramer Externship.

CONCLUSIONS
Mentoring students in radiation oncology, mainly through extensions of classroom instruction and research, can allow for exposure to the field that has both breadth and depth. Employing a vertically-integrated curriculum across pre-clinical and clinical years, thereby engaging hopeful family practitioners and radiation oncologists alike, in conjunction with nurturing research interests can help to develop a potent approach to personalized mentoring.

STUDENT SUPPORT
Award Nominee

A PRE-MATRICULATION INTERVENTION TO IMPROVE THE ADJUSTMENT OF STUDENTS TO MEDICAL SCHOOL

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PURPOSE
The transition from a baccalaureate program to a medical curriculum can be a difficult period for many students. Our study asked whether providing students with review materials, and a means of assessing their degree of preparedness prior to matriculation, influenced actual and perceived performance in first year basic science courses.

METHODS
Didactic review materials in four basic science subjects encountered in the first year were made available to pre-matriculants online. Access to materials for each subject was contingent upon completion of a pre-test. Pre-matriculants were free to use the materials as they saw fit. Once students matriculated, performance in basic science subjects was compared between those who had accessed the materials and those who had not. Students who accessed the materials were also surveyed to determine if they perceived any benefit from their use.

RESULTS
Over half of matriculants chose to access the intervention materials. There was no significant difference in MCAT, science GPA, or total GPA between those students who chose to access the intervention materials and those who did not. In terms of perceived value, seventy one percent of respondents found the intervention to be 'helpful' or 'very helpful'. Students also reported gains in confidence in their ability to perform well in medical school. Most interestingly, those students who accessed the intervention materials had significantly better examination performance in basic science subjects than those who did not.

CONCLUSIONS
An online pre-matriculation intervention can provide useful background material to interested students. Access to this material increased academic performance in the first year basic science courses and was perceived as valuable by students.

TBL / PBL

ASSESSMENT OF LEARNING IN TEAM BASED LEARNING (TBL) EDUCATIONAL SESSIONS

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PURPOSE
In 1984, the Association of American Medical Colleges (AAMC) recommended a change in curriculum for medical education. It was not until 1997 that team-based learning (TBL) was developed for business courses, and then incorporated in 2001 for medical schools. Tulane integrated TBL into the medical basic sciences curriculum in 2008 as part of the "Mechanism of Diseases" course. The purpose of this study was to assess the initial progress of students' grades in those block groups with TBL sessions, and to evaluate the Pathology Shelf Exam grades pre- and post-implementation of TBL.

METHODS
For this purpose, we reviewed TBL objectives, individual readiness assessment test (IRAT), and group readiness assessment test (GRAT) questions. We also reviewed exam questions (and grades) covered by TBLs, and compared grades of questions from those exams with grades from pre-TBL year (2007) and mean exam grades from 2007 to 2009 (including NBME performance in specific content areas).

RESULTS
Student performance improved on internal exam questions relating to 3 of the 4 specific content areas covered by TBLs, although the increase was not statistically significant ($p>.05$). There was a significant decline in student performance on internal exam questions relating to the Coagulation content area from pre-TBL to post-TBL ($p<.01$). Overall, mean student performance on the Cardiovascular exam (Heart Failure TBL) improved significantly from pre-TBL to post-TBL ($p<.01$). However, mean student performance on the Neoplasia/Hematology exam (Coagulation TBL) declined significantly from pre-TBL to post TBL ($p<.01$).

CONCLUSION
Given that TBL will become a more integral part of the basic science curriculum moving forward, continued monitoring of student performance is recommended to gauge the impact of TBL on student learning.

TBL / PBL

DIABETES TBL: GENESIS OF A MODIFIED TBL SERIES FOR MEDICAL BIOCHEMISTRY

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PURPOSE
Team-based learning enables students to self-teach themselves and team members, provides concrete active learning, holds students responsible for their education, and shifts students from passive learners to active participants. In our Metabolic Biochemistry course, diabetes was previously taught in five didactic lectures. To convert this material into a TBL format, we had to determine how best to: (1) convert a complex topic like diabetes into a traditional 2-hour TBL format, (2) provide pre-Learning resources of modest length, and (3) cover the full range of material in a single session without diluting the depth at which these concepts were presented.

METHODS
These problems were overcome by modifying the traditional TBL format to include three stand alone IRAT/GRAT sessions, each one-hour session covering material of major topics from three distinct learning objectives. A comprehensive one-hour GAE session followed.

RESULTS
The average team GRAT scores (9.72 out of 10 points) were 18% greater than student IRAT scores (7.93 out of 10 points), suggesting effective team teaching. Team-discussed GAE questions were similarly well answered (4.54 out of 5 points). Students utilizing the modified TBL series increased their exam scores by 2.75 points (a 3.2% increase), as compared to past students learning the same material from traditional lectures. Student evaluations ranged from 3.88 to 4.33 on a five-point Likert scale. Student written comments were similarly very supportive of this active learning series.

CONCLUSIONS
The diabetes TBL series is popular. Student performance is equal to, or better than, performance from previous years taught in traditional lectures. The TBL series provides self- and team-learning. IRAT/GRAT quizzes stimulate team interactions, and deter procrastination. Instructors can convert several theme-based lectures into a modified TBL series without scheduling additional sessions or diluting topic. Finally, breaking pre-Learning reading assignments into three sessions didn't overwhelm students with cognitive overload.

TBL / PBL

SECOND YEAR MEDICAL STUDENTS AS PEER FACILITATORS IN PBL TUTORIALS: A RECIPE FOR SUCCESS?

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PURPOSE
Anecdotal observations indicate that some 2nd year medical PBL groups can maintain effective tutorial environments without facilitatory assistance from their tutors. This study was conducted to determine: (1) if second year PBL groups could benefit from peer-facilitated tutorials (PFPBL) and (2) the impact of participating in PFPBL on the academic performance.

METHODS
The study was conducted during the 4 week Reproduction block. Three PF and three control groups, each consisting of 8 students volunteered to participate. Of the three weekly tutorials, each of the first two was facilitated by a different peer facilitator (PF), the last one by the faculty tutor. Confidential guides, developed to emphasize key concepts of the case and list potential learning issues, were distributed to the PFs via email before the relevant tutorials. PFs were required to pre-read the guides but not to become 'content experts'. At the end of each PF tutorial all participants assessed their experience using five-point Likert scales. All PF and control students completed weekly anonymous quizzes, each consisting of six multiple choice questions emphasizing key concepts of the case. Finally, written examination grades were used to determine the impact of PFPBL on participants' academic performance.

RESULTS
All three PF groups provided very positive assessment of the Group Dynamics, Individual Contributions, Professionalism, Peer Facilitator and Effectiveness of Tutor-less Sessions (4.52, 4.30, 4.55, 4.35, and 4.45 out of 5, respectively). Average quiz scores were statistically similar, both within and between treatments. Participation in PF tutorials had no impact on written examination scores (ANCOVA with the average first year examination scores used as covariate).

CONCLUSIONS
Properly structured PFPBL can provide highly rewarding and stimulating learning environment without jeopardizing participants' academic performance. Offering PFPBL can serve as an effective strategy to renew, often eroded among second year medical students, sense of excitement about PBL process.

TBL / PBL

DOES STUDENT AND FACULTY PBL GROUP ASSIGNMENT AFFECT EXAMINATION PERFORMANCE?

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PURPOSE
Medical student examination performance in an integrated problem-based learning (PBL) curriculum related to group and faculty facilitator assignment has not been well studied. At our university preclinical basic sciences are taught concurrently in 12 modules from 5to 7 weeks long with 9 hours of group sessions per week. Students are numerically graded by a single integrated multiple-choice examination following each module. This study asks: does the group and faculty to which a student is assigned affect examination performance?

METHODS
The neurology (NE), musculoskeletal (MS), cardiovascular (CV), and endocrine (EN) modules of the curriculum from 2006 to 2009 were studied. Class size ranged from 52 to 61 students, with 8 or 9 groups per module, and 5 to 8 students with a single faculty facilitator per group. Both faculty and student group assignments changed for each module. There were 47 individual faculty facilitating 1 to 8 groups each. There were 136 total groups with 65 facilitated by practicing clinicians and 71 by basic scientists. A total of 917 student examination scores were recorded. A one-way analysis of variance (ANOVA) test was performed using the method of Kolmogorov and Smirnov applied to individual student scores by module group and by facilitator, with Tukey-Kramer Multiple Comparison test if $P<0.05$ for the ANOVA.

RESULTS
Only 6 groups (4.4%) with 6 different facilitators in 5 modules (2 NE, 2 MS, 1 EN) had non-Gaussian student examination score distributions, 4 above and 2 below the class average. There were no significant differences in student examination scores between groups facilitated by clinicians or basic scientists or by faculty discipline expertise.

CONCLUSION
Tutorial group and faculty facilitator assignment by clinical or basic science background or discipline expertise had no significant effect upon student examination performance in an integrated basic science PBL curriculum.

TBL / PBL

VIRTUAL PBL WITH ONLINE FACILITATION: TRAINING LEARNERS IN ONLINE COMMUNICATION AND FEEDBACK

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PURPOSE
Student trained in Problem Based Learning (PBL) have been found to perform better during the clinical years and exhibit high enthusiasm. However, PBL is faculty-intense and is dependent on well trained tutors who will not dominate the group. The goal of this study was to enhance live PBL by using a virtual group interaction with a virtual faculty facilitator. Contact between learners and the tutor was online only, allowing the group dynamic to proceed in a virtual environment with faculty coaching. We sought to provide a more open, independent learning setting, more closely simulating the clinical environment.

METHODS
Two second year medical student groups (n = 12) participated as volunteers, sharing a common facilitator. Sequential case handouts were posted to the group via a shared Google document. Students added to the document and used it as a forum for discussion. A deadline was given to the students for completion of each assignment. The facilitator would check the document daily and then post more data or pose additional questions. Students could meet live or virtually as the group wished, and met with the facilitator for post-case wrap up. Peer feedback was provided anonymously after the case.

RESULTS
Compared to traditional "live" PBL, students reported more time spent on the case, higher quality group interaction, and a lower frequency of quiet students' being non-participatory. Stress, learning, and enjoyment were not different. Narratives described reticent members becoming more participatory and broader participation than in normal PBL. Students felt that peer feedback was more accurate, specific, and more likely to induce behavioral change than previously received PBL faculty feedback. Conclusion Virtual PBL succeeded in facilitating online group learning with fewer faculty. There was better group interaction. Some students who were reticent in normal PBL were more participatory. Peer feedback was felt to be superior to that of faculty. Virtual PBL is promising in situations with limited faculty and for training students in virtual communication strategies.

TBL / PBL
Award Winner

CONCEPT MAPPING AS A TEAM-BASED LEARNING APPLICATION EXERCISE IN A FIRST YEAR MEDICAL BIOCHEMISTRY COURSE

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PURPOSE
To evaluate the effect of concept mapping in a team-based learning model on first-year medical student performance and perception of learning.

METHODS
The Biochemistry and Molecular Biology course is delivered using a modified team-based learning method. Briefly, the course consists of a Readiness Assurance Process (RAP) for each module and case-based team application exercises emphasizing the integration of concepts covered in the RAP. For each case, teams answer multiple-choice questions (MCQ) and report the answers simultaneously in the large group. This year (2009-10), teams also generated a concept map as part of the case application exercise to illustrate the connections between basic science concepts and pertinent clinical details of the cases (e.g. symptoms, lab values). Teams exchanged concept maps and provided written feedback using a grading rubric. Following the exchange, teams had an opportunity to revise the maps and use them to answer the team MCQs for the case. At the end of the session, maps were graded by the course faculty using the same rubric. To assess the effect of concept mapping on student performance, we compared results on 72 MCQs that appeared on both 2008-09 and 2009-10 exams. Student satisfaction and engagement was assessed from course evaluation surveys from 2008-09 and 2009-10.

RESULTS
The average percentage of students answering correctly on the MCQs increased from 65.23% + 2.3 (2008-09) to 72.70 + 2.08 (2009-10;concept mapping) ($p<0.001$). This result correlated with an increase in time spent preparing for class ($p<0.001$), perceived gain of factual knowledge ($p<0.001$) and reported connection of basic biochemistry to medicine ($p<0.01$). There is no difference between the average GPA and average MCAT scores for the two classes.

CONCLUSIONS
The addition of case-based concept mapping to the application exercise of a team-based learning model improves performance of first year medical students on MCQs, increases engagement and motivates students to spend more time preparing for class.

TBL / PBL

IMPROVEMENT OF PROBLEM-BASED LEARNING BY IMPLEMENTING CASE-BASED REASONING INTO STUDENT PRESENTATION

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PURPOSE
Of various teaching strategies, problem-based learning (PBL) is best seen as one of a number of moves towards making learning more student-centered. When PBL was implemented in the course of Pathophysiology, the course became the least important one. Two major problems appeared in our school, including ineffective learning in self-directed study. To improve the effectiveness of self-directed learning, our approach was to ask students submit a newly synthesized reasoning schema through a Web-based iTEACH system and integrate case-based reasoning into student presentation. Therefore, the purpose of this study was to explore if case-based reasoning improved the effectiveness of PBL in Pathophysiology.

METHODS
From 2006 to 2009, an annual evaluation of student perception of "overall satisfaction on PBL Pathophysiology was conducted by the Center for Education at the National Cheng Kung University Hospital. In 2009, a student survey of PBL Pathophysiology was conducted by the course coordinator.

RESULTS
The annual survey showed that student perception of "self-evaluated attention in Medical Physiology" was significantly greater in 2009 than that in the year before. Of six courses taken in the same semester, PBL Pathophysiology was the third course on the top.

CONCLUSION
Integration of case-based reasoning into PBL provides an alternative tool to improve the effectiveness of self-directed study on the basis of Web-based teaching system.

TECHNOLOGY

A MODEL TO INTEGRATE PATHOLOGY TEACHING USING TECHNOLOGY

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PURPOSE
To develop a model for integration in teaching pathology in the third year courses of medical school using technology. Traditionally in Kenya the first two years of medical school are considered basic, anatomy, physiology and biochemistry, introduction to immunology and pharmacology while the third year has been for teaching the abnormal, pathology. The teaching of pathology historically has been done by the departments of pathology, immunology, haematology, microbiology, histopathology and biochemistry. Major deficiencies have been noted in that students are not able to integrate the teaching from all these departments. To address this problem we developed a model to integrate the various aspects of the different departments by providing additional cases and materials in the thin client computer laboratory. All the information is on the central server which provides it to the sixty terminals. This controls what material students can access, prevents students from surfing the web, and requires maintenance of only the server rather than sixty separate computers.

METHODS
Eight week course of general pathology has been chosen for this model. This is based on the fact that this is the first course in pathology and has available teaching materials in the computer server. The faculty member who teaches the course is the course director. Three practical sessions are usually given to each of the following departments: histopathology, microbiology, haematology, immunology and clinical chemistry. Additional information was made available to students in the new thin client computer laboratory funded by Prof. Smith. A questionnaire to evaluate student opinions of the new format was administered at the end of the course to all the students. It targeted three areas: computer technology as a teaching tool, quality of materials and relevance.

RESULTS
Feed back of students was analysed. A second analysis will compare the continuous assessment tests (CATs), also known as end of term one exams (ETE 1) results performance with those of the same time last year.

CONCLUSIONS
The results will be used to develop a model to integrate teaching of pathology using computer technology. This will later be extended to include basic courses; anatomy, biochemistry, immunology and physiology.

TECHNOLOGY
Award Nominee

INTEGRATION OF ONLINE LEARNING SYSTEM RESOURCES IN A PROBLEM BASED ANATOMY COURSE

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PURPOSE
In Drexel University College of Medicine's Problem Based Learning (PBL) curriculum, anatomy (including embryology, gross anatomy and microanatomy) is taught within the framework of 15 clinical case scenarios and includes both lab and lecture based resource sessions. Last year, we supplemented the course with an online resource developed within the Blackboard Vista (Bbvista) learning system. The resource provides students with self-study learning modules, microanatomy laboratory assignments (including virtual slides), practice assessments, and supplementary lecture material, all organized within their case-based framework. Relevant materials become available to students as new cases begin and self-assessments automatically activate at the end of each case.

METHODS
Data on student (N=68) usage and self-assessments were collected automatically within Bbvista. Correlation coefficients and t-tests were used to test for relationships between various measures of Bbvista usage and performance on practical and multiple-choice exams.

RESULTS
Average time spent on Bbvista was 36 hrs 31 minutes (+/- .67) per student. Students who opted not to take online assessments performed significantly lower on both practical and multiple-choice examinations, as did those who, on average, failed the online assessments. Students who spent the least amount of time on Bbvista overall performed significantly lower on practical exams.

CONCLUSIONS
The use of an online learning system provides flexible access to resources for students in a PBL curriculum. Students can choose which resources to utilize and when. In-class laboratory time, particularly in microanatomy, is used more effectively, serving as a time to review and discuss. Amount of time spent on Bbvista, and usage of the self-assessments both correlated positively with student performance. The predictive value of the self-assessments could be a useful tool for identifying at risk students early in the term.

TECHNOLOGY – E-Demo

ENHANCEMENT OF ONLINE LIVE PRESENTATIONS WITH VISUAL ANNOTATIONS USING A TABLE MONITOR

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PURPOSE
From 2006-2009, Pathology teaching at the Indiana University School of Medicine – Evansville was conducted by a course director resident 200 miles away in Lafayette, IN. Both second year Pathology courses in Evansville and Lafayette were taught concurrently with the Evansville students having access to lectures recorded in Lafayette, as well as live online conferences and infrequent visits by the instructor. During web conferences, the instructor narrated Powerpoint presentations using a microphone and mounted webcam. However, students suggested that the live Powerpoint presentations were more difficult to follow and less effective than the recorded lectures because the instructor was able to annotate slides during lectures in the classroom, but not in the web conferencing environment.

METHODS
Using an Educational Research Grant awarded by the Indiana University School of Medicine, a tablet monitor was purchased to annotate Powerpoint presentations during the live web conferences. Students we asked to complete a survey and to evaluate the use of the tablet monitor during presentations.

RESULTS
Five of fifteen students completed the survey on the use of online resources for the course. All five report that the use of the annotations during in the online presentations was "Very Helpful". However, when asked how helpful it would be to have access to the already annotated Powerpoint presentations for study, four students said that they would be "Somewhat helpful" and one student said "Not Very Helpful".

CONCLUSIONS
Presentations using electronic annotations of the slides enhanced the ability of the students to focus both during live and recorded presentations, particularly when images were being described. The utility of these annotations included 1) visual stimulation to see something moving on the screen as the slide was being presented and 2) see how the instructor organized, prioritized, and emphasized information on the slide. Having slides that were already annotated were less useful to the students as compared to realtime visual changes to the slides.

TECHNOLOGY – E-Demo

ENLIVEN LECTURES BY ADDING COMMENTARY TO VIDEOS FROM TV MEDICAL DRAMAS

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PURPOSE
The students in medical school today expect the quality of the lectures to be more innovative than just PowerPoint slides or chalk talks. One way to enliven the presentations is to incorporate video from popular TV medical shows to illustrate important points in the lesson. This method was used in a second year medical student course "Essentials of Endocrinology and Reproduction" and the students were surveyed on the effectiveness.

METHODS
Commercial TV shows were captured using a Direct Video Recorder and transferred to a computer where the relevant scenes were edited for presentation. The instructor comments regarding the TV scenes were incorporated into the video using green screen technology and the video editing program Premiere Elements (Adobe Systems Inc.). The video was then integrated into the PowerPoint lecture. At the end of the course the students were asked to rate the following question using a Likert scale (strongly agree to strongly disagree): "I found the videos to be interesting and useful in understanding the ER principles".

RESULTS
The student survey showed that 58% agreed or strongly agreed with the survey question while only 4.5% strongly disagreed or disagreed. In the survey we received student comments such as the following: (1)Videos in lecture are always good at cementing information into our heads. (2)Videos during lecture keep students awake. (3)Any different method of presenting the material helps me to think of it from a different angle. (4)In answer to "what I liked about the course" the response was: The videos from Dr. Smith's lectures. The one complaint from the students was that the videos were not captured by the lecture recording system (Tegrity Inc.).

CONCLUSIONS
The incorporation of short videos from commercial medical TV dramas can be used to illustrate important points during lectures. These enhancements to the usual PowerPoint lectures will hold the student's interest.

TECHNOLOGY – E-Demo Award Nominee

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PURPOSE
Biology has traditionally been taught using static flowchart images. The advent of computer animations provides a means to help students visualize the dynamic processes. A series of FlashTM animations has been composed to present molecular and cellular biology. The efficacy of these animations has been verified by favourable student evaluations and research data (Thatcher, 2006, JAOA, 106, 9-14). The animations are now being developed into an instructional program to be used as a supplemental resource for collegiate level courses.

METHODS
The program opens to a central menu allowing users to choose which animated lesson they wish to open. Each lesson opens to a topic menu allowing users to jump to any point in the lesson they wish. They can also click anywhere on the screen to progress through the lesson step by step. The lesson formats are stop action. Where appropriate, lists, tables and bit map images are incorporated. Explanatory text and narration are provided to explain concepts. Both the explanatory text and narration can be toggled on and off to serve the needs of individual users. Interactive quizzing is provided by pop up questions and by a question bank at the end of each lesson. Modular excerpts of the lessons that can be downloaded into PowerPoint slide shows will be provided with the instructional program.

RESULTS
This instructional program exploits the advantages of computerized instruction by allowing users to visualize complex, dynamic processes without overwhelming them with in depth details that are best presented by traditional textbooks.

CONCLUSIONS
The program serves as a valuable supplemental resource for collegiate level molecular and cell biology courses. It provides visual aids for lectures, and it can be employed for self-study.

TECHNOLOGY – E-Demo

DEVELOPMENT OF AN ELECTRONIC MEDICAL RECORD FOR DOCUMENTATION OF AN INTERPROFESSIONAL TEAM ACTIVITY

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PURPOSE
Create a stand-alone electronic medical record (EMR) for documentation of a required interprofessional educational (IPE) activity. In this activity each team of four students was required to document the history, physical, past medical history (HPI), as well as form an assessment and patient care plan for a standardized patient (SP). The EMR yields a MS Word® document that could be easily distributed, read, reviewed and graded by the faculty involved in this project.

METHODS
The EMR was programmed with MS Visual Basic® software. The program resembles a standard medical record. The EMR software has free text boxes for students to type patient information with limited drop down boxes to facilitate the writing process. Once finished, the student can save, e-mail or print their record.

RESULTS
All year two medical (M2) and year three pharmacy (P3) students participated in a mandatory interprofessional experience (IPE). Sixty, four person teams, two M2s with two P3s, collaboratively interviewed an SP. Then they had 1 hr to research any additional info needed & complete their EMR. Students found the EMR easy to use, while prompting them to include all pertinent data. The faculty were able to review and evaluate the EMR in concert with the SP assessment of the HPI and team dynamics with the video of the SP interview.

CONCLUSIONS
The EMR provided a consistent format that was easily distributed. This was imperative to adequately assess the 60 team reports in conjunction with other team data. Continued use of the EMR will facilitate the development of the students' interviewing and written communication skills by prompting a complete review of systems with free text fields for HPI, assessment and plan.

TECHNOLOGY – E-Demo

CT BASED 3-DIMENSIONAL IMAGING, A NEW TOOL FOR INSTRUCTION IN ANATOMY AND READING OF CROSS SECTIONAL IMAGES

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PURPOSE
This e-presentation will introduce a new tool for three-dimensional imaging, which can be used for instruction in anatomy, the anatomy of the biology of disease and radiology, and demonstrate its functionality.

METHODS
A radiation therapy treatment planning system (Eclipse, Varian Corp., Palo Alto, California) provides a powerful tool for three-dimensional imaging, which can be used for instruction in anatomy, the anatomy of disease and radiology. It is based on CT anatomy, and requires that structures be contoured (drawn) on sequential individual CT slices. Based on this contouring, structures can be visualized from any angle, either on digitally reconstructed radiographs (in 2D) or in 3 dimensions, with or without a translucent body surface. CT image sets obtained, and in some cases, associated PET scans &/or MRI scans, were de-identified, and then structures drawn by attending physicians, resident physicians, medical students, undergraduates and even a high school senior. The fusion tool allows structures to be contoured on MRI and PET image sets as well as CT.

RESULTS
Students report that this tool is the most effective way of learning to read CT scans they have found, and comparison of their drawings. The process of drawing teaches anatomy, & then image sets are available for interactive instruction and testing of mastery. The system is simple enough that a reasonably computer literate student or physician can learn to draw structures with less than an hour of orientation and training, with the use of a cross sectional anatomy book and occasional supervision from an experienced physician. While a library of three-dimensional images is being generated for ongoing use in instruction of anatomy of disease, learning is greatest when students draw themselves.

CONCLUSIONS
A modern radiation therapy treatment planning system provides a tremendously powerful instructional tool for lectures in anatomy, biology of disease, and diagnostic radiology, for testing of knowledge in these subjects, and for self instruction, particularly in the advanced imaging technologies.

ANNOUNCEMENTS

Learning Communities Institute Annual Conference
November 6, 2010, at the Johns Hopkins University School of Medicine. Activities will include innovative presentations and discussion by member learning communities, networking, research collaboration, student leadership, and mentoring for new medical school learning communities. We invite proposals for presentations in the *Learning Community Innovations* section of the conference (Deadline for proposals - October 8, 2010). Program agenda, registration and innovations presentation proposal forms and bus transportation reservation from Washington, DC are now available at www.hopkinsmedicine.org/som/colleges/LearningCommunities2010/LCIRegistration.html

The 2010 Generalists in Medical Education Conference: Promoting Engaged Learning and Scholarship across the Medical Education Continuum
The Generalists in Medical Education welcome basic scientists, clinicians, and other educators interested in medical education. We are educators who teach, conduct research, and provide support services in all areas of predoctoral, postdoctoral and continuing medical education. At each annual conference, we exchange ideas and knowledge to enhance our professional growth. Each conference offers opportunities to develop understandings of the latest initiatives and innovations in medical education and to explore solutions to educational problems. The meeting is on November 5-6, 2010 at the Hotel Palomar in Washington, DC. See: www.thegeneralists.org/

10th Annual Team-Based Learning Collaborative Conference
We invite you to the 10th Annual Conference on Team-Based Learning in Higher Education. The Annual Meeting presentations take the form of plenary presentations, workshops, oral presentations, and posters. Submission deadline for Poster Abstracts is December 15, 2010. This year's meeting will be March 3-4, 2011 in Las Vegas, Nevada. See www.TBLCMeeting.org

LIMSC 2011
The Leiden International Medical Student Conference (LIMSC) is one of the largest student conferences in Europe. LIMSC provides talented medical and biomedical students worldwide with the opportunity to present their research to an international audience. LIMSC aims to let students experience and be exposed to high-level research and have the possibility to interact and learn from the current leading figures in the academic world. Furthermore an extensive Career & Internship Fair will provide possibilities for international internships and career perspectives. The seventh edition of LIMSC will take place in Leiden, the Netherlands March 16th-20th 2011. Abstracts can be submitted until November 12th, 2010. See www.limsc.nl

2011 Annual Meeting of IAMSE
Amidst the orange groves in this wonderful tropical state of Florida, the meeting will be hosted by the University of South Florida, College of Medicine, and is a great opportunity to network with colleagues and find new friendships and collaborations. The program will include keynote lectures on Professionalism, Competency and Simulation, several focus sessions, workshops and poster presentations. The call for abstracts will be open in January 2011. Please watch our website www.iamseconference.org for more details or send an email to julie@iamse.org with the subject line "St Pete 2011 mailing list" and we will update you on this meeting!

AMEE 2011
The AMEE Conference is now established as the leading international conference in medical education attracting healthcare professional from around the world. The next meeting will take place in Vienna, Austria, Reed Messe Wien, August 27-31, 2011. More information can be found on www.amee.org .

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