

Medical Science Educator

The Journal of the International
Association of Medical Science Educators

In this issue:

Transformational Leadership and Healthcare

The Use of Horizontal Basic Science Proficiencies

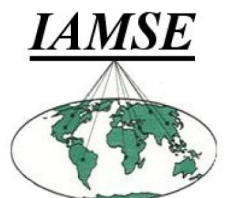
Benefits of Traditional Cadaveric Dissection in a Digital World

Faculty and Student Perceptions of Readiness for Clinical Clerkships

Impact of Introducing a Diagnostic Scheme to Medical Students

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most current information to succeed in their
task by publishing scholarly activities, opinions,
and resources in medical science education.
Published articles focus on teaching the
sciences fundamental to modern medicine and
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Letter from the Editor-in-Chief

Peter G.M. de Jong

Leiden University Medical Center, Leiden, The Netherlands

Welcome to the 23(1) issue of *Medical Science Educator*. In this issue we present to you eight interesting pieces of work and some meeting reports, again ranging from basic science education to clinical teaching. I am very happy that educators from the entire continuum are finding our journal as a window to display their scholarly experiences. The Meeting Reports give you as a reader the chance to learn from recent meetings you may not have been able to attend. One of the meetings reported on is the annual The Generalists in Medical Education conference. I had the opportunity to attend this meeting to promote the journal and to participate in a workshop on online publishing. I experienced a great deal of enthusiasm and passion for medical science education, and I am convinced that we will publish some of the work presented at this meeting in our journal later in the year.

In December of 2012 Associate Editor Jay Menna announced his resignation from the Editorial Board. Due to health issues he is not able to continue his work for the journal. Dr. Menna has served the board for one year, and in that time he did contribute to the work and direction of *Medical Science Educator*. We want to thank Dr. Menna for dedicating his valuable time to IAMSE, and we wish him all the best.

I am happy to announce that Darshana Shah (USA) will join the Editorial Board. Dr. Shah is the Associate Dean of Faculty Affairs & Professional Development, and Professor and Chief of the Pathology Academic Section at Marshall University Joan C. Edwards School of Medicine in Huntington, WV (USA). She has been involved in IAMSE for several years, and has recently been elected President of GRIPE, the Group for Research in Pathology Education. We look forward to working with her.

The next issue of *Medical Science Educator* will be a journal supplement entirely dedicated to Basic Science Research Projects for medical students. We solicited submissions for this special issue and we received a very high response to our request. A selection of these submissions will be published as well as the 50 best abstracts from the 8th LIMSC International Conference on Student Research to be held in the Netherlands in March.

I truly hope that you as a regular reader will continue to support the journal, either through membership in IAMSE or by an individual subscription. But above all, that you and your colleagues will continue publishing your own scholarly work in our journal for the benefit of all our readers. Enjoy this issue of *Medical Science Educator*!

Peter G.M. de Jong, PhD
Editor-in-Chief

The Use of Horizontal Basic Science Proficiencies in a Systems Based Curriculum

Stanley J. Nazian & Frazier T. Stevenson

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Abstract

Many discipline based faculty resist the transition to system or organ based curricula. They are frequently concerned that students trained in such curricula will not acquire discipline based knowledge or skills. We briefly describe one response: a discipline based series of "proficiencies" that run horizontally through our system-based courses.

Integration of basic science content has been a common theme of curricular reform for many years. Generally, the result is a curricular structure that is organized around organ systems or clinical presentations.¹⁻³ A typical model of such a structure in the pre-clerkship years contains a series of courses in which, for example, the anatomy, physiology, pathology, immunology, pharmacology and biochemistry of a particular organ system are examined, but only as they pertain to the system under consideration. Such a model may also include a module that discusses the core principles of the individual disciplines, typically in fairly theoretical terms.

Many basic science faculty, particularly those who were themselves trained in a non-integrated system, resist the transition from a grouping of discipline based courses to a model that just considers one organ system in isolation. The rationale for this resistance can be based on a number of factors.^{4,5} Two recurring themes are the loss of control of the educational process by discipline based departments and a fear that students will neglect one or more of the disciplines in favor of the one whose presence in a given course is greatest. Thus a physiologist might feel that during the course that emphasizes the musculoskeletal system, students will concentrate on the gross anatomy of the muscles and not the underlying mechanisms by which muscles contract. Such a student might perform well in the course on the musculoskeletal

system, but have significant difficulty in understanding the concepts of cardiac preload and afterload in later courses. Conversely a student might thoroughly understand the factors affecting heart rate, cardiac output and blood pressure, but be uncertain about the precise locations of the coronary arteries.

The pre-clerkship curriculum at the University of South Florida has evolved gradually. In the 1980's it was a classical, discipline based curriculum where each department ran a separate course more or less independently of the others. It slowly transitioned through a period of gradually increasing cooperation and coordination. An interdisciplinary course in Neuroscience was established as early as 1995. Attempts to merge other, more disparate disciplines, into a single course were initially unsuccessful. Faculty who resisted the merger typically used the arguments outlined above. Due in part to the innovation described below, the curriculum has now evolved into an integrated organ-based system (Figure 1).

Curricula that focus on insuring that medical students reach some pre-specified level of competency have been proposed and implemented at a number of institutions.^{6,7} Most of these models have concentrated on multiyear, terminal program competencies (i.e. what a student will have achieved by the time of graduation). In part to address the concerns of discipline based faculty, we incorporated a series of discipline-based one year proficiencies into our organ system curriculum. Students were assessed on both their performance in the integrated courses and on their proficiency within a discipline.

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The first year curriculum for the academic year 2010/2011 consisted of 4 separately graded 8-9 week courses covering the sciences basic to medicine. All included some elements of Anatomy, Behavioral Medicine, Biochemistry, Cell Biology, Genetics, Molecular Biology, Neuroscience and Physiology. Two year-long courses titled Doctoring 1 and Evidence Based Clinical Reasoning covered the

elementary aspects of the skills needed for clinical practice. Running across the entire year, spanning the individual courses, were the Basic Science Proficiencies: Molecular, Structural, Neurobehavioral and Functional (Figure 1).

Academic Year 2010/2011			
			Doctoring I
		Evidence Based Clinical Reasoning I	
Core Principles and Musculoskeletal System	Communications: Neurologic and Endocrine Systems	Cardiovascular and Pulmonary Systems	Renal, Gastrointestinal and Reproductive Systems
<i>Molecular Proficiency</i>			
<i>Functional Proficiency</i>			
<i>Neurobehavioral Proficiency</i>			
<i>Structural Proficiency</i>			

Figure 1: Map of the first year's curriculum for academic year 2010/2011. The indicated Proficiencies were evaluated at the end of each course. Students in academic difficulty were counseled by the appropriate Proficiency Director in ways to improve performance within the Proficiency.

Multiple choice questions for tests within the basic science courses were developed by individual faculty and reviewed and edited at "question vetting" sessions. When a question was approved, it was also assigned to one or more of the proficiencies. Student performance within a proficiency was tracked cumulatively across the year. Four senior faculty with expertise in the appropriate area were assigned as Proficiency Directors. They were charged with monitoring performance and reporting to the students after each individual course. To advance to the second year students were required to pass all courses and demonstrate proficiency in these areas. Assigning a given question to multiple proficiencies had several

salutary effects. It emphasized to both the students and the faculty the integrative nature of the program while at the same time reassuring faculty that valuable knowledge and skills were not being neglected.

The medical faculty determined that proficiency in a particular area would be determined by an overall score of 70%, i.e. a student would have to correctly answer at least 70% of all the questions assigned to that proficiency. This aligned with the historic 70% pass line used for several years to determine course pass lines. The first year students in our Doctor of Physical Therapy program also take the identical courses as the first year medical students. However,

the Physical Therapy faculty determined that for their program, somewhat different standards for proficiency should apply. Their criteria to demonstrate proficiency was 75% in the Structural Proficiency, 65% in the Molecular Proficiency and 70% in both the Functional and Neurobehavioral

Proficiencies. The ability to assign different thresholds for proficiency depending on the objectives of the student's program added a significant degree of flexibility to the implementation of this system and to its acceptance by the faculty.

Proficiency	Course			
	Core Principles & Musculoskeletal System	Communications Neurologic & Endocrine Systems	Cardiovascular & Pulmonary Systems	Renal, Gastrointestinal & Reproductive Systems
Structural	0.85	0.77	0.79	0.79
Functional	0.79	0.78	0.90	0.90
Molecular	0.89	0.79	0.79	0.88
Neurobehavioral	0.81	0.86	0.76	0.75

Table 1: Correlation Coefficients between Course Scores and Proficiency Scores (n=153)

Students who failed to achieve these standards were allowed to demonstrate their proficiency in a particular discipline during the summer following the first year. Assessments to demonstrate discipline proficiency were recommended by the Proficiency Director and approved by the appropriate student promotions committee. They were highly individualized and focused on those areas within a proficiency where the student was weakest.

All students who failed at least one of the integrated courses also failed to demonstrate proficiency in at least one domain. More than 98% of the students who passed all four didactic courses also demonstrated proficiency in all areas.

Faculty support of the integrated curriculum, initially mixed, became more accepting as it was seen that overall performance in the individual courses (as determined by final course score) correlated well with Proficiencies (Table 1).

This use of discipline based proficiencies within an interdisciplinary curriculum permitted the development of true integration without students' de-emphasizing key curricular themes. Assigning questions to multiple proficiencies emphasized to students and faculty alike the interdisciplinary nature of the curriculum. The relative congruence between performance in the individual courses and demonstration of discipline proficiency suggests that discipline based knowledge and skills were adequately demonstrated by the individual student

and reassured discipline-based faculty that core knowledge was not lost.

Keywords

Basic science, discipline based proficiencies

Notes on Contributors

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Medical Students in Early Clinical Training and Achievement Motivation: Variations According to Gender, Enrollment Status, and Age

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Abstract

The purpose of this study was to examine the achievement motivation perceptions of medical students in early clinical training, to find out if variations in such perceptions may relate to students' gender, age, ethnicity, or enrolment status (domestic or international). The participants were 272 4th and 5th year medical students who voluntarily completed the short version of the Motivated Strategies for Learning Questionnaire. The students' scores in self-efficacy, intrinsic value, test anxiety, cognitive strategy use, and self-regulation, derived from the questionnaire, were analyzed in relation to the students' gender, ethnicity, and enrolment status, along with their age as a possible covariate. Female students evidenced lower self-efficacy and higher test anxiety compared to their male counterparts. Likewise, international students were found to have lower self-efficacy and higher test anxiety compared to domestic students; the international students also scored lower in intrinsic value perception. Age was found to significantly correlate with self-efficacy, test anxiety, and intrinsic value perception. The findings suggest a need to use strategies like role-modeling to counteract the possible detrimental effects of negative gender stereotyping on female students' self-efficacy – especially female students from non-Western cultural backgrounds. The higher levels of test anxiety evidenced by some groups may be understandable in the context of clinical training, but nevertheless indicate a need for the formulation and provision of appropriate forms of skills training and support for students – including communication skills training and support for international students.

Introduction

Few topics in the area of higher education have attracted more attention, research, and theoretical speculation than motivation to learn.^{1,2} In medicine, there is a burgeoning literature in the area of motivation, particularly of studies that examine its importance in various aspects of medical education and training.³⁻⁸ However, there is dearth of literature where investigations into specific characteristics of medical student cohorts and their motivational perceptions are concerned. This is surprising given the diversity – in terms of factors like gender, age, ethnicity, and enrolment status (domestic versus international) – that usually characterize medical student groups.^{9,10}

Issues surrounding gender difference among medical students has to some extent been researched.¹¹ Studies have found, for example, that men studying medicine experience higher levels of loneliness, while women tend to be more anxious about tests and life in general, possess lower levels of self-esteem, and tend to be less confident.¹²⁻¹⁴ Some studies have also reported that female medical students use deeper learning approaches, and are therefore more likely to be intrinsically motivated.¹⁵⁻¹⁷ In addition, Sobral found some motivational differences through the use of an academic motivation scale.⁵ More specifically, female medical students were found to be further committed to completing tasks that they value compared to their male counterparts who, in turn, were more motivated by external regulators and were more prone to amotivation (i.e., failure to

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perceive contingencies between one's own actions and resulting outcomes).

In other studies, some indications have been found that students at different ages possess different motivational constructs.¹¹ Pintrich and Zusho suggested that there are likely to be developmental changes over the lifespan that affect motivation and the use of regulatory strategies for study. Vaez and Laflamme also proposed an interesting gender and age interaction effect, suggesting on the basis of their findings that young male students may be more at risk of attrition compared to older female students.¹⁸ In addition, Lepper and colleagues observed a decrease in intrinsic motivation with age, which may be attributable at least in part to increases in age-related social pressures.¹⁹ The present authors, however, found no research studies within the field of medical education that convincingly linked age and motivational variations.

In general, there are few studies that have examined motivational differences across ethnic groups, particularly at the tertiary level.¹¹ Examples of findings from the literature that have been reported include generally higher levels of academic motivation among students of Asian immigrant heritage in the US, lower levels of academic motivation coupled with higher levels of amotivation among Japanese domestic students compared to those studying overseas, and greater academic motivation arising from family obligation attitudes among students from immigrant as compared to US-born families.²⁰⁻²² Despite the fact that ethnicity-based academic attainment differences have been reported among medical students, the question of how students according to ethnic group categories may differ in academic motivation has not been investigated.^{23,24} Such an investigation seems warranted especially given that demographic statistics pertaining to medical students in New Zealand and overseas have evidenced wide diversity in ethnic affiliation.²⁴⁻²⁶

Finally, there is growing research interest in the area of enrolment status, and more specifically in comparisons between domestic and international students, partly because of the growing industry associated with global education.²⁷ Some important findings have already been reported. For example, in quality of life studies, Sawir, Marginson, Deumert, Nyland and Ramia found that international students reported more experiences of loneliness and depression compared to their domestic peers.²⁸ In addition, in a paper that focused on Asian students studying medicine within New Zealand, Henning and colleagues reported that

Asian international students were more test anxious than their domestic peers and that this anxiety may be moderated by environmental concerns related to transportation, accommodation, and finance.⁷ However, many possible areas of difference between international and domestic students – particularly those studying medicine – have remained unexplored, including differences that may exist in their motivational characteristics and perceptions.

The specific aim of the present study was to examine through the use of a survey the motivational perceptions of a specific cohort of medical students, and whether any variations in such perceptions may relate to the students' gender, age, ethnicity, or enrolment status. The specific cohort chosen were 4th and 5th year students, early in their clinical training and this group was of particular interest as they would have already completed their regular academic courses, and would have been in the process of developing clinical skills for use in hospital environs. Findings from the present study could potentially contribute to a better understanding of this particular cohort of medical students, and how medical educators and administrators may be able to facilitate more successful and satisfying outcomes.

Methods

Participants

Fourth and 5th year medical students (early in their clinical training) in one university in New Zealand were invited to complete a questionnaire survey (described in the next subsection). At this New Zealand university, the first three years of training are focused on science for medicine and following this students in years 4 and 5 complete clinical attachments in general and specialty medicine, geriatrics, anesthesiology, general and specialty surgery, general practice, obstetrics and gynecology, pediatrics and the emergency medicine. A total of 272 students (80% response rate) voluntarily participated. This total comprised of 150 female and 122 male students, with an average age of 22.74 years (SD = 2.75 years). The students indicated their ethnic group affiliation in terms of, 99 European, 28 Maori and/or Pacific Island, 97 Asian, and 47 in the "Other" category. Enrolment status pertained to a distinction between "international" (i.e., those who were non-New Zealand residents, holding an international student visa or equivalent) and "domestic" students (i.e., those who were New Zealand residents). Forty nine of the students were international, and 223 were domestic. Some students failed to respond to some items in the

questionnaire and were consequently omitted from the multivariate analyses.

Materials and Procedure

The students were requested to fill in the shortened version of the Motivated Strategies for Learning Questionnaire (MSLQ) at the end of one of their formal class lectures. This version of the MSLQ has 44 items and five sub-scales, namely self-efficacy, intrinsic value, test anxiety, cognitive strategy use, and self-regulation.²⁹ Each item within the scales requires response on a Likert-type scale, and high scores for each scale represent higher levels of motivation or self-regulation with the exception of test anxiety, where high scores indicate increased anxiety. Ethics approval for the collection and use of data in this study was obtained from the institution’s human participants ethics committee.

Data Analyses

Multivariate analysis of covariance procedures were conducted with gender, ethnicity, and enrolment status as independent variables, the MSLQ scores as the dependent variables, and age as a potential covariate.³⁰ Ethnicity and enrolment status were considered and analyzed separately given that international students included only “Asian” and “Other” categories. Year of study (4th year; 5th year) was not included in the analyses as it did not significantly contribute to the model.

Results

Gender and Ethnicity

Using Wilks’ Lambda as the multivariate test statistic, the multivariate analysis results showed a significant main effect for gender ($F(5, 254) = 4.74, p < .01$) and a significant effect for the covariate age ($F(5, 254) = 3.57, p < .01$), but no ethnicity effect or interaction was found.

The results of the between-subjects analyses (shown in Table 1) revealed significant effects for gender in terms self-efficacy and test anxiety. In addition, age generated a significant effect for self-efficacy and test anxiety. An incidental finding was noted for the interaction between gender and ethnicity in terms of self-efficacy. A subsequent visual inspection of self-efficacy scores according to gender and ethnic affiliation revealed that European female students rated their self-efficacy higher than their male peers. However, in all the other ethnic groups (i.e., Maori-Pacific, Asian, and Other), male students’ ratings of self-efficacy were higher than those of their female counterparts.

An inspection of the means (Table 2) shows that female students rated self-efficacy items lower than male students. In contrast, female students’ ratings were higher for test anxiety than the ratings of their male counterparts. To investigate the age effects further, the correlation between age and test anxiety was found to be significant ($r = .15, p < .05$), while the correlation between age and self-efficacy was not significant ($r = -.09, n.s.$). We concede that the first correlation is statistically significant but weak, and hence caution is required in terms of interpretation.

Variables	Dependent Variable	MS	F	df ₁	df ₂
Covariate (age)	Self-efficacy	1.63	4.82*	1	258
	Intrinsic value	.71	3.08	1	258
	Test anxiety	5.45	7.44**	1	258
	Cognitive strategy use	.27	1.32	1	258
	Self-regulation	.02	.08	1	258
Gender	Self-efficacy	4.87	14.42**	1	258
	Intrinsic value	.51	2.22	1	258
	Test anxiety	7.51	10.25**	1	258
	Cognitive strategy use	.17	.82	1	258
	Self-regulation	.06	.26	3	258
Ethnicity	Self-efficacy	.61	1.80	3	258
	Intrinsic value	.20	.88	3	258
	Test anxiety	1.66	2.26	3	258
	Cognitive strategy use	.20	.98	3	258
	Self-regulation	.04	.17	3	258
Gender* Ethnicity	Self-efficacy	1.34	3.68**	3	258
	Intrinsic value	.10	.45	3	258
	Test anxiety	.71	.971	3	258
	Cognitive strategy use	.07	.34	3	258
	Self-regulation	.13	.59	3	258

Note: * $p < .05$, ** $p < .01$

Table 1: Tests of between-subjects effects for gender and ethnicity over the five MSLQ scale measures with age as a covariate

Gender and Enrollment Status

Using Wilks' Lambda as the multivariate test statistic, the multivariate analysis results revealed significant main effects for gender ($F(5, 259) = 3.19, p < .01$) and enrolment status ($F(5, 259) = 4.52, p < .01$), and a significant effect for age as a covariate ($F(5, 259) = 2.95, p < .05$). No interaction effect was found. The international student cohort was made up of students who self-identified either as "Asian" ($n = 40$) or "Other" ($n = 9$); a subsequent MANOVA revealed no significant difference between the two groups in terms of their MSLQ scores ($F(5, 43) = 1.35, \text{Wilks' Lambda} = .86, \text{n.s.}$).

The results of further between-subjects analyses (Table 3) revealed significant effects for gender in terms of self-efficacy and test anxiety. Three significant enrolment status effects were found, pertaining to self-efficacy, intrinsic value, and test anxiety. In addition, age generated a significant effect for intrinsic value and test anxiety.

An inspection of the means (Table 2) shows that domestic students rated self-efficacy items higher than international students. Additionally, domestic students rated intrinsic value items higher than their international student counterparts. However, the reverse trend is shown where test anxiety is concerned, with international students having higher ratings compared to domestic students. A significant but weak correlation was found between intrinsic value and age ($r = .13, p < .05$).

MSLQ - subscales	Gender		Enrollment status	
	Female ($n = 150$)	Male ($n = 122$)	International ($n = 223$)	Domestic ($n = 49$)
Self-efficacy	3.34(.57)	3.56(.62)	3.25(.61)	3.48(.60)
Intrinsic value	3.91(.47)	3.98(.49)	3.82(.37)	3.97(.50)
Test anxiety	2.99(.90)	2.66(.82)	3.22(.81)	2.76(.87)
Cognitive strategy use	3.59(.45)	3.54(.45)	3.60(.39)	3.56(.46)
Self-regulation	3.50(.48)	3.51(.46)	3.45(.41)	3.51(.49)

Table 2: Means (and standard deviations) for gender and enrolment status for the five MSLQ subscales

Discussion

The main findings of this study were that female medical students in their early clinical training evidenced lower self-efficacy and higher test anxiety compared to their male counterparts. The same trend was found with international students who evidenced lower levels of self-efficacy and higher test anxiety when compared to their domestic counterparts. In addition, the international students were lower in their MSLQ intrinsic value scale score compared to the domestic students, suggesting that they had lower intrinsic interest in their course of study. Age was also found to significantly correlate with test anxiety and perceptions of intrinsic value, suggesting that older students were more anxious about their course related assessments, and at the same time more appreciative of the intrinsic value of their studies. Theoretical and practical implications of these findings are discussed in the following subsections.

Gender, Self-Efficacy, and Test Anxiety

The finding in this study showed that female medical students rated themselves as being less self-efficacious and more test anxious, which is consistent with wellness research findings suggesting that female students are more at risk with respect to confidence and anxiety-related conditions.¹²⁻¹⁴ In terms of study motivation, however, it indicates that female and male medical students – at least those in their early clinical training – are differentiable by the expectancy and affective components of motivation (i.e., beliefs about one's ability to perform a task, and emotional reactions to the task, respectively), rather than the value component (i.e., degree of interest in the task) or self-regulation.²⁹ Given that female students in medicine often outperform their male counterparts in terms of both academic grades and clinical proficiency, some reconciliatory explanations – and their corresponding implications – would appear necessary.³¹

One possible explanation for this finding could be posed in reference to Bandura's social learning theory, whereby students are likely shaped by social role models who represent specific identifiable groups.³² Female students, for example, have been found to be influenced by mathematically competent role models.³³ In medicine, there is a strong sense of a hidden curriculum, leading to values and norms being transferred through informal learning environments.^{34,35} Learning environments in medicine are, accordingly, often gendered and thus likely have differential effects on men and women.^{36,37} In their study, Pelaccia and

colleagues found that female third year medical students, studying emergency medicine (where women are under-represented), felt that emergency medicine careers were better suited for men and this negative gender stereotype depressed their self-efficacy perceptions toward emergency medicine learning.³⁶ The authors proposed that the resulting lower self-efficacy likely leads to female students avoiding emergency medicine as a career. They therefore recommended role modeling as a strategy for counteracting the detrimental effects of negative gender stereotypes on female students' career choices.

Pelaccia and colleagues provided a viable explanation for why female students may evidence lower self-efficacy scores, but they do not resolve the possible incongruence between lower self-efficacy of female medical students on the one hand, and reports of better academic achievement of female medical students on the other.³⁶ In other studies, study self-efficacy has been identified as one of the best predictors of student academic performance and as such one would normally expect lower self-efficacy to be associated with lower academic achievement.^{11,37} The answer to this apparent incongruence may lie with the incidental finding in the present study that, unlike female students from other ethnic groups, European female students actually scored higher in self-efficacy compared to European male students. Thus, only female students from other ethnic groups actually evidenced the comparatively lower self-efficacy scores. Elsewhere, Eaton and Dembo reported that for Asian American students' fear of failure better explained achievement motivation than did self-efficacy beliefs.³⁸ This suggests that, for students who come from other ethnic groups, self-efficacy may not be a strong influence on achievement motivation and the resulting academic achievement (e.g., grades, proficiency outcomes). Instead other factors, such as fear of failure – which is synonymous with the “test anxiety” factor examined in the present study – may have a greater influence.

The relationships between test anxiety, study self-efficacy, and achievement motivation (along with academic outcomes) warrant more careful examination in future research – especially in light of the fact that similar differences were found between international and domestic students in self-efficacy and test anxiety scores, as discussed in the next subsection. No significant difference between female and male students was found in the present study as far as cognitive strategy use was concerned, thus providing no support to earlier findings that female medical students tend to use

deeper learning approaches.^{16,17} However, it would be useful to examine in future research whether higher levels of test anxiety might correspond to use of different learning approaches – and possibly outcomes – particularly among female medical students, and students from different ethnic/cultural backgrounds.

Enrolment Status, Self-Efficacy, Test Anxiety, and Intrinsic Value Perception

The present study found that, compared to their domestic counterparts, international students were lower in their ratings of self-efficacy and intrinsic value, but higher in ratings of test anxiety. These present analyses have extended the previous findings presented in Henning and colleagues showing that Asian international medical students were more test anxious compared to their Asian domestic student counterparts.⁷ In the present analysis, the international student group comprised of both Asian and ‘Other’ students; thus the previous finding about Asian international students and test anxiety appears applicable also to ‘other’ groups of international students.

These findings have some important implications. Firstly, they suggest that the domestic Asian group is very similar to all the other domestic ethnic groups (European, Maori-Pacific, and Other) as far as the expectancy, affective, and value components of motivation are concerned. Secondly, the findings suggest that all international students are likewise similar as far as these components of motivation are concerned. Hence, enrolment status distinguishes motivational components of the students rather than ethnicity. This finding supports Hawthorne and colleagues' report indicating that international medical students significantly differed from Australian-born and Asian-born permanent resident students in their performance in problem-based learning assessments, with the latter two domestic groups not showing any significant differences.³⁹ Likewise, Treloar and colleagues found that one important difference between international and Australian domestic medical students was in their reported feelings of isolation in group learning situations.⁴⁰

Variables	Dependent Variable	MS	F	df ₁	df ₂
Covariate (age)	Self-efficacy	.79	2.29	1	263
	Intrinsic value	1.01	4.45*	1	263
	Test anxiety	4.47	6.33*	1	263
Gender	Cognitive strategy use	.13	.66	1	263
	Self-regulation	.01	.05	1	263
	Self-efficacy	3.21	9.27**	1	263
	Intrinsic value	.49	2.18	1	263
	Test anxiety	3.59	5.09*	1	263
Enrollment status	Cognitive strategy use	.16	.78	1	263
	Self-regulation	.00	.00	1	263
	Self-efficacy	2.73	7.89**	1	263
	Intrinsic value	1.14	5.04*	1	263
	Test anxiety	10.49	14.87**	1	263
Gender* Enrollment status	Cognitive strategy use	.04	.18	1	263
	Self-regulation	.23	1.02	1	263
	Self-efficacy	.30	.88	1	263
	Intrinsic value	.14	.63	1	263
	Test anxiety	.20	.28	1	263
Gender* Enrollment status	Cognitive strategy use	.00	.01	1	263
	Self-regulation	.00	.00	1	263
	Self-efficacy	.30	.88	1	263

Note: * $p < .05$, ** $p < .01$

Table 3: Tests of between-subjects effects for gender and enrolment status over the five MSLQ scale measures with age as a covariate

As explained in the previous subsection, self-efficacy and test anxiety may have different influences on students' achievement motivation according to ethnic background. During early clinical training, greater expectations are placed on medical students to communicate effectively and this may have contributed to the international students' manifestation of lower self-efficacy in the present study. As reported in previous studies language and communicative competence is the single, biggest challenge for most international medical students in English speaking countries.³⁹ The stress and anxiety associated with such challenges would likely be exacerbated during clinical training when many forms of assessment would be spoken and would require spontaneous rather than rehearsed responses and it was posed that this same reason may therefore explain the finding of higher test anxiety scores for the international student group. Nonetheless, given the stringent selection processes faced by students when they apply to study medicine, it is unlikely that language would be the primary reason explaining lower levels of self-efficacy and intrinsic value and higher levels of test anxiety, although it

could be part of the problem. It is equally likely that other more multi-layered factors related to acculturated stress may be an issue.⁴¹ Clearly more research is required in this area to tease out the underlying issues related to this finding.

In contrast, however, foreign-born domestic students would likely be better acculturated compared to their international student counterparts irrespective of ethnic affiliation. This group would likely be more familiar not only with language use and communicative expectations, but also with the values, norms, and belief systems that exist in their educational environment.^{42,43} Thus, even if self-efficacy and test anxiety influence their achievement motivation differently compared to students from Western cultural backgrounds, the better acculturated domestic students from Asian and other non-Western cultural groups would have less likely been negatively impacted by the new challenges presented by early clinical training. The lower intrinsic value score evidenced by the international medical students suggests that they possessed lower intrinsic interest in their course of study compared to their domestic counterparts.

Given that international medical students are known to make considerable personal and financial sacrifices to pursue their studies in a foreign country, this finding is understandable.^{8,40} For these international students, the personal and financial sacrifices they had made would have likely made them fully cognizant not just of intrinsic motivations for their studies but also the many – and equally compelling – extrinsic motivations for making such sacrifices. For example, for many of these international students, family obligation attitudes – which is an extrinsic motivator – would have likely had a strong bearing on academic motivation, as found for tertiary students from immigrant backgrounds in the US.²⁰ It is also acknowledged that students from diverse cultural backgrounds will likely respond differently to attitude-laden questions and that response variations would likely occur because of different frames of reference, cultural heterogeneity and contradictory understandings about modes of behavior or perception.⁴⁴

Age, Test Anxiety, and Intrinsic Value Perception

Pintrich and Zusho suggested that there are likely to be some motivational changes that would occur over time as people increase in age.¹¹ The findings of the present study show that certain aspects of motivation are likely linked with age. More specifically, the motivational belief constructs of self-efficacy, intrinsic value, and test anxiety. The ‘post hoc’ correlational investigations revealed that older students were likely to be more test anxious but more intrinsically interested in their studies. However, the self-efficacy and age connection showed no clear direction. It is important to note also that no differences were obtained in comparisons of the 4th and 5th year students with regard to their MSLQ scores.

The finding about higher levels of test anxiety being linked to increases in age partly supports Pritchard and McIntosh’s finding that students became more unsure, depressed, and pessimistic as they progressed through law school – suggesting that the experience of studying law may have had an adversarial impact on the students’ sense of well-being.⁴⁵ Similar issues have been reported in medicine, where students have shown increasing experiences of negative psychopathologies as they progressed through medical school.⁴⁶ However, the association between higher levels of test anxiety and age found in the present study needs to be considered very carefully in light of the possibility that test anxiety may affect achievement motivation in different ways for different groups of students, as

discussed in the preceding subsections. Higher test anxiety need not be equated with lower achievement motivation or lower academic achievement. Previous research has not revealed any consistent performance deficits for older students in medical studies. Feil and colleagues, for example, found that some initial differences in test achievement between younger and older (over 25 years of age) medical students disappeared by the time the students reached their clinical years.⁴⁷ Although academic achievement (e.g., grades) was not specifically examined in the present study, the authors were not aware of any achievement related concerns for older students in the medical school where this study was conducted.

The finding of a positive correlation between age and intrinsic value in the present study is contrary to an earlier report of decreases in students’ intrinsic motivation with age, which was attributed to age-related social pressures.¹⁹ In this study, the older students may have been better able to appreciate the importance of the academic and clinical studies in light of their maturity and world-life experiences. Nonetheless, it is conceded that the age range of the students involved in the present study was limited and the correlations were relatively weak so it is difficult to draw any firm conclusions.

Implications for Practice

The gender difference in self-efficacy scores found in the present study suggests a need for interventions to counteract the detrimental effects of negative gender stereotyping on female medical students – particularly as lower self-efficacy could pose serious threats to their career choices and self-confidence. A strategy like role modeling, as suggested elsewhere, may be appropriate. However, as lower self-efficacy scores were found particularly among non-European female students, formulation of efficacious role modeling strategies would require additional considerations related to ethnicity issues.³⁶

Test anxiety, which was found to be higher among female and international students in the present study, had been proposed as a potential positive influence on achievement motivation in a previous study – at least for students from some non-Western cultural groups.³⁸ Nevertheless, it would be helpful to determine the kinds of assessment anxiety that early clinical training students experience, and to design corresponding interventions to reduce the negative consequences of such anxiety. Interventions could take the form of instruction in preventative strategy planning, provision of advice

and skills training in test skills and associated anxiety management, and provision of appropriate pastoral, psychological, and medical support to students who require it. These same strategies could be employed to address test anxiety issues that may affect older students.

The self-efficacy scores of international students were also found to be lower than those of domestic students. As the students were in their early clinical training, it is likely that the greater demand that such training places on students' communicative competence impacted negatively on many international students' sense of study self-efficacy. Thus, the provision of appropriate language and communication skills development support for international (as well as other students from non-English speaking backgrounds) would likely help in effectively addressing this problem. The likely benefits that would ensue – as far as the students, their clinical teachers, the medical faculty, and even the institution, are concerned – would almost certainly outweigh the costs that may be involved in providing this support.

Conclusion

The findings of the present study indicate that medical students in their early clinical training possess achievement motivation perceptions that may differ according to their gender, enrolment status, and age. Self-efficacy and test anxiety variations may stem at least in part from the ethnic/cultural background of the students and their educational environment experiences. To alleviate some of the negative effects that may be associated with lower self-efficacy and higher test anxiety, interventions such as role modeling, and the provision of skills training and support are indicated. More research is required to determine if the age effects identified in this study require any form of intervention. A further potential consideration relates to the confounding influence of prior experience. It is possible that older students' test anxieties were related not to age itself but to previous failures which led them to approach a new career in medicine with trepidation. Therefore, future studies could investigate whether anxiety and previous performance measures (employment history, entrance exams, and grades averages) are correlated with test anxiety.

The present study has a number of limitations that need to be acknowledged. First, the study utilized data gathered from medical students embarking on their clinical training (years 4 and 5) and, therefore, these findings may not be generalizable to other

students in other stages of medical education. Second, the study has involved only one medical school in one institution and, therefore, conducting similar investigations with other groups of students in other institutions would be helpful in verifying the findings. Third, the study utilized only the survey method, but it would be helpful in future research to investigate whether other forms of data collection (e.g., observations, task performance, interviews) could provide verification as well as deeper insights into the factors that impact on the achievement motivation of medical students.

Keywords

medical students in early clinical training, achievement motivation, gender, New Zealand

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Impact of Introducing a Diagnostic Scheme to Medical Students in a Problem Based Learning Curriculum

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Abstract

The curriculum at our Faculty of Medicine is hybrid problem based learning curriculum. Scheme inductive reasoning is one of the strategies used during problem solving. The Aim of this study is to determine the effect of using schemes in problem-solving for the undergraduate medical students, to study the relationship between its use and students' performance in exams and to have students' feed-back on this educational method. Two schemes had been introduced to students during the second half of the Endocrine block, one for Diabetes Mellitus, and the second for Cushing syndrome. Students' approach to clinical problems and their grades in quizzes was compared before and after schemes use. Also students' feedback on scheme use was investigated through a questionnaire. The results showed that the mean of students' marks in quizzes was higher (7.47 ± 1.82) after the use of the scheme, than before its use (7.11 ± 2.14), but the difference was statistically insignificant ($P=0.326$). Number of students with efficient approach to problem solving significantly increased after introduction of schemes, their percentage was 60% before scheme use versus 85.7% after scheme use {OR=4, 95% CI (0.84<OR<20.25)} $P=0.042$. In conclusion: Medical students' skills regarding problem solving was improved after using schemes. Their response to this educational method has been favorable, and most of them recommended use of schemes throughout the PBL process.

Introduction

Our curriculum in Faculty of Medicine, King Fahad Medical City is divided into three phases which is extended through 6 years. Phase one (premedical) is covered in year 1, phase two (preclinical) is covered in year 2, 3, and first semester of year 4, and phase three (clerkship) is covered up to the 6th year. We are following the hybrid Problem Based Learning (PBL) curriculum. PBL among educational strategies, is thought to promote critical thinking and provide a rich environment for learning.¹⁻⁵ Critical thinking development, has recently gained attention and importance in research related to student attitudes and achievement.⁶

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In a full PBL curriculum, where the problems guide and drive the entire learning experience, there are no lectures from the 'expert' and groups or individuals work independently of one another, however, in the hybrid PBL curriculum problems are solved in groups, but also lectures are used to present the fundamental concepts and some of the more difficult topics, also there is inclusion of basic medical sciences labs, clinical skill labs, and seminars prepared and presented by students. In addition, in the hybrid PBL system the methods of assessment include traditional exams. This hybrid approach was believed to provide structure to undergraduate students and allow faculty to control to some extent the student's learning, and this is the curriculum we are following in our medical school.⁷

We as clinical teachers must pay attention to both the patient's clinical problem together with the learner's ability and skill.⁸ It was found that there is a natural progression in knowledge structure as a learner progresses from a novice to an intermediate to an expert, including the progressive phases of reduced knowledge, dispersed knowledge, elaborated causal knowledge, scheme knowledge, and scripted knowledge.⁹⁻¹¹ It appears that experts (a) generally remember new information in their field better than do the less expert; (b) work forward to solutions; (c) form superior representations of problems; (d) are superior in knowledge, not in basic processing abilities; and (e) require extensive practice over a period of years to achieve expert status.¹²

Investigations into clinical problem solving has identified different forms of reasoning through which clinicians work during problem solving, and these include, hypothetical-deductive reasoning, which is synonymous with predictive, causal, or backward reasoning, forward (or data driven) reasoning, case based reasoning (pattern recognition), and scheme inductive reasoning.¹³⁻¹⁵ Deductive reasoning is guided by generated hypotheses. The physician relates the general knowledge of the disease suspected to the specific signs and symptoms of the patient.¹⁵

Groen & Patel consider hypothetico-deductive reasoning is a weak method of problem solving in which students often reason by a process of hypothesis generation and testing of one symptom at a time. Schmidt et al considered pattern recognition as a reasoning strategy is successful and mostly used by experts for problem solving. In addition, expert clinicians use illness scripts most of the time because it involves a pattern recognition model of clinical reasoning that may be more efficient than hypothetico-deductive reasoning.^{10,16-18}

Scheme inductive reasoning is based on schemes which may be considered similar to road maps. The term "scheme" was introduced at the University of Calgary, Faculty of Medicine within its <clinical presentations> curriculum.¹⁹ Solving clinical problems with scheme inductive reasoning involves using information from the patient's signs and symptoms and laboratory results to differentiate between different clinical conditions at the intersections of the scheme.¹⁵ The schemes reflect the way expert clinician store the information in their memories and recover it to solve problems.¹⁵ Mandin et al believe that the intent of using schemes for students as a teaching strategy is not

only for solving problems, but initially is important to organize learning.²⁰ Effective learning occurs when students correlate new knowledge with a preexisting conceptual framework. Understanding these concepts supports expertise in critical thinking and promotes clinical problem solving.^{21,22} Scheme use by small-group preceptors is associated also with increased odds of diagnostic success.²³ In addition, the association between the use of diagnostic schemes and the long term knowledge structure was investigated by Novak et al, who found that the use of a diagnostic scheme by students may attenuate the loss of expert-type knowledge structure.²⁴

In our medical school, we follow the seven steps Problem Based Learning, in which each problem is covered in two sessions, the first one is the brain storming session and the second is the review session in which the students report on learning topics identified in the first session and present their findings. There are also panel discussion sessions which are held before the review session of each problem. During these panel sessions, all the instructors who shared in the educational activities of this week should attend to answer the queries of the students and to ask them some questions regarding the topics that were covered during the week. In our school, we are following the hypothetical-deductive reasoning during problem solving since 2005, which was considered by some authors as the classic model of clinical diagnosis.²⁵

The trial of applying scheme inductive reasoning during problem solving in the preclinical phase in our medical school may be important in authors' view for preparing our students for the upcoming clinical phase in which they need to think as experts and to develop critical thinking abilities which is crucial for diagnostic success.

The purpose of this study was to determine the effect of using schemes in problem-solving for the undergraduate medical students compared with the already used backward hypothetical-deductive reasoning, and to study the relationship between the use of schemes and students' performance in exams. Also we aimed at collecting the feedback of our students about the use of this new approach.

Methods

Ethical Approval

An ethical approval was obtained from Institutional Review Board-IRB (IRB Number: 11-104).

Setting

The study was carried out at the Faculty of Medicine at King Fahad Medical City, King Saud Bin Abdulaziz University for Health Sciences in Riyadh, Kingdom of Saudi Arabia.

Subjects

This study involved all third year (preclinical) medical students in female section (n=38) enrolled in Endocrine system Block during the 2010-2011 academic year (pre-clinical phase). In the PBL sessions, students were divided into four groups, each include 9-10 students with a tutor for each group.

Data sources

Endocrine system Block was four weeks Block in which the following four problems were covered respectively, one in each week: Acromegaly, Hyperthyroidism (Goiter), Type 2 Diabetes Mellitus, and Cushing's syndrome. During the first two weeks we followed the hypothetical deductive approach during problem solving in which no schemes were used or posted during the discussion, brain storming, and solving of the problems. This hypothetical deductive approach is characterized by the generation of multiple competing hypotheses from initial patient cues and collection of data to confirm or refute each hypothesis. If the endeavor is unfruitful, students create and investigate new hypotheses in an iterative process of hypothesis generation and testing. During the last 15 minutes of the panel discussion session of the Acromegaly problem week, a formative assessment was conducted in the form of a case scenario distributed on students followed by a query to evaluate the effectiveness of their problem solving skills (Appendix 1). Answers were collected and graded according to a pre-set key. Students who had got score of two or three out of three were considered as having an efficient approach for problem solving, while those who had got less than two were considered as having inefficient approach.

During the last two weeks in the block, we introduced two schemes to the students and tutors and posted it in the tutorial rooms during problem discussion and solving. One scheme was for Diabetes Mellitus, and the second for Cushing syndrome (appendix 2). These schemes were modified from two text books: Harrison's Principles

of Internal Medicine, and Kumar and Clark's Clinical Medicine.^{26,27} Solving clinical problems with scheme inductive reasoning involves using information from the patient's signs and symptoms and laboratory results to differentiate between different clinical conditions at the intersections of the scheme. These schemes were available to students and tutors for the whole week in which the problem was covered. In the panel discussion session of Diabetes Mellitus problem, a second formative assessment on Diabetes was conducted in the same way as the first assessment (Appendix 1). Answers were collected and graded.

The purpose of conducting these two formative assessments was to compare if there is an improvement in problem solving skills and knowledge among students after scheme use.

Grades of the two quizzes

Quiz 1 was held after the end of first problem (Acromegaly) in which the hypothetical deductive approach was followed. Quiz 2 was held after finishing Diabetes Mellitus problem in which the scheme was introduced. Grades of the two quizzes were statistically compared. Each quiz composed of 10 Multiple Choice Questions, and it was scored by computer out of 10 marks according to a preset key.

Example of a question from Quiz 1

A 34 year- old patient known to have oat cell carcinoma of the lung has developed in the last two months confusion, nausea, vomiting and seizure. Investigations shows concentrated urine, low level of plasma creatinine, urea and protein. He was diagnosed as having syndrome of inappropriate anti-diuretic hormone release (SIADH). What is the cause of the symptoms mentioned above?

- (A) Hyperkalemia
- (B) Hyponatremia
- (C) Hypokalemia
- (D) Hypercalcemia
- (E) Hypoproteinemia

Example of a question from Quiz 2

Which one of the following options best explains the presence of polyuria in a diabetic patient?

- (A) Insulin deficiency causing decreased water reabsorption from the renal tubules
- (B) Hyperglycemia inhibiting the effect of the antidiuretic hormone
- (C) Water excretion due to increased osmolarity in the renal tubules
- (D) Secondary effect due to increased water intake

Students' feedback on the use of schemes during problem solving was investigated through an end-of-block questionnaire (Modified from Woloschuk et al., 2000).²⁸ They responded to each item using a 5-point Likert scale that ranged from "strongly agree" to "strongly disagree". Students were also asked to provide a written free text comment about this approach at the end of the questionnaire.

Data Analysis

Data were analyzed using the statistical software (SPSS version 17). The obtained data were analyzed and tabulated. Descriptive analysis was performed in this study including frequencies and percentages. Student's paired t-test and p value were also calculated for comparing the means. (Level of significance selected for this study was $p < 0.05$).

Results

Results of the study are represented in tables, 1, 2, 3, and figure 1. Table (1) demonstrates the results of quiz 1, and quiz 2 obtained for all third year medical students in female section (n=38) enrolled in the Endocrine block.

The mean of students' marks was higher in quiz 2 (after the use of the schemes), but the difference between the two means was statistically insignificant ($P = 0.326$).

Table (2) represents the classification of the students into those who have an efficient approach to problem solving and those with inefficient approach following the two panel queries. The response rate for the panel queries was as follow; the panel before scheme use: 52.6%, the panel after scheme use: 73.7%. Results of this table indicate that there was a significant increase in the number of students with efficient approach to problem solving after introduction of schemes. Their percentage was 60% before scheme use versus 85.7% after scheme use {OR=4, 95% CI (0.84<OR<20.25)}, $P=0.042$.

Table (3) and figure (1) represent students' feedback on the questionnaire regarding the use of schemes during problem solving. A total of 34 student questionnaires were returned (completed) representing response rate of 89.5%. Results of the questionnaire revealed that most of the students provided positive feedback about the use of schemes. The majority of the students found the schemes clear, informative, covering a good variety of differential diagnosis, and help them in reaching a diagnosis. However, 2.9% disagreed about the usefulness of the use of schemes in reaching a

diagnosis. 79.5% of them believe that the use of schemes help them in formulating a hypothesis during problem solving. Also, 58.8% either agreed or strongly agreed that use of schemes can save time during the process of problem solving; however, 8.8% disagreed regarding this point. The majority of the students recommend the application of this strategy of problem solving with the use of schemes throughout the PBL process.

Quiz 1 (Before scheme)	Quiz 2 (After scheme)	P value
7.11 ±2.14	7.47 ±1.82	0.326

Table 1: Comparison between students' marks in Quiz 1 and Quiz 2 using Mean ±Standard deviation.

Panel sequence	Efficient approach, no. (%)	Inefficient approach, no. (%)	Total
The panel after scheme use	24 (85.7%)	4 (14.3%)	28
The panel before scheme use	12 (60%)	8 (40%)	20
Total	36	12	48
OR=4 95% CI (0.84<OR<20.25) P=0.042			

Table 2: Classification of the students into those with efficient and inefficient approach to problem solving following the two panel queries.

Discussion

Deep learning and good understanding of a topic is not related to the quantity of information gained but by the way in which the information is conducted in a coherent way.²⁹ Schemes were defined by Mandin as a mental categorization of knowledge that includes a particular organized way of understanding and responding to a complex situation, "the big picture" that facilitates storage of information and its retrieval.³⁰

In our study, we chose to make the two schemes explicit to the students rather than asking them to construct it on their own in order to direct their attention to the schemes and motivate them to use it. The same was done in Calgary University during applying this educational strategy where they had a debate whether to display the schemes to the students or ask them to discover it by their own, but finally they decided to explicit it.¹⁹

In the present study, the mean of students' marks was higher in quiz 2 (after the use of scheme) than in quiz 1 (before scheme use), but the difference between the two means was statistically insignificant, and this may be explained by the fact that scheme use is reflected more on the students' problem solving skills, however the marks of the

quizzes may not be directly affected except after a longer use of the schemes, as was found in a previous study conducted at the University of Calgary, where the regular use of schemes by the students produced a positive outcome on examination performance.³¹

		Strongly Agree No (%)	Agree No (%)	Neutral No (%)	Disagree No (%)	Strongly Disagree No (%)
I	The schemes were clear	15 (44.1%)	13 (38.2%)	6 (17.7%)	0 (0%)	0 (0%)
II	The schemes were informative	15 (44.1%)	16 (47.1%)	3 (8.8%)	0 (0%)	0 (0%)
III	The schemes save time during problem solving	12 (35.3%)	8 (23.5%)	11 (32.4%)	3 (8.8%)	0 (0%)
IV	The schemes help you in formulating the clinical information in the case into a hypothesis	11 (32.4%)	16 (47.1%)	7 (20.5%)	0 (0%)	0 (0%)
V	The schemes expose you to common diseases	13 (38.2%)	17 (50%)	4 (11.8%)	0 (0%)	0 (0%)
VI	This approach helps you in diagnosis of cases	11 (32.4%)	14 (41.1%)	8 (23.5%)	1 (2.9%)	0 (0%)
VII	It is recommended to apply the schemes throughout the PBL process	11 (32.4%)	15 (44.1%)	8 (23.5%)	0 (0%)	0 (0%)

Table 3: Students' feedback on the questionnaire regarding the use of schemes.

Problem Based Learning itself is believed to promote critical thinking of the medical students.³² However in our study, the use of schemes also significantly increased the numbers of students with efficient approach to clinical problem solving after the use of schemes than before its use, as was shown in the grades of the panel sessions queries. This may be explained by the fact that the use of schemes during problem solving was proved to facilitate and organize the learning process through breaking down the information.³¹

In our study, students gave their feedback about the use of schemes during problem solving by responding to the questionnaire. The high student response rate obtained (89.5 %) helped to ensure that the results presented were a valid representation of students' opinion. Generally, students' feedback about the use of schemes was positive regarding its usefulness, and some of them recommend their use on regular basis during problem solving. These findings were consistent

with the results of Woloschuk et al.²⁸ On the contrary, few of our students stated that use of schemes was not so helpful in the diagnosis of the clinical cases. This also was relatively consistent with the findings of Woloschuk et al who stated in their study that a few students did not find this approach is helpful in learning.²⁸ These variations between students and their preferable educational approaches need to be further investigated.

There was an open-ended question for free-text response at the end of the set of questions included in the questionnaire, and the data were used in conjugation with all other data in order to further explain our findings. From these data we found that some students recommended that they might be asked to construct their own schemes for different clinical presentations as an assignment to help them in better achievement and deeper learning, however, others believe that the use of schemes should be left optional during the process of problem solving rather than being applied

constantly. McLaughlin & Mandin, found in their study that the percentages of students using a scheme for learning any one specific domain varied

from 57% to 90%, and 53.1% of students had designed their own schemes.³¹

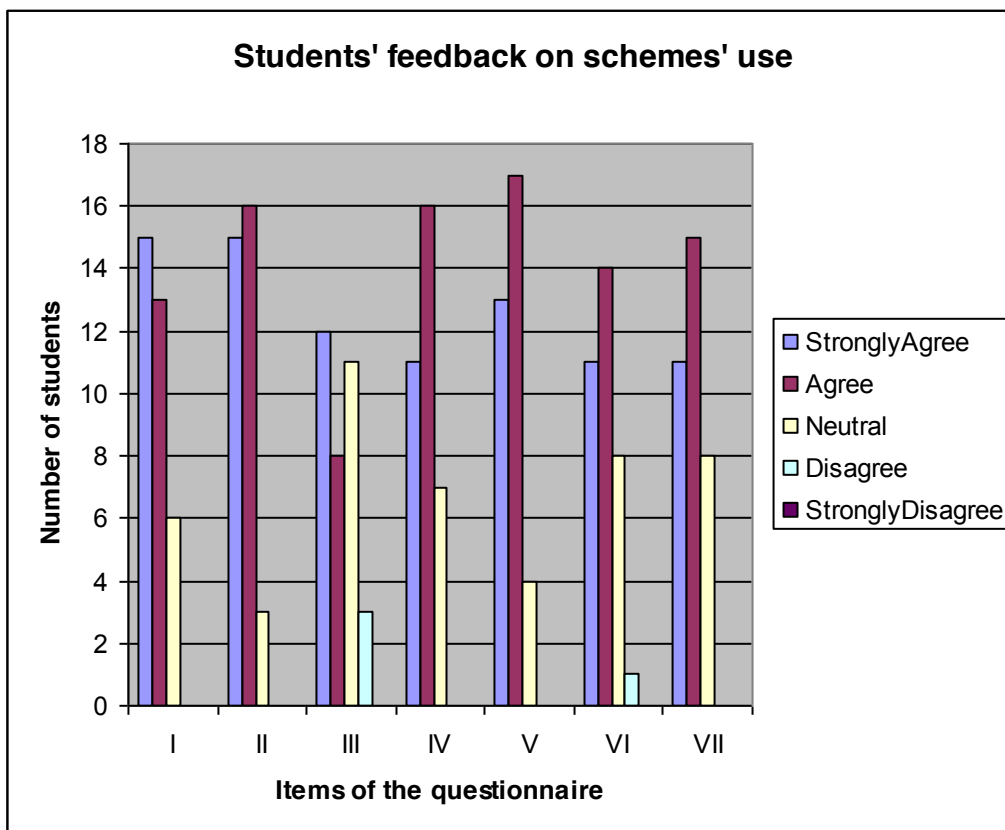


Figure 1: Students' feedback on schemes' use.

In our study, students stated that using the schemes during discussion of the clinical presentations help them in focusing and organizing their thinking, and this was consistent with McLaughlin & Mandin findings which demonstrated that almost 94% of the respondents to a questionnaire about the use of schemes found schemes to be useful for organizing information during learning.³¹ Woods et al suggested that providing students with schemes might aid knowledge retention, transfer, and recall.³³ Some of the students in the present study said that they did not refer to the schemes during problem solving except when their instructor did that and drew their attention to the schemes, and this point raise the issue of the commitment of the instructors to refer to the schemes during discussing the clinical problems, which will be reflected positively on the students as was recommended by Woloschuk et al.²⁸

The present study has some important limitations. Results from such a study is hypothesis generating and cannot be interpreted as showing that it is the use of schemes that ensures expert-type knowledge structure and development of deep learning and critical thinking. To test this hypothesis a study in which subjects were randomized to receive the schemes or not, would be required. We need a longer period of time for application of such an educational method to ensure the validity of the outcome. In addition, we did not ask the students to build their own schemes in order to investigate their forward or backward reasoning.

Conclusion

Although the implementation of schemes use during problem solving in this study was for a short duration, however the students approach to problem solving was improved after using it. In addition, their response to this educational method has been favorable, and most of them recommended its use throughout the PBL process.

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Key Words

Scheme inductive reasoning, Problem Based Learning, Medical School

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Appendix 1

Case scenario and query that followed the problem of Acromegaly:

Student Name:

Student ID:

A 44 year old woman, known to have type 2 diabetes mellitus, presented with backache and a six month history of increased sweating, increased sleepiness, more recent headache, and decreased vision. She attributed her tight rings and numbness in the hands to arthritis. In view of the latter symptoms and her suggestive facial features, her general practitioner requested growth hormone and insulin-like growth factor-1 (IGF-1) to be measured. Both tests showed raised values, so the doctor referred her to an endocrine centre for further investigations.

The query: Mention 3 key clinical features help in making a diagnosis.

Sample of student's answer:

- Recent headache and decreased vision: may suggest brain tumor especially pituitary adenoma.
 - Suggestive facial features, tight rings and numbness in the hands (with positive history of diabetes) could suggest Acromegaly which may be secondary to pituitary adenoma.
 - Elevated growth hormone and insulin-like growth factor-1 (IGF-1): support the diagnosis of Acromegaly.
-

Case scenario and query that followed the problem of Diabetes Mellitus:

Student Name:

Student ID:

A 45-year-old female patient presents to you with feelings of malaise, tiredness, and lethargy over the past month. She noticed that she had to go to the bathroom more frequently than usual especially at night, but she attributed that to a recent episode of candidal vaginitis that she has self-treated with over the counter medication. Her appetite is still good, but she is happy to report that she has lost 5 lbs in the past month. She gave birth to her two children by C-Section for failure of normal vaginal delivery as both infants had been large for gestational age at 10+ lbs. On physical exam, you note an obese female; weight 220 lbs. BP 130/80mmHg; pulse 84 bpm; RR 18/min; temp.: afebrile. Her physical and systemic examinations are negative. Her abdominal exam is limited by obesity but there is no evidence of ascites or hepatosplenomegaly. Her extremities show good pulses with trace pitting edema, and she has no relevant skin lesions.

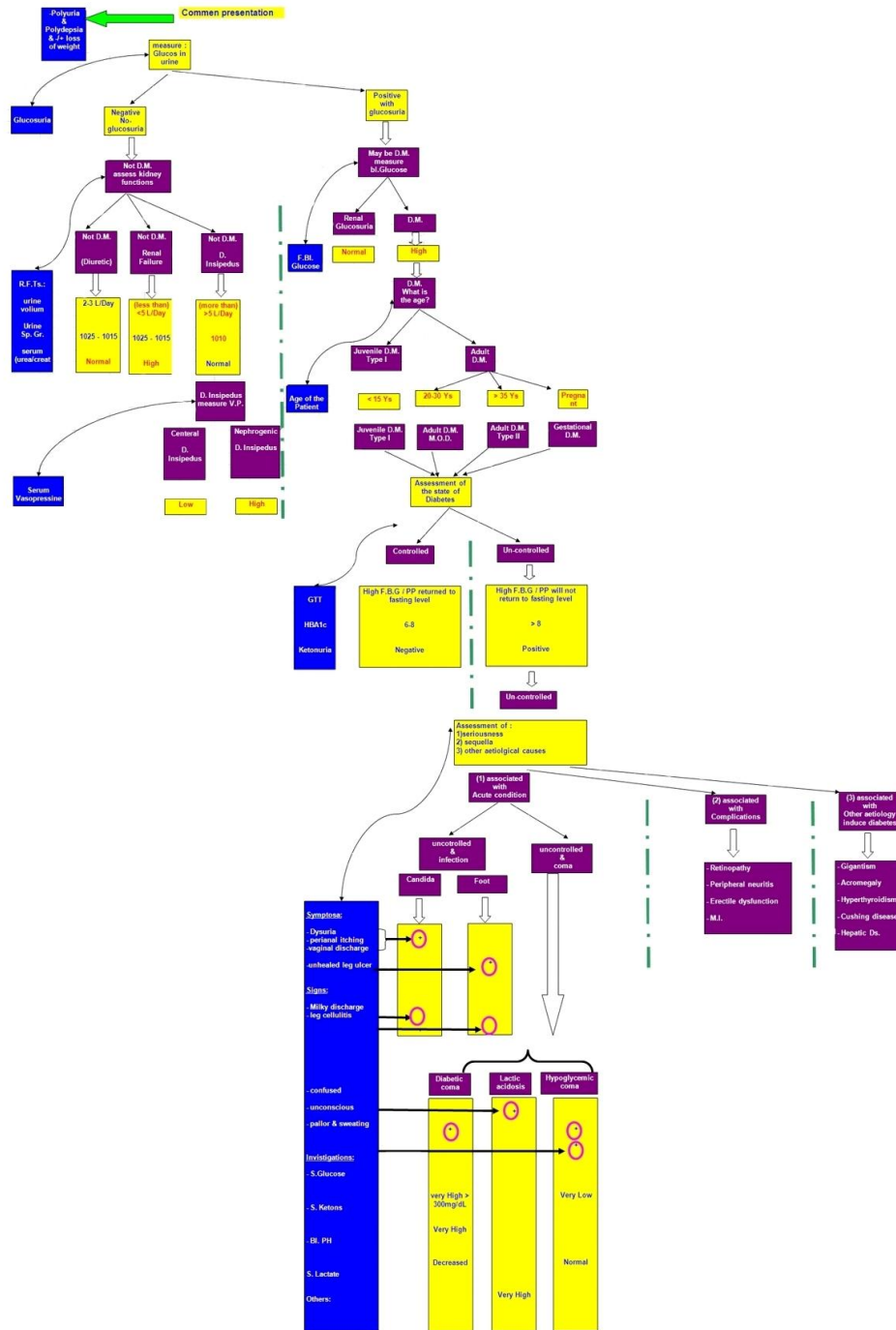
The query: Mention 3 key clinical features help in making a diagnosis.

Sample of student's answer:

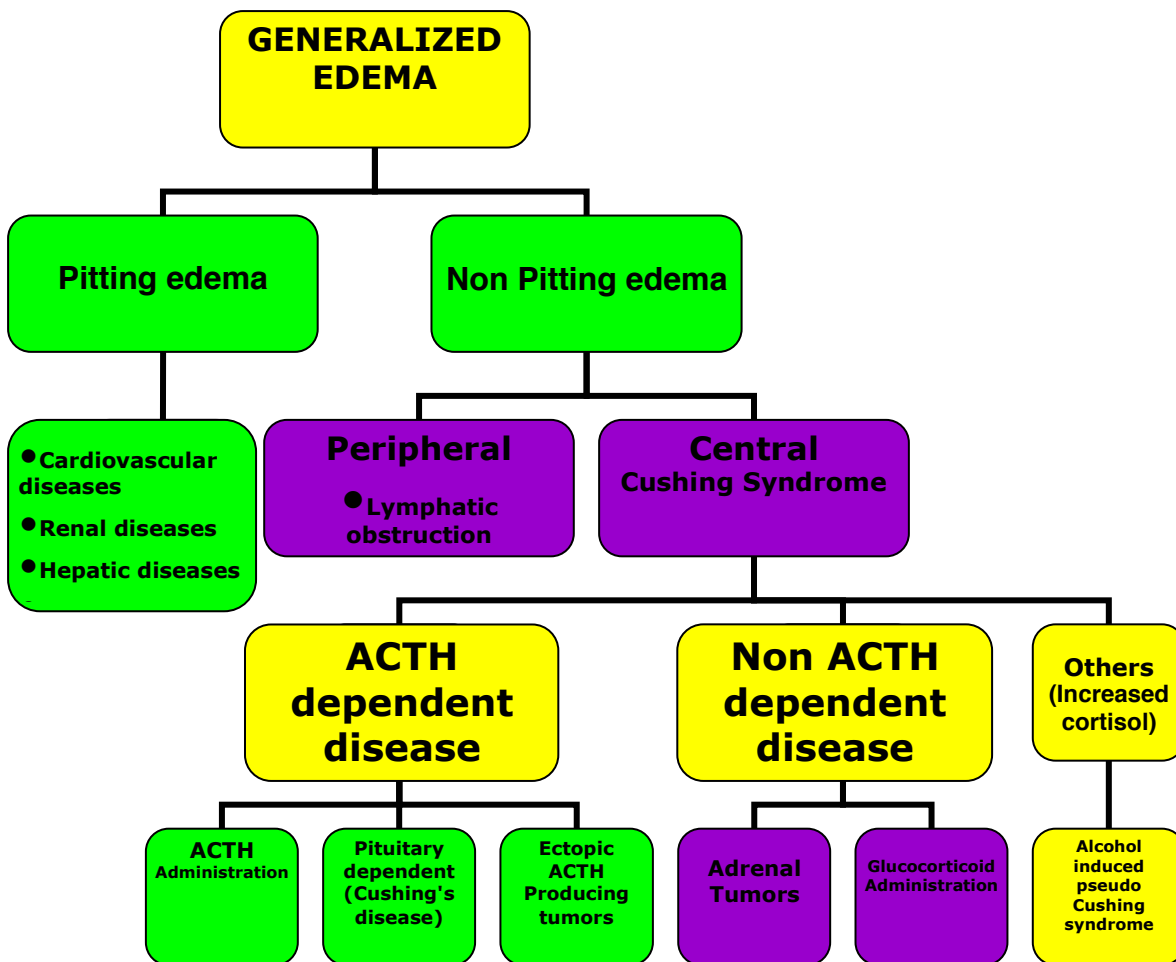
- Obesity is a risk factor for developing type 2 Diabetes Mellitus
- Infants had been large for gestational age: could be attributed to gestational Diabetes.
- Frequent urination: may be due to Diabetes and/or urinary tract infection predisposed by Diabetes Mellitus.
- Blood glucose level should be measured to confirm the diagnosis of Diabetes Mellitus.

Appendix 2

Scheme for the problem of Diabetes Mellitus:



Scheme used for the problem of Cushing syndrome is shown below:



Benefits of Traditional Cadaveric Dissection in a Digital World: Medical and Dental Students' Perspectives

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Abstract

The aim of the present study was to assess the benefits of cadaver dissection in the process of learning anatomy and to determine the degree of student's respect toward the donors. An anonymous survey was distributed to 265 first-year students: 103 medical students (39%) and 162 dental students (61%) who conducted cadaveric dissection during their gross anatomy course. Ninety five percent of medical students and 98% of dental students found the dissection beneficial. They listed the most valuable aspects of cadaver dissection as visual learning (56-58% female, 40-45% male), hands-on experience (34-36% female, 36-48% male), and spatial learning (28-31% female, 17-33% male). All students (100%) declared appropriate respect and appreciation for the donors. Most of medical and dental students were in favor of organ donation; however less than half would consider donating their own body for educational purposes. They disagreed (94% of medical students and 86% of dental students) with the idea of completely replacing cadaver dissection with computer-based programs. These results suggest that medical and dental students regard cadaver dissection as an effective learning experience that reinforces lecture and textbook material and provides a better understanding of the complexity and variability of the human body.

Introduction

Dissection of the human body has long been a core component of the gross anatomy curriculum in medical and dental schools worldwide. For many years, cadaver dissection has been viewed as the best way to study and understand the complexity and variability of the human body. More recently, the rapid development of technology has provided new techniques and computer-based programs that are changing the vision and approach in teaching human anatomy courses. The elimination of cadaveric dissection or the use of alternating dissection groups is a current topic of debate among medical schools throughout the world.^{1,2}

A successfully designed and executed dissection course should instill in students that body bequeathal donors are their best teachers and first patients, so they should treat them with great

respect while learning as much as possible from the experience.^{3,4} One important aspect of the cadaver dissection is to help students to work through their feelings about death and introduce them to their role as medical, dental or allied health professionals.^{4,5} Typically, medical and dental students take anatomy courses during their first year and they are not always emotionally prepared to deal with death.⁶ Most students lack prior dissection experience and thus dissection of the human body is an emotional, physical and mental challenge for them.^{7,8} Cadaveric dissection can affect students' feelings in different ways.⁹ Some cannot handle the smell, others have eating or sleeping disruptions or, feel uncomfortable dissecting male or female reproductive organs.^{10,11} Most students describe their initial experience in the dissection laboratory as positive, whereas others perceive it as the most stressful aspect of anatomy.^{12,13} Most anatomists believe that the student- cadaver relationship is very important in developing professional skills, and in the case of health professional students, in developing proper attitudes toward their future patients.

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Researching certain significant aspects of the student experience in cadaver dissection may provide educators with new ideas on how to approach dissection in the future and how to enhance this process in the dissection laboratory. Considering the cost associated with cadaveric dissection, the relative scarcity of experienced anatomy educators, reduction of time devoted to gross anatomy courses, and increase of computer technologies, the following questions may be raised: Does cadaver dissection still benefit current medical and dental students? Given that most of our students are part of the millennial generation, also called Generation N (as in Network), relying heavily on technology from computer or cell phone-based instant messaging to Google and Wikipedia, does it make sense to replace the cadaver dissection with a computer-based programs?¹⁴

The aim of the present study was to assess any student-defined beneficial aspects of cadaver dissection in the process of learning human gross anatomy by medical and dental students, and to determine their degree of respect toward the donors.

Materials and Methods

The material used for this manuscript is part of a larger study coordinated through Wright State University that also includes the University of Louisville, the University of Kentucky, and West Virginia University. The aims of the entire study are:

1. To determine if and how cadaver dissection is beneficial in the process of learning human anatomy.
2. To describe the emotional reactions, attitudes and fears of students faced with cadaver dissection.
3. To describe the technical difficulties students faced with cadaver dissection.
4. To assess if students' perception have been affected by demographic variables such as gender, religious background, specialty or others.
5. To determine the degree of respect toward the donor.

In view of the fact that each of these Universities has different programs and schedules, and because we just started to collect our data, only three groups of students were included in the current analysis. The Boonshoft School of Medicine (Wright State University) is represented by medical students only, because the school does not offer the dental

program. The University of Louisville and University of Kentucky are represented only by the dental students, because the gross anatomy course for medical students followed the dental gross anatomy courses, and we did not have the opportunity to collect medical student's surveys yet. All dental students were combined into one group, since we are interested in differences between medical and dental student's perspectives rather than variation between institutions.

An anonymous, voluntary 25-item survey was distributed to the first-year medical students at the Boonshoft School of Medicine (WSU), and to the first-year dental students at the University of Louisville (UL) and the University of Kentucky (UK) at the end of their gross anatomy course. Dental students completed their course in spring of 2011, whereas medical students finished in fall of 2011. All students who participated in the study performed full cadaver dissection during their human gross anatomy course. See Appendix.

The survey was designed to gather information in three domains: students' emotional reactions to cadaver dissection, remarks about the technical side of cadaver dissection, and the perception of any beneficial aspects from this process. The results presented here are focused mainly on the beneficial aspects of cadaver dissection (questions 22-25) although student's emotional reaction to this process was also queried (questions 14, 15, 20, and 21).

The questionnaire also gathered demographic information (questions 1, 2, and 5)) and explored what, in the student's opinion, were the most valuable aspects of performing cadaveric dissection (question 22). This open-ended question provided a broad spectrum of answers, which were grouped in four categories. Whenever students stated that the most valuable aspect of doing cadaver dissection was to "see things in real", we categorized this answer as the visual learning. If they answered that dissection gave them the better understanding of relationships and spaces in the body, we categorized it as spatial learning. Seeing variations in the body was selected as the comparison learning, and hands-on learning was the student's appreciation for touching and manipulating the human body. Answers to question 22 were assessed qualitatively by the two authors working independently, and then compared. Ninety five percent the author's assessments were compatible. The answers on which the authors could not agree how to categorize were eliminated.

The students were also asked about their willingness to become the organ and body donors (questions 24 and 25), and about their appreciation for the donors (question 23). In addition they were asked- if they would consider complete replacement of the cadaver dissection by the computer-based programs (question 13).

The survey was approved by the Institutional Review Board at Wright State University (IRB exemption 4539).

Results

The study population consisted of 265 students (100% response rate): 103 medical students (39%) – WSU, and 162 dental students (61%) – 56 UK and 106 UL students. Slightly more than half of this population were male (59% medical and 57% dental students). Ninety seven percent of the medical students and 90% of dental students were younger than 30 years of age, and the majority of them (82% medical and 78% dental students) had no prior cadaver dissection experience.

Beneficial aspects of cadaver dissection	Medical students		Dental students	
	Male [%]	Female [%]	Male [%]	Female [%]
Visual learning	45	56	40	58
Hands-on learning	48	36	36	34
Spatial learning	17	28	33	31
Comparison learning	14	3	6	8

Table 1: What was the most beneficial aspect of the cadaver dissection?

All dental and medical students in this study indicated appropriate respect and appreciation for the donors. Among the medical students 97% strongly agreed and 3% somewhat agreed with the statement: I feel appreciative to the people who donated their body for use in the anatomy lab. Among the dental students the numbers were respectively 97%, 2%, while 1% of them had no opinion about this statement. Eighty seven percent of medical students and 86% of dental students declared that they felt emotionally prepared for dissection and that cadaver dissection did not bother them (83% and 88% respectively). They found dissection to be a useful (87% medical and 80% dental) and an interesting experience (91% medical and 87% dental), as well as positively challenging (73% medical and 66% dental) and exciting (53% medical and 51% dental). Intriguingly,

only two of 103 medical students and two of 162 dental students did not experience any positive feelings about cadaver dissection. At the same time, some students described this process as unpleasant, stressful, or even disgusting. The most negative aspect of cadaver dissection for medical students was stress, and 53% of them declared to feel stressful, while only 16% of dental students reported the same feeling. Contrastingly it was a stressful event for most of the medical female students (65%), while less than 10% of male dental students found dissecting stressful. Thirty two percent of medical and 28% of dental students described cadaveric dissection as an unpleasant experience. A group of students agreed that it was disgusting experience (27% medical and 15% dental students). Twenty seven percent of dental and 19% of medical students did not have any negative feelings performing dissection.

Ninety-eight percent of dental students and 95% of medical students found cadaver dissection beneficial. Based on their individual answers given to the open-ended question regarding the benefits of cadaveric dissection (question 22) we selected four themes: visual learning, hands-on learning, spatial learning and comparison learning. Students cited visualization as the most valuable aspect of this process, which allowed them to actually see a 3-D representation of the information presented in class notes and lectures. In both groups (medical and dental students), female students were more visual learners than male students (Table 1). Both medical and dental students appreciated the opportunity for the hands-on learning experience, which helped them to better understand the human body as a unit, but it seemed to be the most beneficial aspect of cadaver dissection for male medical students. Another useful aspect of doing cadaver dissection frequently mentioned by students was the spatial learning. Understanding the anatomical relationships helped them to learn and appreciate the complexity of the human body. Although both medical and dental students found it interesting to see variability presented in real human material, as opposed to that described in textbooks, this aspect of cadaver dissection was the least beneficial in their opinions (3-14%). The highest percentage that found comparison learning beneficial was among male medical students (14%). To learn if this was a coincidence or general trend, we need to analyze larger samples in our future study. The vast majority of all students (95% of medical and 86% of dental students) disagreed with the idea of complete replacement of cadaver dissection by computer-based programs.

Knowing that all participants of this study indicated appropriate respect and appreciation for the donors, we asked them about donating their own body for educational purposes, or donating their organs for medical purposes. Although both medical and dental students themselves were generally in favor of organ donations (Figure 1), less than half of them would consider donating their own body for educational purposes (Figure 2).

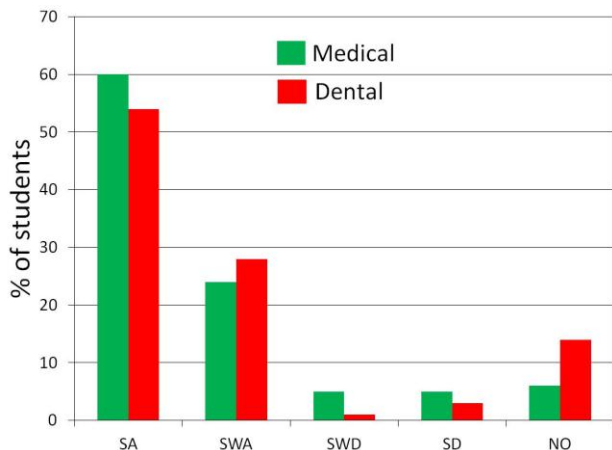


Figure 1: Medical and dental students' willingness to become organ donors (SA – strongly agree, SWA – somewhat agree, SWD – somewhat disagree, SD – strongly disagree, NO – no opinion).

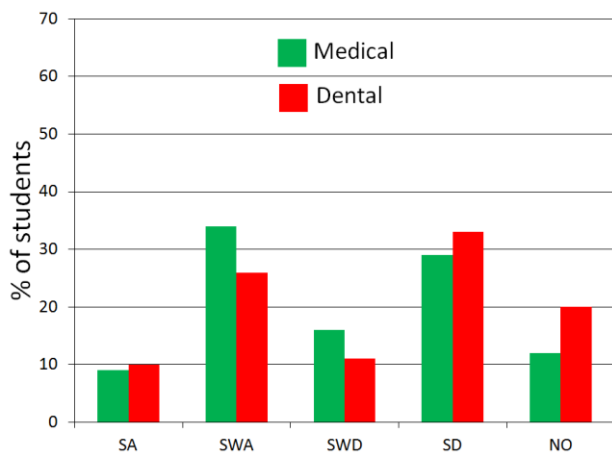


Figure 2: Medical and dental students' willingness to become body donors (SA – strongly agree, SWA – somewhat agree, SWD – somewhat disagree, SD – strongly disagree, NO – no opinion).

Discussion

This study describes first year medical and dental student's attitudes toward dissection in terms of their respect for the donors, perceived academic benefits from the process, and their own emotional reactions. While prior studies have documented

students' self-reported emotional responses to dissection, few have queried students as to their level of respect for, and appreciation of, the donors for bequeathing their bodies for education. The results of this study demonstrate a high level of student gratitude and esteem for donors. The cadaver serves as the students' first patient, teaching them respect and professionalism. Students cultivate and integrate humanistic values into their training through positive interaction with donors. In Taiwan, medical students call the donor "great body teacher" and begin each dissection session by respectfully and humbly greeting the cadaver.³

The vast majority of students in the present study (95%-98%) found the cadaver-based anatomy laboratory academically beneficial, primarily for visualization of anatomical structures and spatial learning. This is consistent with Cahill and Ettarh, who found that more than 77% of their student population reported dissection as important in learning anatomy.¹⁵ Participants of our study emphasized that cadaver dissection helped them integrate theory and practice; and, in this way, facilitated their learning process. The same view was presented by students from a medical college in western Nepal, who considered anatomy dissection as a significant life experience and one which was largely positive. They felt that their dissection experience was the foremost learning tool in assimilating human anatomy.⁹ Granger and Calleson studied the impact of alternating dissection on students' performance in a medical anatomy course and concluded that dissection gives students the opportunity to construct and integrate three-dimensional data about the human body.² Besides mastery of anatomical knowledge, other important learning outcomes have been identified by medical students in a British medical school, including team work, respect for the body, familiarization of the body, application of practical skills, preparation for clinical work, and appreciation of the status of dissection within the history of medicine.⁵

The majority of our student population felt emotionally prepared for dissection and the process did not bother them, which was consistent with other studies.¹⁵⁻¹⁶ Eighty percent of our students reported dissection to be useful and interesting, while 60% felt it was positively challenging and 50% found it exciting. These findings are consistent with those of Quince et al., who reported that between 60-94% held positive attitudes toward the process of dissection, with 70% using two or fewer negative adjectives to describe the experience.¹⁶ Quince described gender differences in these attitudes

toward dissection, with male students being more likely to describe the experience as “exciting” (82%) compared with their female counterparts (71%). In our study, female medical students found dissecting most stressful (65%), whereas male dental students found it least stressful (10%). By comparison, 13.63% first year medical students in Venezuela reported that the anatomy dissection room was the most stressing aspect of the anatomy syllabus.¹² In the same study, 52.22% of them described their initial experience with a cadaver as positive, while 34.25% considered it to be very positive. Medical students from the University of St. Andrews, UK, also found dissection to be a positive and challenging life event, similar to the students in western Nepal.^{9,13} In addition, other studies have linked elevated anxiety levels and the recent loss of a loved one to more negative attitudes about dissection.^{16,17}

The disconnect between students’ willingness to participate in organ donation versus body bequeathal for educational purposes is consistent with the findings of Cahill and Ettarh, who report that younger students are reluctant to consider body donation themselves in the future and feel the same way about their family’s involvement.^{18,19} Their study demonstrated that as students spent more time in the dissecting laboratory, the less inclined they were to commit to be personally involved in the donation process. Furthermore, Arraez-Aybar et al. reported a similar personal reluctance for body donation among anatomy educators, with only 11% being willing to donate their body to medical research, versus 53% who were willing to donate an organ.⁴ There is an interesting correlation between willingness to donate the body or organs and years of teaching experience. Anatomists in favor of donating only organs, belonged to the group with 10 or fewer years teaching experience, while those of favor of donating only for anatomical research mainly belonged to the group having 11-20 years of teaching experience. Other factors influencing an individual’s willingness to consider body and organ donation include education, race, ethnicity and social status.²⁰⁻²³

According to Drake et al., the total hours allocated to teaching gross anatomy in the United States has decreased 55% over a period of 49 years.²⁴ The most dramatic reduction took place between 1955 and 1973, but the decrease is still continuing. At the same time, the majority of gross anatomy courses in the United States still have some type of cadaver experience— 60% use student dissection exclusively, 35% combine student dissection with prosections, and 5% use prosected material only. Our study

confirmed that in a digital world, cadaver dissection is still perceived by the medical and dental students as a beneficial and essential component of their human gross anatomy course and accordingly the majority of students strongly disagreed with the idea of replacing cadaveric dissection with computer-based programs. The same opinion was expressed by students from the University of Melbourne who did not agree that dissection should be replaced by any other learning/teaching tools.²⁵

Conclusions

1. Results of our study indicate that both medical and dental students regard cadaver dissection as an effective learning experience that reinforces and enhances knowledge acquired in lectures and textbooks, and help them to better understand the complexity and variability of the human body.
2. Finding the dissection beneficial; the vast majority of these students disagree with the idea of replacing cadaver dissection with a computer-based program.
3. Most of medical and dental students are in favor of organ donation; however less than half would consider donating their own body for educational purposes at this point in their life.

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Keywords

Cadaver dissection, gross anatomy, medical students, dental students, anatomy education

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Appendix 1: Survey questionnaire

Demographic information:

1. Gender:

- Female Male

2. Age:

- 20-25 26-30 31-35 36-40 41-50 51 and older

3. Religious Affiliations:

- Christian: Protestant Catholic Other Christian
Other religions: Jewish Buddhist Muslim Hindu
 Unaffiliated Other.....

4. Ethnicity:

- White/Caucasian Black/African descent Asian/Pacific Islander
 Hispanic/Latino American Indian/Alaskan Native Other

5. Are you?

- Medical student Dental student
 Anatomy Graduate student Other (specify)

6. Do either of your parents work as a health professional (doctor, dentist, nurse, PA, PT, OT, etc.)?

- No Mother Father Both

7. Dietary habit:

- Vegetarian/Vegan Non-vegetarian

"Technical" aspects of cadaver dissection:

8. Have you ever done an animal dissection before?

- Yes No

9. Have you ever done a human dissection before?

- Yes No

10. Did it matter for you if the cadaver you dissected was female or male?

- Yes No

If yes, which gender of cadaver would you prefer to dissect and why?

- Male Female

Because.....

11. Which part of the body was the most technically difficult for you to dissect? (Please list 1 part per line, with the first being the most difficult)

1.....

2.....

3.....

- There wasn't any difficult part for me

12. Which part of the body was the most uncomfortable for you to dissect? (Please list 1 part per line, with the first being the most uncomfortable)

1.....

2.....

3.....

- There wasn't any uncomfortable part for me

13. It would be a good idea to completely replace the cadaver dissection with a computer-assisted one in the future?

- Strongly agree Somewhat agree Somewhat disagree
 Strongly disagree No opinion

Why?.....

Emotional aspects of cadaver dissection:

14. Did you feel emotionally prepared going to the dissection lab?

- Yes No

15. Did dissecting a human cadaver bother you?

- Yes No

16. Did you feel any disruption in your eating or sleeping patterns when you started dissection of the cadaver?

- Yes No

If yes, please describe it briefly.

.....

17. Did you prefer to keep the cadaver's face covered until the head and neck dissection?

- Yes No

18. Did you refer to the cadaver by name (real or invented by you) while working in the lab?

- Yes No

19. Did you ever think about the cadaver as a person who had life, family, job etc...?

- Yes No

20. Did you experience any positive feelings about dissection (check all that apply)?

- Exciting Useful Interesting Positively challenging
 Other.....
 No positive feelings

21. Did you experience any negative feelings about dissection (check all that apply)?

- Disgusting Horrible Creepy Unpleasant Stressful
 Other.....
 No negative feelings

Beneficial aspects of cadaver dissection:

22. Did you find doing dissection beneficial?

- Yes No

If yes, what was the most beneficial aspect of doing dissection by you?

.....

23. I feel appreciative to the people who donated their body for use in the anatomy lab:

- Strongly agree Somewhat agree Somewhat disagree
 Strongly disagree No opinion

24. I would consider donating my own body for educational purposes?

- Strongly agree Somewhat agree Somewhat disagree
 Strongly disagree No opinion

25. I would consider donating my organs for medical purposes?

- Strongly agree Somewhat agree Somewhat disagree
 Strongly disagree No opinion

Creative and Reasoning Skills Are Low Among Health Sciences Students Who Rely Mostly on Memorized Templates: An Australian Case

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Abstract

Creativity is an important skill that graduates of medical and health science courses require to address challenges of their professions. This study used a non-traditional special tool to test skills of creativity, learned prediction and reasoning of undergraduate students of health sciences in an Australian university. It was the questionnaire with one multiple choice type and two open-ended questions. Answers were scored independently by three experienced university educators.

Correlations of scores the educators assigned indicated good reliability of the tool. Eighty-four undergraduate students attending medical and health sciences courses in the Faculty of Health Sciences, University of Adelaide, Australia were tested. Results indicate that less than half (48%) of students were acceptably creative while nearly 2/3 (64%) were adept at learned prediction. Less than 10% of students achieved high creativity scores. Only 1/3 of students achieved good scores for reasoning. It appears that undergraduate students are reasonably good at "learned prediction", that is at repeating what they have learned earlier, while their reasoning and creative abilities are inadequate.

Introduction

Creativity derives from the Latin word 'creare' meaning 'to produce'. It is a concept much discussed, but has many different definitions.¹ This definitional disparity is due to the use of the concept of creativity in many disciplines including psychology, anthropology, philosophy of science, theology, economics and business studies. One definition of creativity is offered by Csikszentmihalyi who connects it to individuals whose novel ideas have been recognized by social others.² Runco offered the following varied theory of creativity:³

"Creativity may be associated with expertise, eminence, and actual performance, in which case the hierarchy works as he initially uses it or it may be associated with potential and a personal kind of effective behavior, which may be artistic or simply self-expressive, in which case the inverted hierarchy may indeed be more appropriate."

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Creativity has been linked with higher levels of psychotism, while interactionist theory of creativity associates it with facilitating or inhibiting creative behaviors.⁴⁻¹¹

Psychological, environmental and motivational factors, particularly the latter, influence creative thinking. Bruner claims that creativity also involves an element of strong surprise or the 'eureka moment'.¹²⁻¹⁶ The afore mentioned definitions of creativity are consistent with those of other theorists.¹⁷⁻²⁵ Albertas proposed that creativity requires the strong skill of decision making along with intuitive and environmental factors and has further explained that creativity is also a social process, because certain individuals are considered to be more creative than others as they belong to a certain social stratum.^{26,27} Social attributions of creativity have a historical precedent, as novel thinkers may not receive the due recognition for their creative talents during their lifetime, but may get the recognition at a later time. The classic example of this is the 19th century impressionist artist Vincent van Gogh, whose art was deemed to be inappropriate and banal according to the social standards of his day while in the 20th century, the

changes in social values led to the recognition of his highly creative talents.

The role of creativity among students has received a great deal of attention. Chambers's seminal study on creativity of American college students indicates the importance of teachers' role in either encouraging or hindering student creativity and in fostering student creativity beyond the class room.²⁷ Chambers's assertions have been replicated in later years, but there is a general consensus that the school environments may not necessarily foster creative processes in students.²⁸⁻³⁴ According to the findings of Bhegetto & Plucker, the current practices in school based learning do not foster adequate development of knowledge to generate skills in individuals in a discipline and this leads to marginalization of creativity among the students.³⁴ The current methods of teaching and learning, and standardization of test scores have been identified as the factors that influence the above outcome of school students.³⁴

The economic rationalization of education at schools and tertiary institutions to generate graduates to meet the demands of the job market, introduction of cost cutting methods and also to run education as money generating/profit making ventures both in developed and developing countries may have further eroded student creativity in favor of uniform thinking amongst students.³⁵ This has certainly been the case in Australian universities since the early 1990's, that have primarily focused on earning much needed capital rather than on providing education appropriate for future intellectual and professional leaders. One of the effective methods of earning additional university income has been admission of students from other countries, especially from the Asian continent. The majority of the international students come from environments where the primary aim and the motivation are to learn in streams that qualify them to get into "high earning" professions. Traditionally in Australia, medical and legal professions have been considered as highly prestigious, thus university courses in medicine, dentistry, veterinary science and law attract the best high school graduates. Learning curricula of these professions, out of necessity contain a large element of vocational training concentrating on reliable repetition of standard procedures and memorization of large quantities of facts. Therefore, especially when teaching large classes of students for the sake of economy, the teaching programs concentrate on "imitation" mode with minimal or no room for encouragement of creativity.

Methods for Assessment of Creativity

Various tools have been used to measure creativity. The Torrance Tests of Creative Thinking are widely used, but they are not without problems.³⁶ These tests were designed to measure creativity of individuals from kindergarten to graduate level. They require approximately 30 minutes of test time in conditions specifically designed to encourage participants to "have fun". They do not measure learned prediction and reasoning at the same time. Furthermore, they do not measure special aspects of creativity such as, scientific creativity or creativity in clinical communication. To measure these aspects of creativity different methods of observations have to be designed.³⁷⁻³⁸

Taking these difficulties into account, we designed a novel method to measure simultaneously skills in learned prediction, reasoning and creativity among a sample of undergraduate students attending an Australian university. In this analysis, "creativity" is defined as the ability to leave structured paths and modes of thinking and use previously unconnected pieces of knowledge and experiences to arrive at an idea of how to solve a given problem. According to Geschka creativity is different from "learned prediction" and "reasoning" skills.³⁹ Learned prediction is defined as predicting a possible outcome from the knowledge learned through formal education or life experiences. Reasoning is taken as deriving a conclusion intelligently and logically using the facts at hand. Reasoning can use learned knowledge as well as newly encountered facts.

The above three skills are present in all "normal" humans, but at different levels and are used at different times according to the situations an individual is faced with. These are skills determined by genetic makeup and environmental influence, and the latter plays the major role. These skills may have been expressed by humans from very early days of evolution and it may be verbally, in writing, in art form or by physical action. Early cave art (e.g. Chauvet-Pont-d'Arc cave in southern France and Australia), as well as, other kinds of figurative art testify that by the Upper Paleolithic period (circa 40,000-10,000 ka) Homo sapiens had become sophisticated in their creative thinking.⁴⁰

Present day humans have many different ways/modes (e.g. computers, internet, television, radio, etc.) for learning, which were not available to people in the early 20th century and before. The marked progress that has been made in the environmental influences (i.e. in learning) should

increase the skills of creativity, learned prediction and reasoning in the present day people. It is difficult to compare the creativity, learned prediction and reasoning skills of people who lived before this time with the current human population because no quantitative uniform methods of testing the three skills could be retrospectively applied to the past. There are obvious age differences in creativity and there may be culture-specific differences, too.⁴¹

The method, established for this study is based on our experience as university educators, it is specific for university students and for Australian cultural environment. It may not be objective, but compares students' performance with our expectations based on knowledge of mental skills of previous generations of university students. The aim of the present paper is to share our impressions supported by structured examples in order to contribute to the discussion regarding quality of university education in the era of globalization.

All three of the authors have a combined experience of teaching at Australian universities for 50 years of contact with students in various professional programs. In addition, MH has taught in European, American, Asian and South African universities, AS taught in Asian universities, while JK has been a student and taught in Sri Lanka.

Participants

We have questioned 84 medical, health sciences and general science undergraduate students at the University of Adelaide, which is the third oldest university in Australia (established in 1875). In this university, medicine is a 6 year undergraduate course (different from 4 year postgraduate medical courses in America), while health sciences and science undergraduate courses last 3 years each. All courses admit "school leavers". The majority of the students while admitted to these courses were of 17-18 years of age.

Eighty four students from the University of Adelaide medical, health sciences and general sciences courses volunteered to participate in the study. The student sample consisted of 30 second year medical students, 30 third year health sciences course students, and five second and 19 third year general science students. Age, sex or the nationality was not taken into account in the recruitment of students into the study, since we aimed to obtain an unbiased sample of the local student population. We distributed and collected questionnaires in person, and thus we could observe sex and age of

participants while they returned completed questionnaires. We avoided making precise notes, but we have formed good impressions regarding sex and approximate age of participants. Both sexes were represented in approximately equal numbers while age was largely that of school leavers going directly into undergraduate university study, no participants appeared to be mature-age adults (30+ years). The study was approved by the Human Research Ethics Committee of the university.

Participants were informed about the purpose of the study (Table 1). This encouraged them to try to appear as creative as they possibly could be. Such an approach introduces a bias resulting from a student's understanding of the concept of creativity, which may be confused with exaggerated originality, but at the same time avoids attempts at "political correctness" of answers or self-censorship of more original, not to say weird, scenarios. Misunderstandings aside, we can expect that most respondents would try to be as creative as they could.

We have constructed a questionnaire consisting of three questions. The first one was a multiple-choice type, the other two asked for open-ended comments with no prescribed content or length. The only condition was the maximum number of words allowed (100) per answer to a single question. The multiple-choice type question was designed to measure the degree of stereotyping a decision, the first open-ended question (question #2) presented a scenario related to a situation the respondent was not expected to experience, while the third question asked for a scenario a respondent was likely to experience. Answers to questions two and three were scored on a categorical scale from zero to three separately for learned prediction, reasoning and creativity, each of those qualities being, theoretically, independent from the other two. Hence, it was possible for a particular answer to be scored zero for all three or scored 3 for each of the three qualities. Each of the three authors scored each answer independently.

Creativity Survey

We are interested in how creative University of Adelaide students are. We ask you to provide answers to three simple questions below. Your participation is entirely voluntary. We do not ask you to provide any personal information. Thus your answers will be fully anonymous. Your participation (or not) will not affect any results of your academic activities at all. By giving us your responses you agree to participate in this survey. You may retain a copy of this sheet (provided) for your records.

Your answers will be analysed statistically and will form a part of a research paper.

Thank you for your co-operation.

September 2009

Dr Arthur Saniotis, Public Health Prof Maciej Henneberg, Anatomical Sciences

1. Which videocamera is of the best quality (circle one)
 - a) HaoXing
 - b) Videodel
 - c) Buonquadro

2. Four people are stranded on an island following a mishap. They look around the island and find out that there is not enough food to sustain them for several weeks. And yet, 3 months later a passing ship notices people living on this normally uninhabited island, stops and picks them up. They are all in reasonably good health. How could they survive? (Use less than 101 words).

3. During an overseas travel, while in Thailand, a young Australian gets very drunk and the next morning finds himself in a small town far away from any city, without documents, money and the mobile telephone. He does not know the language. What would he do to return home? (use less than 101 words, please continue over the page)

Table 1: *The questionnaire used in this survey*

The first question asked for a choice of one of the three brand names of video cameras. All three names were fictitious. The aim was to assess student's learned perception/learned preference, or conversely their ability to innovate. The first name was made to sound Chinese (new on the market, growing economy, inexpensive) the second was supposed to be "international" (well-established, aimed at first-world markets), and the third sounded Latin (minority, unknown location, but outside of the First World).

The second question presented a rare scenario of survivors of a ship-wreck. We hoped that no respondents would have a personal experience of such situation and in presenting their scenarios they would have to rely on their imagination, general knowledge and memories of contents of commonly accessible movies, TV programs, magazine stories and books.

The third question related to a situation that can, however rarely, be actually experienced by a student. Here the respondents could rely on their own experience or stories told informally by their friends, as well as on generally accessible sources like travel advice or published accounts of tourist experiences.

Answers to the second and the third question were assessed qualitatively by the three Authors working independently. The Authors are experienced academic teachers and researchers in anthropology, science and medicine. The assessment consisted of giving scores from 0 (the lowest) to 3 (the highest) for three qualities; learned prediction (LP), creativity (C) and reasoning (R). It was assumed that LP and C are mutually exclusive while R could be applied to either of the other two.

LP was considered to be the use of previously learned knowledge, like repeating without serious modification a section of a movie or formal travel advice. C was considered to be an innovation and imagination. R was a quality of logical apposition of facts and drawing of possible conclusions.

After each Author assigned scores to all students for both questions, the Authors met and discussed those few cases where there were major discrepancies (i.e. a difference of 2 scores) in their assessments to identify the causes for each discrepancy. These differences in the scores occurred in a small number of cases where the answers were either non-logical or far from reality. Then, the specific cases were re-scored independently giving consideration to the discussion and the differences between assessors did not exceed 1 point.

Assessments of each component of each answer correlated significantly among the three assessors, though they were not identical (Table 2). This indicates a degree of the freedom of judgment as well as a degree of reliability and repeatability. Since answers were not structured, each assessor could recognize in them somewhat different qualities of a student. Thus, averaged scores of the three assessors are better reflections of the quality of an answer than individual scores. Despite some differences among assessors, their basic judgments were similar.

Assessors:	JK x AS	JK x MH	AS x MH
Learned Prediction	0.74**	0.79**	0.55**
Creativity	0.78**	0.77**	0.76**
Reasoning	0.46**	0.57**	0.53**

Table 2: Correlation coefficients between scores given for learned prediction, creativity, and reasoning, to individual participants by the three assessors. N= 84x2 questions. ** significant at 0.01 level

The questionnaire we used is newly constructed, thus its validity is unproven beyond the fact that scores assigned for the three components correlated among assessors and that scores for the three components given for answers to Question 2, correlated with scores for answers to Question 3 (Table 3). This indicates that answers to both questions allowed measuring of the same qualities of the respondents, as interpreted by the three assessors. Since the assessors are experienced academics, while our measurement tool was

purposely designed to measure three qualities of the university students, it can be argued that the creativity, learned prediction and reasoning as measured here reflect notions of these qualities in an academic environment, as perceived by the authors

property	Q 2 and Q 3 correlation
Learned Prediction	0.51**
Creativity	0.37**
Reasoning	0.42**

Table 3: Correlation coefficients between averaged over three assessors scores for learned prediction, creativity and reasoning assessed in answers to Question 2 and Question 3, N= 84. ** significant at 0.01 level

Parametric and non-parametric statistical methods were used to analyze the data. Simple moment-product correlation coefficients were calculated to express various relationships. Confidence intervals of percentage values and contingency table Chi-squared tests were used to compare distributions.

Results

Distributions of answers and answer scores did not differ significantly amongst the four groups of students taking different courses. Thus all answers were analyzed together.

The answers to the first question indicated that the video camera with a Chinese-sounding name was selected less often (approx. 18%) than those with Western-sounding names (approx. 30-40%) and the difference was statistically significant ($p < 0.05$) (Figure1). There was no significant difference between frequencies of choices of the two other names, thus we need to accept that they were equally appealing to students.

Due to score averaging for three assessors, individual qualities of each student had scores that were not always integers, but sometimes numbers with decimal fractions (0.3333, 0.66667). An average score between 0 and 1 meant that at least one of the assessors gave the student score of 1, while a score between 2 and 3 meant that at least one assessor gave the student the score of 3 while the other two gave a score of 2 due to the moderation of individual assessor scores to be within one unit of others.

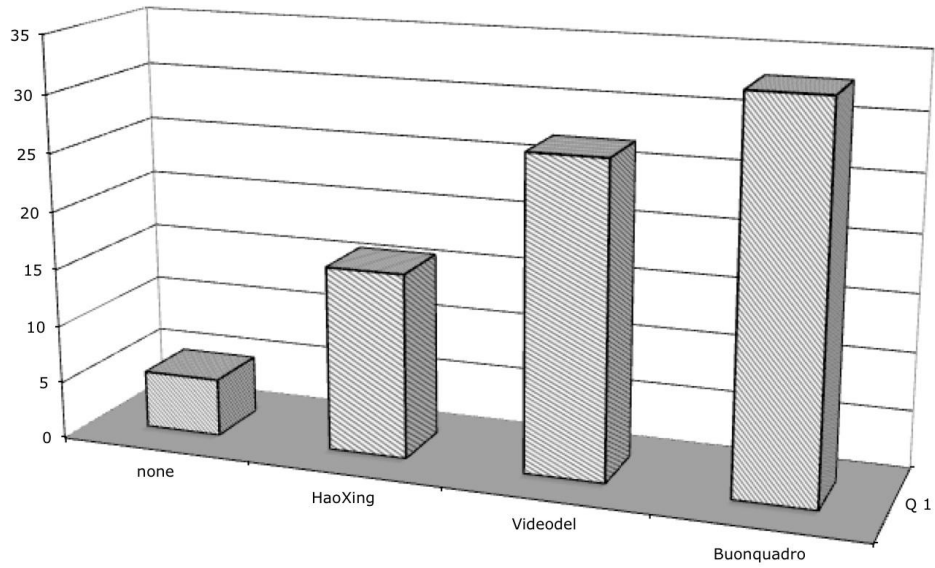


Figure 1: Distribution of answers to the first question (Table 1), N= 84. Names of the three videocameras were fictitious.

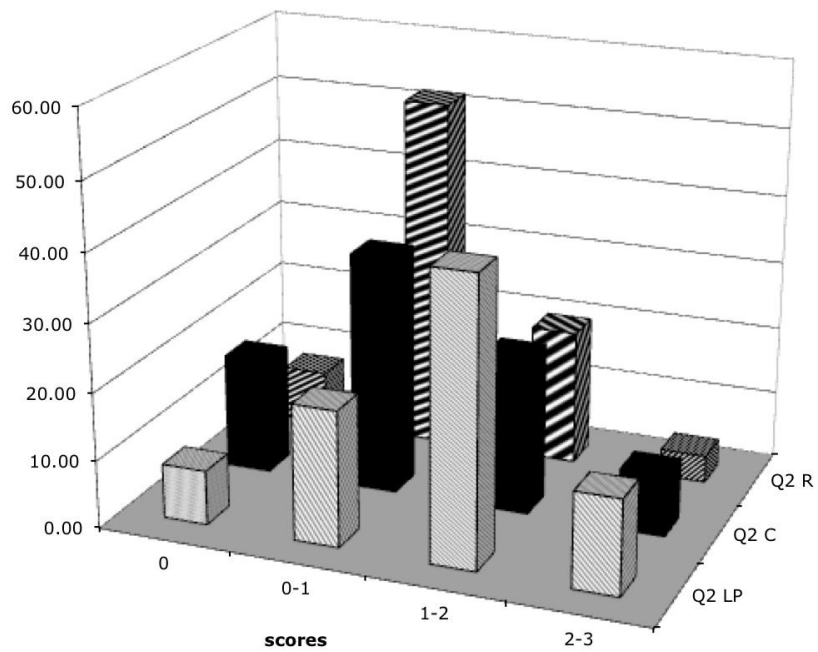


Figure 2: Averaged score distribution for answers to Question 2 (Table 1). N= 84. LP – learned prediction, C – creativity, R – reasoning

Distributions of averaged scores of the 3 assessors for Learned Prediction, Creativity and Reasoning in answers to Question 2 are shown in Figure 2. The modal value for learned prediction is 1-2 (50%) followed by 0-1 (24%) and by 2-3 (17%). The modal value for Creativity was 0-1 (42%) followed by 1-2 at a mere 27% while only 11% respondents got a score of 2-3. Strikingly 20% had creativity judged as null by all three assessors. Reasoning was most commonly assessed as 0-1 (over 62%), followed by 1-2 at just 24% and 2-3 at 5%.

These results indicate that cumulatively 61% of students had creativity scores 1 or less.

An example of answer to Q 2 that was scored high (2-3) for creativity and for reasoning (2-3), but low (1-2) for learned prediction, is:

“Firstly, using logs of trees and coconut hair to string them together they make rafts that let them go out to the nearby reef that had a healthy supply of tropical fish and strangely some abalone. Also the 4 people happen to be midgets meaning they do not need to eat as much food (lower energy requirements)”. This was given by 2nd year student of medicine.

Answers to the Question 3 were generally distributed in a way similar to the answers for Question 2, but emphasis shifted somewhat towards higher scores. For all three properties their distributions differed significantly (Chi-squared) from those for Question 2. Modal value for Learned Prediction was 1-2, like in Question 2, but at a higher percentage – 55%. It was followed by 0-1 at 30% and 3 at 8% (Chi-squared 9.04, df=3, $p < 0.05$). Creativity, unlike in Q 2, had its modal value at 1-2 (36%), followed by 0-1 (29%) and 2-3 at 21% compared to 11% for Question 2. This shift towards higher creativity scores is significant (Chi-squared 13.26, df=3, $P < 0.01$). Reasoning still had its modal value at 0-1 (44%), but followed closely by 1-2 at 39% which is significantly different from 24% in Question 2 (Chi-squared 11.87, df=3, $P < 0.01$). Similar to Question 2, more respondents got a score of 0 (10%) than 2-3 (7%) for reasoning. Overall 57% of students got scores higher than 1 for creativity.

An example of answer to Q 3 that was scored high for creativity (2-3), but lower for reasoning (1-2) and for learned prediction (1-2) is:

“Find a local and persistently follow them around until they become so annoyed they get someone who speaks English to find out how to get rid of you, then you get directions back to the main city.” This was given by a 2nd year Health Sciences student.

Another example is “He falls in radioactive waste, gains superpowers, flies into atmosphere, flies around till he notices familiar areas, flies home to Australia”. Scores for creativity (2-3), reasoning (0-1) and learned prediction (0 only). This response was by a 2nd year student of medicine.

An answer showing good learned prediction, but low creativity: [original spelling] “Thailand people believe in Buddhism. So begging for money and food, especially in the morning between 4-6 am when all other monks come out is very easy if he shaves all his hair to pretend to be a monk”. Scores for learned prediction (2-3), reasoning (1-2) and creativity (1-2). This was given by a 2nd year student of medicine.

An answer to Question 3 that had a good score (2) for learned prediction and low scores for creativity (0) and for reasoning (0-1), but was nonetheless colourful is:

“Run around, make them think that you are a re-incarnated God and get them to give you all their gold and vehicles (e.g. Bison rickshaw).” This response was from a 3rd year General Science student.

A highly creative (3) but low in reasoning (0-1) and learned prediction (0-1) was the following answer: “Play dead on the street and wait for someone to pick up his body to be transported to a funeral home. When he arrived, he could jump up and leap out of the coffin. Fortunately, the funeral home director was also Australian and could thus help him get home”. This is a response from a 2nd year Health Science student.

Summary scores for answers to both questions show that nearly 2/3 of students (64%) are adept at learned predictions (scores over 1), while less than half (48%) score more than 1 on creativity. This is also reflected in reasoning powers where only 42% achieve acceptable level (score over 1). Good scores (2-3) are achieved by less than 10% of all students (Figure 3).

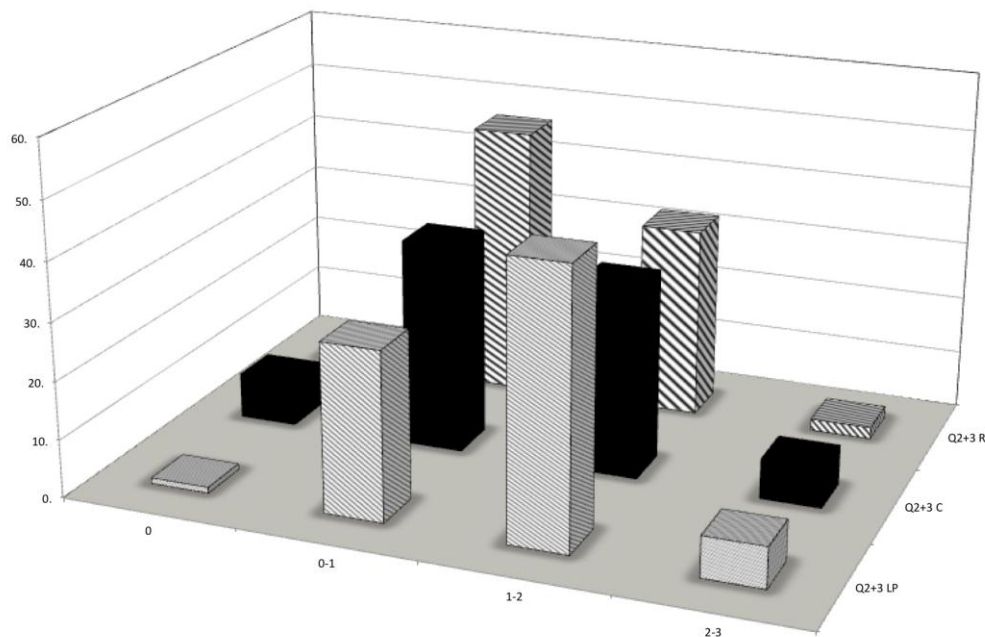


Figure 3: Averaged score distribution for answers to both Questions, 2 and 3 (Table 1). N= 84. LP – learned prediction, C – creativity, R – reasoning

Correlations between students' scores for learned prediction and reasoning and creativity and reasoning were significant at $p < 0.01$ and had fairly high values for both questions. (Table 4). There was, however, the lack of significant correlation between scores for learned prediction and for creativity for answers to Question 3 while in answers to Question 2 these two qualities were weakly correlated, though correlation formally reached the 0.05 significance level. (Table 4).

Correlation of	Question 2	Question 3
LP x C	0.23 *	-0.20ns
LP x R	0.40**	0.34**
C x R	0.52**	0.34**

Table 4: Correlation coefficients between averaged over three assessors scores for learned prediction (LP), creativity (C) and reasoning (R) within answers to each question. N= 84, ** significant at 0.01 level, * significant at 0.05 level

Discussion

General notions like creativity are difficult to quantify precisely. In this study, however, we have obtained a significant correlation between scores assigned by different assessors to the same answers (Table 1). These correlations for creativity scores were similar to correlations for less controversial qualities – learned prediction and reasoning. Like with any subjectively measured categorical variable, scores for the three qualities were not accurate, but

nonetheless they allowed us to discern differences among the three qualities measured and between approaches to the two differently constructed questions. Correlations between scores of answers to each separate question given by the same students are highly significant, but values of correlation coefficients indicate existence of some discrepancies between the answers. Each question gave the students different opportunities to use learned prediction, creativity and reasoning, thus lack of perfect correlations is understandable. It also indicates that averaging scores for both questions provides more general assessment of the three qualities.

We assumed that learned prediction and creativity are mutually exclusive qualities. This was borne out by the lack of significant correlation between scores for these two qualities for answers to Question 3 and by their weak and barely significant correlation for Question 2 (Table 4). The correlation coefficients for learned prediction and creativity indicate that at best a very small portion (less than 5%) of variance in creativity can be explained by variance in learned prediction. This is in contrast to greater correlation coefficients between reasoning and the other two qualities that are more significant (at least at $p < 0.01$) and indicate that more than 10% of variance in learned prediction or in creativity is explainable by variance in the reasoning. Reasoning is required in constructing answers based on both

learned prediction and creativity, hence these stronger correlations were expected.

There were errors resulting from a non-serious approach to answering questions by some participants, or from their misunderstanding of the questions.

Some respondents did not treat questions 2 and 3 as genuinely asking for solutions to described scenarios, but tried to find an error (a trick) in the question itself that would provide a simple answer.

An example of such response to Q 2 is: “The four survivors are not actually the 4 original people stranded on the island. Those 4 people died and new people got stranded and survived off carcasses of the original people” (By a 2nd year student of medicine). This answer was rated 0-1 for creativity, 0-1 for learned prediction and 0-1 for reasoning.

And to Question 3 is: “He does not know the language and others in this town do not know English. He just ask for help to go home”. This answer scored 0 for creativity and 0-1 for reasoning and for learned prediction.

Such answers clearly were not influenced by our disclosure of the purpose of this study being an evaluation of creativity of university students. No attempt at appearing creative has been made by respondents.

Even taking all errors and biases into account, a general picture can be discerned. Very few students are highly creative, they often rely on repeating previously learned answers, and their reasoning is not strong.

Higher creativity scores for Question 3 than for Question 2 can be explained by the difference in the way these questions were constructed. Question 2 described hypothetical situation, far from experiences and expectations of the majority of students. The Question 3 related to a scenario more familiar to students, their friends and families, and also more often related on the news. The fact that there was no difference of results between medical students involved in an integrated, student directed curriculum and students taking traditional courses indicates that even though the modes of learning are different, the curricula are not constructed to change student attitudes to learning.

The above findings indicate that current University undergraduates are not skilled in creative thinking (i.e. to generate novel thoughts), but are skilled in

making predictions using their learning or life experiences. This will indicate that the majority of the students graduating from the Medical and Science disciplines may be good in professions where they could apply/use their experience or what they learned (e.g. Clinical practice, teaching, working in diagnostic laboratories, working in laboratories that produce consumables for patient treatment or research). If they get into research, for example, they will use/apply already published research/research methods to a different tissue, different disease, to a different group of people, different population of people in a country or a different species of animal, etc. to generate publications. In research, individuals from this group are the ones who become very successful as they can become “publication machines” and attract research funding. The current trend in social success including academia is totally determined by the amount of dollars you could earn or bring into the institution. Therefore the current students either in “professional fields” or academia are more likely to take the ‘learned prediction’ path.

In most professions and normal living, skills of reasoning are of value. However, in some professions (e.g. Medical) strict protocols are in place to perform specific tasks. This practice reduces the requirement of reasoning skills. As academics in the current environment, what is our primary role? Is it to train students with skills in “learned prediction” or reasoning or creativity? This is a controversial issue since many tertiary institutions still claim that they foster creativity in their students. To what extent is this a feasible claim?

The small group of students, who are creative may be the individuals who use their knowledge and experience to invent/generate new concepts/products according to the area of specialty. Their success depends on the field of specialty or the opportunities available to them. The small proportion of students who are creative may also reflect the stress on non-creative thought in current high schools and universities whose examinations are formulaic and overly formalized. This may also reflect current societal trend in western societies which privilege more technocratic styles of thinking. This is being spurned by the use of the internet and media which are changing the English language to a more terse and succinct style. Furthermore, western societies are largely image based with little time afforded to critically analyze the kaleidoscope of daily images. Such a visually orientated world does not foreground critical thinking skills, but rather impresses on the brain to

focus on an array of sensorial experiences which may be linked to dopamine receptors. The neurotransmitter dopamine, among other functions, is involved in reward, satisfaction, and pleasure and may also be involved in addiction.⁴²⁻⁴⁵

As the noted English neuroscientist Susan Greenfield has pointed out, present visual technologies which are being accessed by the younger generations may be having an unknown effect on their brain development. Greenfield's notion is not supported by evidence, but has some merit. She declares that the demise of conceptual frameworks which are used as a means of critical evaluation of information and knowledge mainly by books and cross-referencing needs to be privileged.⁴⁶ Greenfield proposes that conceptual frameworks need to be developed concomitantly with visual technologies, if they are going to have any effect on maturing of minds.⁴⁶ Greenfield's concern is that, the Internet is a primary source of entertainment and information for youth in many countries and the majority uses it uncritically, when it could be a source of creative thinking and for the development of critical skills. Whether long term use of the internet will have negative spill on the development of teenage minds is presently unknown.

The concept of creativity has historically been tied to genius, while every human being is potentially creative and a key component of creativity is originality.⁴⁷ In other words, creativity inclines towards novel and innovative thoughts.⁴⁷ Creativity is also linked to utility which evokes effective states in others.⁴⁷

Moreover, 19th and 20th century psychologists found that creativity is also linked with free association. In psychological parlance, free association is defined as thinking processes that do not involve "conscious organization of events" into distilled categories. Here, the mind is allowed free reign that forays into unconscious thoughts.⁴⁷ In Jungian terminology, free association may be nurtured by the collective unconscious and its plethora of archetypes that organize the human psyche and inform conscious thought. Free association is often evoked by polyphasic states (non-ordinary states of awareness) such as daydreaming, visions, and trance states. From the opium inspired poem 'Xanadu' by Samuel Taylor Coleridge (1772-1834), to the visionary art of Austin Osman Spare (1886-1956), an array of artistic creations points to the creative capacities of non-ordinary states of consciousness.

The relationship between creativity and youth is a controversial issue. Neurological studies indicate that the neural mass of the brain increases right through childhood and adolescence and in adolescent brain the pre-frontal cortex is still developing, thus it is still premature. High risk and novelty seeking behaviors of adolescent males have been attributed to the lack of pre-frontal cortical development. The connections between the amygdala (critical region of emotional learning) and the pre-frontal cortex (region of decision making) are still being formed during adolescence. and when this process is completed is still unknown.⁴⁸ In agreement with these findings, CH Wu et al, 2005 have described the influence of age on creativity.⁴¹ Females reach mental maturity earlier than males, thus sex may also have an influence on creative thinking. Our sample of students was considered as one age group since, as mentioned earlier they were all young people, at least in our visual assessment. Although it is possible that there will be some change in creativity within age range of undergraduate university students, it should not be as significant as possible changes between people in their twenties and their sixties.

What this paper has presented is a challenge to educators who believe that creativity is alive and well at tertiary institutions. This is too simplistic and has not been testified by our research. What current research is unearthing is largely imitation, while creative or novel thought is privileged in human learning. The roots of imitation probably go far back in human evolution and it is the primary mode by which human babies learn. Horner and Whitten recently conducted an experiment on 4-6 year old children and 2-7 year old chimpanzees (*Pan troglodytes*) using a specially made opaque trap box.⁴⁹ In the experiment, Horner and Whitten demonstrated a series of unnecessary tasks on the trap box before extracting a piece of candy. Both chimpanzees and children successfully imitated these tasks and extracted the candy. In a second experiment, a clear trap box was used. The same tasks were performed by the researchers. What is interesting is that the chimpanzees apparently noticed that some of the tasks were unnecessary due to the presence of a ceiling in the trap box. Consequently, they by-passed the irrelevant tasks and took the direct route to access the piece of candy. In contrast, the children performed the same unnecessary part of the routine demonstrated by Horner and Whitten before extracting the piece of candy. Why did they do this? Horner and Whitten hypothesized that while 5-6 year old children may understand causal relationships involved in the trap box task, "they may not be able to apply this

knowledge until they are older". Importantly, what this experiment points to is that human children learn by imitating older people which is fundamental to the transmission of culture. Such imitation may still be apparent in the learning of human adults which by necessity negates creative thought.

Notes on Contributors

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KEYWORDS

Creative skills, reasoning skills

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Faculty and Student Perceptions of Readiness for Clinical Clerkships

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Abstract

Background: There is a paucity of literature focusing on what students and educators believe constitutes students' readiness for clinical clerkships. The purpose of this study is to gain insight into clinical faculty and students' perceptions of student readiness for clerkship education. **Methods:** Educational experts conducted focus groups and semi-structured individual interviews with third-year medical students and faculty who teach in clinical clerkships, including directors of the required rotations. Two authors independently coded the transcribed notes from the interviews to identify themes. Discrepancies were resolved among all authors in an iterative process. **Results:** Eight students and 15 faculty members participated in the interviews. While faculty focused on the need for students to be able to apply knowledge, be active in their learning, and display professionalism, students discussed their beliefs about why readiness for a "completely new environment" was unattainable. **Discussion:** Issues that impact perceptions about readiness include: defining professionalism in the context of a hierarchical system, the challenge of transferring learning to apply knowledge in new environments, and the teacher's role in facilitating and encouraging active learning. The differences in conceptualizations among faculty and students about readiness highlight the need for enhanced communication regarding expectations for students as they enter clinical clerkships.

Faculty and Student Perceptions of Readiness for Clinical Clerkships

Many medical schools follow the "2+2" model of undergraduate medical education proposed by Flexner in 1910, in which basic science courses and clinical clerkships are scheduled in sequence.¹ This curricular model presents challenges for students who encounter dramatically changed learning environments between their second and third year.^{2,3} Shifting from a primarily classroom-based environment to the clinical context requires transfer of learning and the application of classroom knowledge to interactions with real patients.³⁻⁵ However, research indicates that students often have difficulty with knowledge transfer, and shifting their knowledge structure from theory-to-practice (identifying symptoms given a disease) to practice-to-theory (identifying a disease given

symptoms).^{3,5,6} This challenge is often compounded by students' experiences of cognitive overload, which occurs when students are confronted with too much information to process and are unable to effectively retrieve information from their long-term memory.⁷ In addition to challenges of learning and cognition, research further indicates that transitioning students often experience difficulties with the socialization process and navigating the hierarchical structure of the clinical environment.^{3,5,8} Taking these findings into consideration, recent literature suggests that both students and clerkship directors have concerns about students' lack of preparedness for their clinical years, leading one group of experts to propose that "it is time to reexamine pre-clerkship preparation."^{9,10}

There has been a call to establish consensus in defining competencies for students prior to entering clerkship education; and further, to institute a national clinical skills curriculum for preclerkship students based on developmentally appropriate

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knowledge, skills, attitudes, and behaviors.^{11,12} In attempts to identify curricular models for pre-clerkship education, studies exist that describe and evaluate various courses and programs (including early patient interaction opportunities and transition courses) and their effects on student preparation.¹³⁻¹⁸ One such study by O'Brien et al. surveyed American and Canadian academic institutions to identify the objectives, content, and educational strategies in transition courses.⁴ The authors determined that while most courses incorporated relevant content to facilitate the transition for third-year students (e.g., "relationships and well-being, routines, norms, and cultures"), the educational strategies used were often not aligned with the goal of preparing students for workplace learning; most were primarily classroom-based didactic sessions and offered little exposure to the clinical context. Beyond investigating curricular innovations to prepare students for clerkship education, a survey conducted by Small et al. investigated second and third-year students' perceptions of the top three essential skills needed for clerkships.¹⁹ The perceptions of preclerkship students differed from those of their clinical colleagues. Preclerkship students viewed history taking, case presentation, and generation of differential diagnoses as necessary skills while clerkship students ranked interpersonal skills, history taking, and time management as the three most important skills. It is interesting to juxtapose these findings suggesting that students have particular beliefs about skills necessary for clerkships with those of Weinrich et al. who surveyed students and preclerkship and clerkship faculty to investigate the congruence of expectations regarding students' preparedness for clerkships.¹ The findings of this study suggest that while there were no statistically significant differences among the three groups regarding their expectations of basic science knowledge, students, preclerkship, and clerkship faculty had discrepant opinions about the clinical skills needed to be prepared for clinical clerkships.

While these studies offer evidence of the need for enhanced communication between students and faculty about the expectations of the knowledge and skills needed for clinical clerkships, they do not provide a full understanding of what it means to be ready for clinical clerkships. This insight would serve to clarify discrepancies between faculty and students' understandings of readiness as well as guide development of curriculum to prepare students and direct the choice of assessment activities to ensure readiness. Therefore, the purpose of this study was to explore the perceptions

of readiness for clerkship education of both students and clinical faculty.

Methods

This study used an inductive mode of knowledge inquiry (interpretive research design) with the intent to gain greater understanding of the lived experience of faculty and student expectations for roles and responsibilities in clinical clerkships.²⁰ A purposeful sample, which involves "selecting individuals who can provide the richest information in regard to the purpose of the study," was identified.²¹ Potential participants, including third-year medical students and clerkship directors, were contacted via email. Clerkship directors were asked to identify additional faculty members who teach in the clerkships, and these individuals were also contacted. Recruitment of participants continued until saturation was achieved. Saturation is the point in time when the researcher believes that he or she has heard the full range of ideas from participants and additional participants are not supplying new information.²⁰

One of the authors (JJ) held focus groups or semi-structured individual interviews using a guide created by the authors through a consensus-building, modified Delphi method. Each interview guide consisted of five questions (Appendix A). Faculty and students were interviewed separately. Questions for faculty and student sessions were purposefully crafted to mirror one another. For example, while students were asked, "What does it mean to be ready for clinical clerkships?" faculty were asked "What does it mean for a student to be ready for clinical clerkships?" Each interview session lasted approximately 45 minutes to an hour. The interviews were recorded and transcribed for analysis.

In conducting the analysis for this study, two authors (JJ and ET) independently reviewed the transcripts to identify essential elements of the discussion. The authors coded the notes identifying preliminary themes. Analysis was done using a constant comparative method (CCM) to categorize and code the data based on emergent themes.^{22,23} Through an ongoing process of "comparison and reflection," coding was further refined through discussion with the third author until consensus was reached.²² Quotes from the transcripts that exemplified the themes were chosen as representative of common ideas expressed by the participants. This study was approved by the Institutional Review Board at the academic health center where the study was conducted.

Results

Data gathering took place over a nine month period at a medical school located in a suburban area in the northeastern United States. The curriculum at the medical school includes clinical learning experiences in the first two years which are focused on clinical skill development. The basic science courses incorporate large group, didactic sessions, laboratory sessions, as well as problem-based learning and small group discussion sessions. Orientation sessions for the clerkships are provided in a large group session during the second year as well as at the beginning of each clerkship rotation. Orientation sessions outline the policies, procedures, and structure of the rotations.

At the time of the interviews, student participants had between three and ten months of experience in clinical clerkships. Five of the faculty participants were clerkship directors and the remainder of the faculty were clinical educators who teach in the clerkships. There were a total of 23 participants including eight students (four male, four female) and 15 faculty members (nine male, six female).

Faculty Perceptions

Faculty ultimately conceptualized student readiness for clerkships as: having a depth of reproducible knowledge; being an active learner; and demonstrating professionalism.

Having a Depth of Reproducible Knowledge

Faculty initially defined readiness in terms of the basic science knowledge students must possess prior to entering the clinical environment. More specifically, there is a certain “depth of knowledge that we expect them to have,” as one physician noted, which essentially involves attaining mastery of “the basics.” The “basics” were defined as “the underlying medical knowledge, like the pathophysiology and the biochemistry and the pharmacology.” However, beyond simply having a deep understanding of particular scientific knowledge, emphasis was placed on the ways in which students need to be able to apply or “reproduce,” as one physician put it, this knowledge in the clinical context.

Faculty believed students need to be able to work through clinical problems and to articulate their thought processes. In other words, it is expected that students are able to process information from the patient encounter, and use their medical knowledge to come up with, and articulate, a differential diagnosis. One faculty member described this expectation, stating: “We would

anticipate that when they arrive at the third year that they have some basic understanding of pathophysiology,” and went on to note, that students should “know how to take a basic history from a patient...then be able to somehow put that together and come up with at least a brief differential diagnosis.”

Faculty members expressed a desire to hear students’ thought processes expressed to ensure that the students understand the reasoning underlying patient care decisions. Referring to this as working through “the deeper thought process,” a number of participants suggested that this is an area where students often struggle, stating that the context in which clinical learning occurs presents barriers that prohibit students from working through this process. Students generally see patients who have already been diagnosed and rarely see physician educators, whose primary focus is on the care of the patient, role model this behavior. As such, faculty expect students to articulate their thought processes even though such behavior is not exhibited by more senior learners or by faculty themselves. For example, one physician noted, “they’re jumping to treatment, they’re jumping to test, without thinking, I need to develop a differential diagnosis...I’m not sure where they’re getting that. Maybe it’s on the wards of the hospital;” while another stated, “they want to help so they...try to be as focused as they see other people functioning in that environment and so they are trying to cut corners.”

Being an Active Learner

Faculty commonly expressed concern over students’ lack of initiative in terms of seeking out opportunities to learn. One participant, who expressed frustration in regard to students being passive learners, asked “Do they feel that it’s their responsibility to make sure they learn...or is it the faculty’s job to kind of spoon-feed them everything they need to know?” Similarly, another suggested that, “They kind of take on a very passive role ... and I think it’s disappointing when...you almost have to push them along to learn. And to me, that bothers me more than a student who came in not knowing as much.”

Being an active learner was discussed in terms of being “motivated and [taking the] initiative to learn.” For instance, one participant noted, “I think that third-year students should be very enthusiastic and ... take on a very active role,” while another stated, students should be “excited about learning.” In this regard, faculty talked about how some students seem more ready than others to take on

this role. As one physician stated, “there’s an element of just needing to take the initiative and just kind of jump in, and some students are more ready to do that than some students who are more willing to sit there and be an observer.”

Demonstrating Professionalism

Faculty also spoke of readiness in terms of students’ professionalism. Physicians felt they knew what constitutes professionalism or the lack thereof, although they struggled to provide a specific definition for the term itself. As one physician stated, “it’s one of those things you recognize when it’s not there.” Another participant noted, “I think absence of what we call professionalism...is more glaring than being able to find that the student has it.” In describing what professionalism means, physicians often referred to the adoption and demonstration of certain attitudes or behaviors that students are expected “to exhibit immediately the first day that they show up in a white coat.” Specific components of professionalism were delineated: having a sense of “ownership,” “altruism;” displaying “empathy, sensitivity, caring.” Other physicians noted that professionalism is about having “a sense of professional decorum;” maintaining “a reasonable attire, a reasonable demeanor;” and “behaving in a way that patients and colleagues could respect.”

Physicians also described professionalism as encompassing the essence of what it means to be a physician. Representative of this commonly expressed sentiment, one doctor stated “you get to the third year and...now we’re talking about being real doctors. You have to talk like a doctor. You’ve got to act like a doctor. You’ve got to be a doctor. You’ve got to stay up. You’ve got to read. You’ve got to be there early. You’ve got to be there late.”

Student Perceptions

Students suggested that readiness is not something that can necessarily be attained, stating for example, “I don’t know if there is a way to be ready per se” and “I don’t think you can really prepare to be on the floor so much.” Students attribute this inability to be ready for clerkships to: decontextualized classroom experiences, a lack of awareness of the hospital culture, and to ambiguous expectations.

Decontextualized classroom experiences

Students suggested that while preclerkship education was important, it lacked contextualization. As a result, it did not enhance their feelings of readiness for learning in a clinical environment. One student, for instance, noted:

I mean you can know as much as you can know about the pathophysiology of disease but until you’re really in there and seeing it...I don’t think you can really fake that or simulate that... It’s good to give us a flavor of that...I don’t know if any medical student is gonna feel 100% confident walking in the door.

Other students cited examples of how classroom learning and simulations fall short in preparing them for what they experience in the clinical setting. One student stated, for example, “we used a lot of mannequins; a mannequin’s not the same thing as a real person.” Interestingly, however, students did not see this as problematic. Rather, they understood this to be the nature of medical education and stated that the purpose of clerkships is to provide exposure to clinical medicine. In this regard, one participant stated:

It’s very difficult to prepare for a completely new environment, but I believe that’s why we have two years of clerkships because you can’t prepare for it. If you could prepare for it, you could just go to medical school and then go on to an internship because you can do it in the classroom but I don’t think you can. I think that’s why we go out on to the floors and why we have these clerkships...And if we don’t have this experience you can’t learn it. You can’t learn it in the classroom.

Students noted that beyond skills and knowledge, discovering how to navigate in the hospital culture is also something for which classroom learning cannot prepare students.

Lack of Awareness of the Hospital Culture

Students indicated that they did not feel ready for the social adjustments that accompany transitioning to the clinical workplace. In particular, a number of students noted that they were “surprised” to see “how the hospitals work.” As one student noted, “the social piece...learning the culture of how hospitals work...and how doctors and nurses work, that took a lot of people by surprise.” Similarly, another student emphasized that despite previous learning about the hospital setting, this experience is still a significant adjustment:

You've all of sudden gone from studying books to here you are – you're now a member of the team and you have to figure out how to fit into the team. Quite often, people are not there to hold your hand, help you out and explain how the ward works ...You not only have to take care of people, talk to people, do a good history and physical, but you have to mesh with your teammates...which you know is something you learn about but until you experience it, it's a trip.

According to students, one of the most significant components in attempting to become members of the team and learning how the hospitals work, is to understand the clinical hierarchy and to determine one's role within it. Coming to understand this hierarchy, according to one student, meant realizing the "pecking order that exists in the doctor level...going in and being told you're subservient to the fourth-year, who's underneath the intern, who's underneath the resident, who's underneath the attending." The lack of awareness of the culture within the clinical workplace led not only to feeling ill-prepared but also to a belief that "it's just really difficult for medical students to enculturate."

Ambiguous Expectations

Students also perceived difficulty in knowing how to be ready for clinical rotations, as the expectations varied so greatly among the different clerkships. One student noted, "Like I feel real comfortable going there in the morning. One second I'm allowed to put in an order and another second I'm not. I mean, I have no clue what my expectations are." Similarly, another stated, "Am I supposed to be putting orders into the computer...Am I supposed to be presenting to the attending or is that the residents' job? I mean these things aren't told to you the first day of the rotation." As indicated by these students, expectations are often implicit. However, students had unique feelings about how to navigate this uncertainty. Some suggested, "if you don't ask what the expectations are, more than likely, you're not gonna know. They're not gonna tell you." Therefore, it is critical to directly ask an attending. Others suggested that "it's difficult to sit the attending down and say 'what are your expectations of me?' They don't have time." Those who chose not to seek out explicit answers regarding expectations, often talked about determining what was expected of them by trial and error. One student stated, "you kind of have to do it by trial and error, and sometimes you'll get applauded for doing what you're doing and sometimes you get completely shot down. And then you just know."

It is important to note that there was also recognition among faculty participants that students are often not provided with explicit expectations and that this can be problematic during students' transition to the clinical environment. As one physician stated, "many of these things are unwritten or unspoken and attendings and residents have an idea of what they expect, and medical students think they have an idea of what's expected of them and those two perceptions are quite different." Another faculty member suggested, "I know what my...advisees are told because I tell them, here's what you can expect...other people don't do that."

Discussion

The clinical faculty participants in this study had well-defined conceptualizations of what defines student readiness for clinical clerkships. Faculty expect students to begin their clerkships with an established knowledge base and to be active, motivated learners who are professional in their approach to their role and to the care of patients. Students, on the other hand, consider the concept of readiness to be inconsequential and feel that the primary challenges of learning in the clinical setting include being able to: transfer knowledge, figure out how the "system" works, and determine what is expected of them. These findings lead to a number of issues to be considered when designing curricula to help prepare students to be ready for learning in clinical settings. First, when objectives surrounding basic science learning are established, these objectives need to address the challenge of transferring these "basics" to the clinical context. Second, if professionalism and active learning are to serve as criteria for readiness, these constructs must be clearly defined as observable behaviors. Finally, and perhaps most importantly, expectations in regard to student readiness must be communicated, and common understandings need to be established among faculty and students. Ultimately, the results of this study suggest that the criteria for readiness must be meaningful for both faculty and students and the criteria must translate into agreed upon expectations.

In this regard, it is clear that the lack of explicit expectations during clinical clerkships has a significant impact on students' perceptions of readiness; as they feel unable to prepare for the unknown. In terms of implications for teaching practice, it is clear that medical educators must become more explicit about expectations (e.g., what to know, what behaviors/attitudes to possess, and what type of learner to be); such implications

support recommendations made in previous studies. Wenrich et al., for example, propose that communication about expectations must be enhanced not only between faculty and students, but also between preclerkship and clerkship faculty.¹ They argue that creating congruent explicit expectations among faculty will help to integrate student learning as well as alleviate student anxiety.

The notion of student anxiety is not new to the medical education literature describing the experiences of third-year students; and thus, it was not surprising that students in our study reported anxiety and bewilderment over expectations. Addressing this anxiety among students, Small et al. recommend that programmatic changes be implemented to more closely “align the content of the curriculum with student experiences on the wards;” in order to better prepare students for the experiences they may encounter in clerkships.¹⁹ These recommendations parallel those of O’Brien et al., who argue that many transition courses lack contextualization and the experiential component that would enrich students’ understandings and ability to apply concepts to the clinical context.⁴

Our findings support these recommendations. Students agree that much of their prior classroom education was not contextual in nature, and therefore could not completely prepare them for what they will experience in the clinic. However, our findings also lead us to question the ability of transition courses to prepare students for the expectations of educators on their various rotations. More specifically, our study shows that each rotation and clinical educator has unique nuances in regard to expectations. As such, students felt that their teachers’ expectations changed almost daily and that they were forced to work under “trial and error” conditions in order to determine the individual expectations espoused by each educator. In terms of practical implications, we suggest that all clinical educators take the time to understand what students are informed about in their transition courses and orientations in regard to expectations, as well as to explicitly communicate to students any individual expectations that they have, that are not articulated in these formal courses.

In addition, we suggest that the need to be explicit about expectations goes beyond simply telling students what is expected. Teachers must also model what is expected. The fact that faculty in our study suggested that they are frustrated when students fail to articulate their thought processes when coming up with differential diagnoses or when they “cut corners” or “jump to test” while also

acknowledging that this is something that is not generally modeled to students, highlights both the challenges students face in figuring out what is expected of them as well as the need for enhanced communication in regard to these expectations.

In this study, faculty also commented on the importance of professionalism as a component of readiness. This concept appears to transcend specialties, and yet remains an ill-defined precept. The challenges of defining and teaching professionalism are documented elsewhere.²⁴ Beyond defining this term, however, it is important to consider professionalism within the clinical hierarchy; more specifically, how appropriate behaviors and attitudes are linked to one’s role/title. In this regard, it is critical to reflect on the impact that the hierarchical culture of medicine plays in defining professional behaviors, and how this culture may silence those on the margins; perhaps forcing students to abide by specific norms and ideologies in order to ensure their success as physicians.

Finally, two additional, but overlapping concepts must be considered: the need for students to be able to use and apply medical knowledge from the classroom in the clinical environment and the need for students to be active learners once in the clinical setting. It appears that when considering these factors in conjunction with one another, one finds a paradox of medical education. While there is an appreciation for the value of situated, or contextual, learning in medical education, there simultaneously exists a belief that a large volume of information needs to be learned by students prior to the clerkships.^{2,10} The more knowledge that is required, the more likely educators rely on didactic, transmission style formats for teaching; formats that reward students for being passive learners. Therefore, the struggle is balancing the need to prepare students for situated (contextual) learning while also helping them to acquire the broad knowledge base needed to successfully participate in their clinical clerkships. Efforts to incorporate innovative teaching strategies and to design fully integrated curricula represent attempts to address this dilemma.²⁴ While these attempts offer promise for many of the challenges experienced by students, we believe that further research is needed to explore how early contextual experiences and teaching innovations may facilitate students’ understanding about readiness for clinical clerkships as well as address issues of learning transfer.

When reflecting on these findings it is also important to consider the limitations of this study. The results represent the perceptions of a small

sample of clinical faculty and students from one institution. This limits the ability to generalize the results. In addition, basic science faculty did not participate in this study. Despite these limitations, the perceptions expressed by participants help to define the range of issues that impact student readiness for clinical rotations. The perspectives provided also suggest specific teaching behaviors that may help to close the gap between the diverse opinions articulated by faculty and students.

Conclusion

To ensure readiness for clinical clerkships, it is essential for faculty to take the time to develop an understanding with students about expectations for performance. Importantly, this discussion must include specific examples of how expectations are to be translated into observable behaviors. Expectations must also be reinforced by faculty simultaneously role modeling the behaviors they wish to see in students' practice. Additionally, faculty must recognize that facilitating students' contextual learning in the clinical environment involves reaching out to them and helping them to connect their current experiences with their prior knowledge. In reaching out to students in this way, it is crucial that faculty also critically reflect on their own journeys to becoming physicians, so that they can provide the empathetic support required during this critical transition into the clinical practice of medicine and this important step in the development of the students' professional identity.

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Key Words

Clerkship readiness; clinical education; clinical competence; medical education

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Appendix A

Student Interview Guide:

1. What is it like to be a third-year student?
2. Do you think you were ready for your third year? Why? Why not?
3. What does it mean to be ready for clinical clerkships?
4. In what ways did your previous coursework prepare you for your third year? In what ways did it fail to prepare you?
5. What would have helped you to better prepare for your third year?

Faculty Interview Guide:

1. How would you describe the typical third-year medical student?
2. Are they ready for their third year? Why? Why not?
3. What does it mean for a student to be ready for clinical clerkships?
4. In what ways does the curriculum prepare students for their third year? In what ways does it fail to prepare students?
5. What would help students better prepare for their third year?

Transformational Leadership and Healthcare

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Abstract

There are numerous published observations, surveys and recommendations that provide insight and advice on how to become an effective leader in healthcare, although much of this literature is not empirically based. This paper reviews the basic tenets and approach to transformational leadership and describes it in the context of several factors that are important for adoption in the healthcare environment. Transformational leadership is an empirically based form of leadership whose basic tenets and approach make it appealing for greater adoption in health care settings. Medical trainees at all levels and their supervisors should be trained in the principles and application of transformational leadership.

Introduction

There are many books and publications on leaders, leadership and the qualities physicians and others must have or learn to become successful leaders. As Xirasagar et al. point out, however, “the published literature on physician leadership...is normative, prescriptive, anecdotal, or observational, based on qualitative opinion surveys...Physician leaders are currently trained with ad hoc adaptations of program content developed for business and industry”.¹

Educators and teachers in the healthcare fields would benefit from knowledge of leadership approaches that are empirically sound and appropriate for the healthcare environment. Weber’s review of the literature suggests that transformational leadership may be such an approach. “Transformational leadership has the potential to transform healthcare from the bedside up” and “Healthcare systems should facilitate transformational leadership for the ultimate purpose of creating healthy work environments, improving job satisfaction, and reducing staff turnover rates”.²

“Transformational leadership,” has gained wide recognition over the last quarter century or so. It has several characteristics suggesting its potential value in the healthcare environment and in medical education, including its principles and values-driven

approach; its emphasis on relationships between leaders and subordinates; its empirical support; its intuitive appeal; and its intention to “transform” and enhance the growth and work related experiences both of subordinates and leaders.

This paper will describe transformational leadership and discuss its potential utility in medical education and the healthcare environment in terms of the characteristics noted above.

Transformational leadership

J. M. Burns is credited with first describing transformational leadership in detail. Transforming leadership “occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality...”³

Bass and Riggio describe transformational leadership as involving a series of processes that include idealized influence, inspirational motivation, intellectual stimulation and individualized consideration.⁴ These four tenets of transformational leadership, with examples relevant to healthcare, are described in Table 1.

Idealized influence refers to the importance of leaders’ vision and the principles and values on which this vision rests. Inspirational motivation refers to the ability of leaders to communicate and inspire subordinates through confidence, optimism and enthusiasm. Intellectual stimulation refers to leaders’ ability to appropriately challenge subordinates to seek solutions to vexing issues that go beyond usual approaches or expectations.

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Individualized consideration refers to leaders' attention to and support for the growth and development of subordinates.

Characteristics of transformational leadership. Are they appropriate for medical education and the healthcare environment?

a. Principles and values driven

Transformational leadership requires that leaders demonstrate to those in lesser positions of authority (e.g. supervisees, students, residents) a clear sense

of vision and purpose. What does the leader believe in? What is his or her vision? What statements, actions or decisions do leaders make and communicate that demonstrate and express their goals? This relates to the first two core principles (Table 1).

Item	Process	Examples Relevant to Healthcare
1	Idealized Influence	The leader is recognized as a model, an individual who provides a vision and upholds principles that maintain and further the organizational mission. The leader's vision is pursued with confidence, determination and focus. Other physicians and healthcare personnel working with leaders with idealized influence respect them and are proud to be associated with them. In the healthcare arena, specific emphases are placed on longstanding core principles in medicine, such as beneficence, respect for autonomy, non-maleficence, and pursuit of lifelong learning. Choosing to implement an electronic health record despite opposition, for example, is justified to others based on expected improvement in health care outcomes.
2	Inspirational Motivation	The leader is able to communicate his/ her vision, principles and adherence to the healthcare mission effectively. This occurs in written and verbal forms, and through personal behavior as well as specific statements. Leaders with inspirational motivation are able to motivate and energize subordinates based on their abilities to convey their vision and values that reflect deeply held principles. The leader, for example, may take on extra patient care duties during times of staff shortage as he or she asks others to do the same.
3	Intellectual Stimulation	Leaders exhibiting intellectual stimulation challenge those working under them to question the status quo and to address difficult problems by coming up with new or innovative solutions. Leaders support subordinates in their efforts, while encouraging them to demonstrate initiative and independent problem solving skills. The leader encourages subordinates to be resourceful and innovative. In healthcare, leaders challenge subordinates to develop new, more efficient ways to provide medical care to patients, perhaps by improving specialist-primary care communication, thus improving outcomes, saving time and conserving resources.
4	Individualized Consideration	The leader recognizes the contributions of subordinates for their efforts and accomplishments in pursuit of the healthcare mission. Leaders demonstrating individualized consideration recognize their subordinates' individuality, personal needs for growth and their unique developmental potential. Leaders provide mentorship or coaching to subordinates to foster their growth and development. In healthcare, for example, leaders recognize particular individuals for their accomplishments in implementing systems of care that reduce medication errors through electronic prescribing, or for developing programs that increase work engagement and reduce burnout.

Table 1: The four major components of transformational leadership with applications to the healthcare environment

Developing a vision requires leaders to have a strong sense of their own guiding principles. Doctors in nearly all of their roles are privileged and perhaps ahead of the game in this area. Over the centuries, in the many oaths and declarations that have been part of the physician's rite of passage, a series of ethical and moral themes have guided the profession. The predominant ethical theme or values orientation in medicine is "beneficence" or the desire of the physician to help those who come to him or her in need. Other basic ethical values that should be among the principles guiding leaders in healthcare include: respect for others, justice, non-maleficence and lifelong learning.^{5,6} There are of course other basic principles that are important for leaders in medicine, as is true for all leaders. These include trustworthiness, honesty, and dependability. In essence, medicine is a values-oriented profession and its leaders and educators must reflect and model these values while inspiring others to approach their activities in the same way. The first two core principles of transformational leadership emphasize this point.

b. Relationship oriented

Medicine and healthcare are relationship oriented professions. Successful healthcare professionals should be competent to establish strong alliances with patients and colleagues that are based on trust. Transformational leadership requires leaders to encourage, support and/or challenge those in lesser positions of authority to find additional or better solutions to situations or problems that arise. Leaders encourage others to be innovative and active problem solvers. This is the third core principle demonstrated in Table 1.

Transformational leadership also requires that leaders recognize those in lesser positions of authority when the latter have been successful and that they treat those in lesser positions of authority as unique individuals, with their own developmental needs and potential for growth. This is the fourth core principle demonstrated in Table 1.

c. Empirically supported

Numerous studies support the efficacy of transformational leadership in a variety of settings. Transformational leadership in healthcare has been found to improve staff satisfaction and empowerment, while decreasing burnout.^{2,7-9} There are suggestions it also improves clinical outcome measures.¹ These features have been reviewed by Bass and Riggio.⁴

d. Intuitively appealing

Transformational leadership is an intuitively appealing leadership approach. This is because its core strategies are the same or similar to core strategies that seem to work in many other relationships involving people at different levels of authority in which the person with greater authority attempts to influence the person with lesser authority. This is true regardless of whether the relationship is between teacher and student, mentor and mentee, supervisor and supervisee, employer and employee, physician and patient, or psychotherapist and client. It is especially appealing since its core characteristics are similar to the principles, ideals, relationships and value for empirical support that are held to be central in healthcare and medical education.

e. "Transformational" potential

Burns indicates that "Transforming leadership ultimately becomes moral in that it raises the level of human conduct and ethical aspiration of both leaders and led, and thus it has transforming effect on both".³ Transformational leadership, therefore, draws subordinates closer to their ideals and raises their expectations. It motivates followers to do better, to go beyond usual expectations, to value their work more, and to strive for greater achievement. Success in a principled endeavor becomes a meaningful and transforming accomplishment.

Case illustration

The following does not describe a specific patient-related incident, but is based on the author's cumulative experiences in the health care field:

During scheduled hospital rounds a group of junior residents were meeting with the training director. One of the junior residents rather excitedly presented the case of a middle aged man, who had been admitted a few days before, with a pleural effusion secondary to advanced cancer. The residents had discussed the case with the attending physician and it seemed to them that a thoracentesis should be performed to reduce the pleural effusion. The junior resident was eager to do the procedure, which he had not done before.

The training director listened to the presentation and said she agreed with the need for the thoracentesis. She then said that she hoped the procedure would help the patient and that his quality of life would improve. Her statements seemed to emphasize not only the medical procedure, but also the adjustment of the patient and family. She inquired how they were doing in

dealing emotionally with his recent diagnosis and apparently poor prognosis.

The resident seemed surprised at the training director's direct statement of hope and that what was being done would be "helpful" to the patient and family. Such statements were perhaps assumed but not directly stated on a busy unit with a rapid turnover of patients. He also was not prepared to discuss the patient's and family's reactions. This became clear as he seemed ill at ease, hesitated, and finally mentioned that he had not yet had a chance to talk to the patient and family about those issues. He planned to speak with them later that day. The training director wondered if they might need additional support since the diagnosis had only been made recently.

On rounds the following week, the training director again asked how the patient and family were doing. The resident spoke of the uncomplicated thoracentesis and of his discussion with the patient and family about his cancer, the prognosis and the treatment that was to be recommended. He spoke about the patient's experience of the illness and the family reactions. He felt that the patient had a realistic understanding of the illness, given the recent diagnosis and had necessary support from his family. A daughter was having difficulty accepting the diagnosis, however, and the resident talked about offering her a chance to talk to the pastoral counselor in the hospital or making an outside referral for counseling. The training director indicated that it was good the resident had begun to address these important issues with the patient and family and that his idea of pastoral counseling was a good one if further support was needed.

Comment

The training director demonstrates transformational leadership in this vignette. She goes beyond the discussion of the medical procedure, and urges the resident to address other aspects of the patient's care that he does not seem to have considered sufficiently. Her direct statement of hope that the procedure would "help" the patient openly states her emphasis on the broad principle of beneficence that goes beyond the technical aspects of the case. This is an expression of idealized influence. She seeks to inspire the resident by pointing out the importance of his relationship with the family and the need for completeness in his approach (inspirational motivation). She follows up with the resident, recognizing that he would benefit from greater attention to his development as a more complete physician. She challenges him to consider whether there is more that could be done to support

the patient and family (intellectual stimulation). She appropriately acknowledges his efforts around the patient and family intervention that he has made (individualized consideration).

This illustration highlights characteristics of transformational leadership that make it valuable for medical education and the healthcare system. The interaction clearly is based on principles and values crucial to medicine. It is relationship based and is intuitively appealing since it overlaps with what physicians recognize as good training and clinical supervision. It may be transformational in that it urges the resident to a higher level of medical practice. Finally, research has shown that individuals who have had transformational leaders early in their careers are more likely to become transformational leaders themselves, thus providing additional support for the empirical basis of this approach.⁴

This illustration draws on a clinical teaching situation to illustrate transformational leadership. It should be noted that the same principles have been shown to be important in a variety of settings. Physician leaders who are medical staff presidents, chief executives of health care organizations, academic chairs of departments, residency training directors or treatment team leaders and group practice leaders all can benefit from the application of these principles.

Implications for medical education

Education and training in healthcare, as in many fields, has hierarchical elements that are similar to the leader/follower, supervisor/supervisee relationships described here that benefit from the application of transformational leadership. As in the illustration, this clearly is the case for the relationship between directors of medical education or residency training and medical students or residents, respectively.

The application of transformational leadership principles in medical education, however, should not be confined to these generally accepted hierarchical roles. The old adage, "see one, do one, teach one" should not be taken in a flippant or casual manner to suggest that medical procedures of any type can be taught or learned quickly or casually. The adage, however, does reflect an accepted pattern in which more senior level trainees "lead" and teach their more junior colleagues in a form of supervisor/supervisee relationship that would benefit from an awareness and application of the principles of transformational leadership.

The junior resident, for example, instructs/leads the medical student on a clerkship. The junior resident in turn is instructed or led by the senior or chief resident. Faculty members or staff physicians participate in the same manner, leading and teaching all of the residents and students under their supervision.

Transformational leadership is a paradigm that is applicable to all of these levels of medical education. Faculty members, chief residents, and others in teaching roles should exemplify and embody the ideals and mission of the healthcare enterprise (idealized influence). They should teach and attempt to provide inspirational motivation to junior residents and students who may be at the stage of “see one” around a particular type of physical examination procedure or interview technique. The chief resident who is supervising the junior resident as the latter then “does one” must also attend carefully to the individual strengths, weaknesses and characteristics of the junior resident (individualized consideration). The chief resident also must support and challenge junior residents to become more adept and increase their skill levels in a particular approach as they “do one” (intellectual stimulation). The junior resident now (or soon) must become the teacher/leader who will use these principles of supervision, and transformational leadership, to model principles, engage, teach and lead those with less experience and training along the same path that was employed with him or her by the chief resident.

Transformational leadership provides a framework for effective leadership in the healthcare environment.¹⁰ How do educators at all levels develop the competencies to apply these principles and to teach within this framework? Some physician leaders and educators need do nothing new; many seem to quite naturally have, teach and express the competencies associated with transformational leaders. Many others, through personal reflection, should be able to learn, apply and teach these approaches fairly readily, given their apparent fit with the existing (or ideal) healthcare culture. For others, including established leaders, those who aspire to leadership positions, and those whose roles (like that of the chief resident) require leadership skills, transformational leadership training can be accomplished in several ways. Supervision, peer groups, or formal training programs all have their place.⁴ Assessment instruments are available to determine current competencies and potential remedial needs.⁴ Review of clinical situations and vignettes such as the one presented here also can be very useful.

Conclusion

The study of leadership and the approach to leadership training in the health care environment has suffered because of a lack of consensus and empirical support around which types of leadership are effective. Transformational leadership has empirical support and is principles-based, relationship oriented, intuitively appealing and potentially “transformative”. Additional education for physicians and for physicians in training in transformational leadership is warranted.

Key Words

transformational; leadership; healthcare

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The initial draft of this paper was written when the author was with the New York State Office of Mental Health, Albany, New York

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Practitioner Research Literacy Skills

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The monograph of Cruser et al. about Practitioner Research Literacy Skills (PRLS) aimed to “synthesize international trends in developing core competencies specifically as related to PRLS in such a way as to formulate a plausibly universal approach to integrating PRLS into a Competency Based Medical Education (CBME) curriculum”.¹ We would like to address some points of constructive critique.

The Model: For their model the authors used the six core competencies: (a) patient care, (b) medical knowledge, (c) practice based learning and improvement, (d) system based practice, (e) interpersonal and communication skills, (f) professionalism, as outlined by the Accreditation Council for Graduate Medical Education (ACGME) and some specific ‘skills sets’.² With a Venn diagram of three sets they illustrated how the core competencies and the skills of their model are interrelated. A Venn diagram represents all possible logical relations between a finite collection of sets—even a ‘metaphorical Venn diagram’ should follow this rule. The challenge to represent six core competencies with three sets is partly solved by combining competencies (a) and (b) in one set: these competencies characterize what a medical practitioner does. It fails for competencies (e) and (f) since these are no subsets of the other core competencies, but core competencies of their own. We would highly recommend to utilize a higher order Venn diagram.³

Strange is the mixture of core competencies with other ‘skills’ like ‘scholarship’ in the diagram. Scholarship is a well known CanMEDS role not a skill. According to the CanMEDS framework the roles represent ‘meta-competencies’.⁴

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Evidence Based Medicine Principles and Practice are located in the realm of medical knowledge and patient care, whereas the ACGME specified it as a subset of Practice-Based Learning and Improvement. To maintain internal consistency this classification should be followed.

The authors distinguished sharply between ‘medical statistics’ and ‘biostatistics’ whereas the tables of content of arbitrarily chosen textbooks on both subjects show a high degree of agreement on fundamentals. Each research group has access to statistical advisory service. For the understanding of publications knowledge of only a very limited number of statistical tests is necessary.⁵

Informatics: The American Medical Informatics Association defines: “Biomedical informatics is the interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving, and decision making, driven by efforts to improve human health”.⁶ We expect that the introduction of intelligent user-friendly online tools will improve the possibilities for high quality scientific work, without the basic necessity for a user to become an information scientist.^{7,8} Networked science will lead to ‘reinventing discovery’ and will substantially change scientific working.⁹

Paradigms: We were astonished to read that there exist three conceptual paradigms (‘lifelong learning’, ‘generic skills’ and ‘T-shaped professional’) associated in the international literature with the core competencies that serve to link them with PRLS. The term paradigm was popularized in the anglo-american scientific community exactly 50 years ago by Thomas Kuhn in his ‘Structure of Scientific Revolutions’.¹⁰ “Nowadays paradigm ... is embarrassing everywhere”, writes Hacking in his introductory essay of the 50th anniversary edition of

Kuhn's work.¹¹ "In many contexts in which it is used, the term is ambiguous and vague."

Life long learning is according to the ACGME a competency at the core of practice based learning and improvement, generic skills are according to the UK Assessment and Qualifications Alliance "the skills that are commonly needed for success in a range of activities", and about a T-shaped professional we found one publication in a PubMed search. Wikipedia describes it: "... 'T-shaped persons' is a metaphor used in job recruitment to describe the abilities of persons in the workforce".¹² None of the three terms qualifies as a paradigm in a scientific context.

Rubrics and Learning Tools: The authors suggested rubrics to help educators to develop relevant outcome measures for basic PRLS. In Fig. 4 they give an example of a PRLS Acquisition Rubric for research questions and testable hypotheses. With reference to Feyerabend we hold that this makes science teaching "duller, simpler, more uniform, more objective and more easily accessible to treatment by strict and unchangeable rules".¹³ "Scientific education as we know it today has precisely this aim. It simplifies 'science' by simplifying its participants" - here the students are infantilized. We would challenge the impression that Undergraduate Medical Education students need a template for guided article review. There are series of suitable articles from different Xmas-issues of the BMJ with medical background which beginners can easily understand.¹⁴ Students can develop a critical review template on their own, which will not be complete, but can be supplemented if need arises. Outcomes ought to be measured in tiny scientific projects.

Two relevant points were touched by the authors but they did not expatiate on them:

Time - if one introduces new elements in the medical curriculum one should simultaneously make proposals on what to eliminate. It has to be a zero sum game - medical curricula are already replete with content and cannot tolerate add-ons.

The Lancet Commission's publication - like the authors this commission took a global perspective on medical education - but from a health system perspective in an interdependent world.¹⁵ The commission concluded that transformative learning and interdependence in education should guide instructional and institutional reforms. This report will likely have broad impact on medical science education in the future and this should be seen in wider context than just critical thinking as done by the authors.

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Teaching Medical Microbiology and Immunology

14th Educational Strategies Workshop of the Association of Medical School Microbiology and Immunology Chairs (AMSMIC), Santa Fe, NM, USA, April 28-May 2, 2012.

The 14th bi-annual meeting of the Association of Medical School Microbiology and Immunology Chairs (AMSMIC) was held in Santa Fe, NM, April 28-May 2, 2012. Seventy-five faculty educators came from institutions in the Caribbean and North America. The workshop aided in the dissemination of educational ideas and tools in the teaching of microbiology and immunology to medical students. The plenary sessions and workshops are summarized below. Podcasts of the Plenary Sessions are available at http://www.amsmic.org/knowledge_objectives.html.

Plenary Session I: Curriculum Concepts and Systems Integration

This session focused on the teaching of microbiology and immunology in the context of an integrated curriculum. This is a significant issue because AAMC data suggest 61 schools teach microbiology and 39 teach immunology as stand-alone identified courses. This would suggest that at least half of all medical schools use some sort of integrated mechanism to teach microbiology and/or immunology. This plenary session was moderated by Dr. Hansel Fletcher (Loma Linda University School of Medicine, Loma Linda, CA).

- **Microbiology in a System-Based Curriculum: To Integrate or Not?**
Dr. Stephanie Oberhaus (Boston University School of Medicine, Boston, MA)
- **Integrating Immunology in Organ & Systems-Based Curricula**
Drs. Rolf Konig (The University of Texas Medical Branch, Galveston, TX) and Jennifer Smith (The Commonwealth Medical College, Scranton, PA)
- **USMLE and NBME Updates**
Dr. Agata Butler (National Board of Medical Examiners, Philadelphia, PA)

Plenary Session II: Faculty Development, Student Evaluations and Innovations

The session was designed as a morning NBME workshop to provide faculty development related to the design and construction of questions for the basic and clinical sciences. The afternoon was devoted to sessions on Team-Based Learning (TBL) and teaching initiatives. This plenary session was moderated by Drs. Stephanie Oberhaus (Boston University School of Medicine, Boston, MA) and Gabriel Virella (Medical University of South Carolina, SC).

- **Constructing Better Quality Multiple-Choice Questions (MCQs) for the Basic and Clinical Sciences**
Dr. Agata Butler (National Board of Medical Examiners, Philadelphia, PA)
- **Team-Based Learning Sessions in Microbiology & Immunology**
Drs. B. Laurel Elder (Boonshoft School of Medicine, Wright State University, Dayton, OH) and Osvaldo J. Lopez (Boonshoft School of Medicine, Wright State University, Dayton, OH)
- **ASM's Curriculum and Teaching Initiatives: An UpDate**
Amy L. Chang (American Society for Microbiology, Washington, DC)

Plenary Session III: Innovations and Curricular Changes in Microbiology and Immunology

This plenary session was moderated by Drs. Michael Schmidt (Medical University of South Carolina, Charleston, SC) and Kirsten Larson (Drexel University College of Medicine, Philadelphia, PA)

- **A Tagged Electronic Database of Exam Questions (TEDEQ) as a Tool for Student Self-Evaluation**
Jason N. Gad (ExamSoft Worldwide, Inc., Boca Raton, FL)
- **Electronic Opportunities in the Real World of Medical Education**
Dr. Michael Schmidt (Medical University of South Carolina, Charleston, SC)
- **Tools in the Toolbox: Diverse and Innovative Techniques to Improve Concept Retention**
Drs. Christopher Keller (Lake Erie College of Osteopathic Medicine, Erie, PA) and Kim Moscatello (Lake Erie College of Osteopathic Medicine, Erie, PA)
- **Web-Based Small-Group Learning: Less Busy Work, Lots of Real-Time Data!**
Dr. Laura Kasman (Medical University of South Carolina, Charleston, SC)

Concurrent Workshop Sessions

- **Role of an Effective Course Director and Educator in Medical Microbiology**
Dr. Uldis Streips (University of Louisville School of Medicine, Louisville, KY)
- **The Nuts and Bolts of Team-Based Learning**
Drs. B. Laurel Elder (Boonshoft School of Medicine, Wright State University, Dayton, OH) and Osvaldo J. Lopez (Boonshoft School of Medicine, Wright State University, Dayton, OH)
- **Learning Objectives and Core Competencies in Medical Education**
Christa Lillig (Medical student, University of Medicine and Health Sciences-St. Kitts, VI) and Drs. Floyd Knoop (Creighton University School of Medicine, Omaha, NE) and Kirsten Larson (Drexel University College of Medicine, Philadelphia, PA)
- **Using Cases to Teach: Reports for Immunology and Medical Microbiology**
Drs. Louis Justement (University of Alabama at Birmingham, Birmingham, AL) and Rolf Konig (The University of Texas Medical Branch at Galveston, Galveston, TX) lead a workshop focusing on the different uses of cases in the teaching of immunology and host defense in both the context of an integrated curriculum and a problem-based learning curriculum (PBL). The pathogenesis and infectious disease cases were discussed in a workshop lead by Drs. Laura Kasman (Medical University of South Carolina, Charleston, SC), Floyd Knoop (Creighton University School of Medicine,

Omaha, NE), and S. James Booth (University of Nebraska Medical Center, Omaha, NE).

Future Meetings and Further Information

The next AMSMIC sponsored Educational Strategies Workshop is scheduled for April, 2014. The AMSMIC website is located at <http://www.amsmic.org>.

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Meeting Abstracts

1) Virtual Interactive Bacteriology Laboratory (<http://learn.chm.msu.edu/vibl/index.html>)

Cindy Grove Arvidson^{1,4,5}, Jiatyan Chen², Geraud Plantegenest^{3,4}

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2) Integration of Basic Sciences in a Clinical Presentation-Based Curriculum Using Team Based Learning

Debra E. Bramblett PhD, Omosalewa O. Lalude, MBBS, Janet Piskurich PhD

Paul L. Foster School of Medicine, Texas Tech University Health Science Center, El Paso, TX

3) National Events Drive Changes in ASM Curriculum and Laboratory Safety Guidelines

Amy L. Chang

Education Director, American Society for Microbiology, Washington, DC

4) Electronic Virtual Patients (eVPs): Generating Interactive, Multimedia Case Studies for Self-Directed Learning in Undergraduate Medical Education

Karen M. Duus, PhD¹ and Isabelle Maisonneuve, PhD²

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5) Utilization of a Multi-Dimensional Model to Teach Microbiology in an Organ Systems Course

M. M. Harriott

Oakland University William Beaumont School of Medicine, Rochester, MI

6) The Challenge of Fitting a 'Silo' Course into an Integrated Curriculum—a First Year Analysis

Kerstin Höner zu Bentrup, PhD¹, and Jennifer W. Gibson, PhD²

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7) Development of Online Learning Objects to Teach Evidence-based Medicine in an Integrated Medical Curriculum

Rolf König, PhD

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8) Anatomy Guy: Using Live Chroma Key Video Capture to Vertically and Horizontally Integrate Basic Medical Sciences Online

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9) Team Active Learning in Basic Immunology and Virology: A Strategy That Improves Problem-Solving Skills?

Oswaldo Lopez, PhD, Patricia Hudes, MSIT, Aaron Smith, BA

Boonshoft School of Medicine, Wright State University, Dayton, OH

10) Teaching Immunology to First Year Medical Students Using Case Discussions in a Large Group Setting

Michael J. Parmely

Department of Microbiology, Molecular Genetics and Immunology, University of Kansas School of Medicine, Kansas City, KS

11) Successful Mapping of Medical Microbiology into a Clinical Presentation Curriculum

Yen-Ping Kuo and Robin K. Pettit

School of Osteopathic Medicine in Arizona, A. T. Still University, Mesa, AZ

12) Comparison of Two Algorithm-Directed, Case-Based Learning Modalities for Infectious Diseases

B.J. Plotkin, R.A. Laddaga, and I.M. Sigar

Department of Microbiology and Immunology, Chicago College of Osteopathic Medicine, Midwestern University, Downers Grove, IL

13) Implementation of a Small Group Clinical Case Presentation Exercise in Immunology

Melissa K. Stuart, Neal R. Chamberlain, Vineet K. Singh, and Neil J. Sargentini

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Outcomes, Competencies and Milestones across the Continuum

The Generalists in Medical Education (TGME) 33rd Annual Meeting San Francisco, CA, USA, November 2-3, 2012

The 33rd Annual Generalists in Medical Education (TGME) conference was held November 2-3, 2012 at the Hotel Monaco in San Francisco, California. Hosted by the Oklahoma State University Center for Health Sciences (OSU-CHS), this year's conference theme – *Outcomes, Competencies and Milestones Across the Continuum* - reflected both the new challenges faced by medical educators in the measurement of student performance and the need for institutions to keep pace with demands for increased documentation and accountability.

A variety of forums highlighted innovative tools, techniques, methods, curricula, programs and skills, including: descriptive sessions, problem-solving sessions, skill-acquisition workshops, panel discussions, roundtables, and digital posters. The keynote address, *Connecting Competencies to the Workplace: The Use of Entrustable Professional Activities*, was delivered by Dr. Olle (Th.J) ten Cate, who leads the Centre for Research and Development of Education at University Medical Center Utrecht (UMCU) and has been a visiting professor at the University of California San Francisco since 2010. The lecture considered a parallel scheme for assessing and measuring clinical competencies. A lunch time discussion entitled *“Interprofessional Education: Status, Challenges and Opportunities,”* provided perspectives, the current status of, challenges presented by, and opportunities for collaboration regarding interprofessional education. The panel discussion featured leaders from fellow medical education organizations – including Dr. Cate Nichols from The Association for Standardized Patient Educators (ASPE), Dr. John Szarek from the International Association of Medical Science Educators (IAMSE), and Dr. Sonia Crandall from The Generalists in Medical Education (TGME) and was facilitated by Dr. Susan Labuda Schrop. Lastly, a special discussion titled *“Through the Looking Glass: What*

is the Future of Educators in Medical Education?” elicited panelists' insights on teaching best practices and reflected on current challenges in medical education. The evening reception provided a relaxing venue for presentation of the 2012 Servant Leadership Award to Dr. Julie Walsh-Covarrubias, from the University of Alabama at Birmingham. New this year were post-conference workshops focusing on program evaluation, online journal publishing, and using personality type to guide medical education practice.

Organizational Steering Committee

The conference was organized by (alphabetically): Sonia Crandall (Wake Forest University), Julie Walsh-Covarrubias (University of Alabama), Carol Hasbrouck (The Ohio State University), Larry Hurtubise (The Ohio State University), Machelie Linsenmeyer (Oklahoma State University), Elza Mylona (Stony Brook University), Susan Labuda Schrop (Northeast Ohio Medical University), David Solomon (Michigan State University), Terry Stratton (University of Kentucky), and Britta Thompson (University of Oklahoma).

Notes on Contributors

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ELZA MYLONA, PhD is Associate Dean of Faculty Development and Associate Professor of Preventive and Internal Medicine, State University of New York, Stony Brook University Medical Center, USA

TERRY D. STRATTON, PhD is Assistant Dean for Assessment and Quality Management and Associate Professor of Behavioral Science, University of Kentucky College of Medicine, USA.

Further information about TGME

More information on The Generalists in Medical Education can be found on the website:

<http://www.thegeneralists.org/>

Session Abstracts

Problem Solving Sessions

The Potential for Social Media to Educate Faculty: Should We Be ‘Tweeting’ This Seriously?

Larry Hurtubise, The Ohio State University College of Medicine; Greg Turner, Florida State University College of Medicine; Caer Vitek, Mayo Medical School. Larry.Hurtubise@osumc.edu

Providing faculty development to a dispersed and diverse population of community-based faculty or hospital-based clinicians is challenging. Recent advances in social networking hold promise for medical educators across the continuum. This problem-solving session explored the impact, implementation, benefits and limitations of social media within medical education.

Should Simulation Centers Have a Role in Community Outreach?

Sheryl Pfeil, Sara Pastore, & Carol Hasbrouck, The Ohio State University College of Medicine.

Sheryl.Pfeil@osumc.edu

Simulation centers can help motivate students toward health sciences, support community interests, promote advocacy/social responsibility, and develop community-school partnerships. This session focused on the role of simulation centers in community outreach, collaborations and recruitment, including the appropriateness of these activities; challenges encountered; support needed; and perceived effectiveness.

Bridging the Milestones Across the Medical Education Continuum

Ellen Pearlman, Judith Brenner, Saima Chaudhry, & Alice Fornari, Hofstra North Shore- LIJ School of Medicine. R.E.Pearlman@hofstra.edu

With competency-based milestone tracking, the opportunity exists to develop competency-based milestones across the medical education continuum. Despite this, little attention has been paid to the transition from UME to GME and CME. This session worked to align the development/assessment of competency-based milestones and entrustable professional activities (EPAs) across the educational continuum.

The Facilitators and Barriers of Medical Education Innovations: How are Medical Education Innovations Adopted and Diffused through Medical Education?

Britta Thompson, University of Oklahoma College of Medicine. Britta-Thompson@ouhsc.edu

Innovations in the delivery of education, such as team-based learning, problem based learning, standardized patients and simulation, are vital to medical education. Based on principles of the diffusion of innovation theory, this session explored the spread and adoption of such innovations. Using team-based learning as an example, facilitators and barriers were identified – along with ways to systematically evaluate educational innovations.

Simulation in Medical Education: The Basic, the Bold and the Creative

Carol Hasbrouck, Sheryl Pfeil & Sara Pastore, The Ohio State University College of Medicine.

Carol.Hasbrouck@osumc.edu

This session guided participants to: (1) describe different types of basic to complex simulations; (2) give examples of how simulation can be used in teaching, assessment, and faculty development; (3) describe steps involved in planning simulations; and (4) consider creative applications of simulations.

Skills Acquisition Sessions

Essential Competencies for Future Educational Leaders

William Anderson, Michigan State University College of Human Medicine & Elza Mylona, Stony Brook School of Medicine. ander113@msu.edu

This skill acquisition session sought to identify the essential competencies for future educational leaders by: (1) applying findings from the medical education literature; (2) having participants develop a personal “prescription”; and (3) discussing issues and problems for implementing these “prescriptions”.

Designing Cases to Meet Your Educational Objectives

Elza Mylona, Stony Brook School of Medicine & Linda Perkowski, Central Michigan School of Medicine. Elza.Mylona@stonybrokmedicine.edu

This workshop provided participants with the essential skills to select and develop specific types of cases to meet their educational objectives and curricula – focusing content on all levels of educators involved in the teaching, assessment, or faculty development of medical students, residents, or practicing physicians.

Using a Narrative Approach to Teach Learners About Stigma

Rachel Brown, Kimberly Hoffman, Melissa Griggs, Jessica Nittler, John Cummins, & Karen Gordy-Panhorst, University of Missouri School of Medicine. brownrac@health.missouri.edu

This workshop demonstrated how to incorporate narrative into curriculum - including various approaches to narrative, faculty development, student confidentiality and the electronic portfolio. Attendees participated in a related exercise to address stigma towards patients with mental illness, and themes from medical student narratives and focus groups were shared.

How Motor Skills Theory Can Improve Every Day Procedural Training & Retention

Roy Phitayakorn, The Massachusetts General Hospital, Harvard Medical School. rphitayakorn@partners.org

This session provided participants with an opportunity to learn new motor skill techniques to add to their repertoire for teaching procedural skills. The session involved trying out a designated motor skill, followed by discussion of the learning objectives.

I've Always Wanted to Direct: Using Video to Develop Faculty- and Student-Generated Teaching Materials

Betsy Goebel Jones, Texas Tech University Health Sciences Center. betsy.jones@ttuhsc.edu

This skill building session focused on strategies for developing faculty- and/or student-generated videos using a web-based product that produces text-to-videos (Xtranormal.com) and iPad /iPhone-based video capabilities. Techniques already used successfully to involve students in creating teaching videos were demonstrated, and materials and methods to publish and share content were showcased.

Panel Discussion Session

Tracking Medical Student Academic Advancement: Green Means Go & Red Means Stop

Daniel Clinchot, Carol Hasbrouck & Howard Werman, The Ohio State University College of Medicine. Dan.Clinchot@osumc.edu

Medical schools struggle with identifying and implementing the best method to track and facilitate students' academic progress. The purpose of this session was to discuss methods used by different institutions to track progress, and to

identify related advantages, disadvantages, and challenges. A newly instituted on-line "colored light" system was described.

In Defense of Medical School Admissions Interview

Carol Elam & Terry Stratton, University of Kentucky College of Medicine; Edwin Doug Taylor, Quillen College of Medicine. carol.elam@uky.edu

As an assessment of personal qualities of applicants, the admissions interview has been a central part of the medical school admission process for decades. However, bias, variability, and a lack of established predictive validity limit the validity of this method. This panel explored pros and cons of the medical interview, and offered potential strategies to better improve the rigor of this process.

Through the Looking Glass: What is the Future of Educators in Medical Education?- Ellen Whiting, Northeast Ohio Medical University (Moderator) & Deborah Simpson, Medical College of Wisconsin (Co-Presenter)

Panelists: Dennis Baker, Florida State University College of Medicine; Carol Hasbrouck, The Ohio State University College of Medicine; Maurice Hitchcock, University of Southern California Keck School of Medicine; David Irby, University of California, San Francisco School of Medicine; Mark Quirk, American Medical Association. ewhiting@neomed.edu

In this panel discussion, generalists united to share teaching practices and reflect on current problems in medical education from their perspectives as educators - inviting attendees to STOP and ask: Who are we, what do we do, where have we been, where are we going as professional educators (and stakeholders) in medical education?

Descriptive Sessions

Curriculum Design for Socially Accountable and Community Engaged Medical Education

Rachel Ellaway, Lisa Graves & Sarah Newbery, Northern Ontario School of Medicine. rellaway@gmail.com

Although institution-specific values can be accommodated within formal curricula, it is not without challenges. This session described curriculum development at a relatively new school founded on principles of community engagement and social accountability, and explored the implications of following the school's vision in curriculum development.

Overcoming Obstacles for Successful Interdisciplinary Integration of Milestones

Rebecca Blanchard & Kevin Hinchey, Baystate Medical Center and Tufts University School of Medicine. Rebecca.Blanchard2@baystatehealth.org
The ACGME is mandating that institutions adopt milestones to track resident development. This session highlighted potential obstacles identified by program directors in anticipation of this process - from the logistics of using new tools to the utilization of milestone data - and presented solutions and discussion questions for educators assisting with this transition.

What Have I Gotten Myself Into? Making Reality Match Expectations for First Year Medical Students

Hugh Stoddard, University of Nebraska College of Medicine & Carol Thrush, University of Arkansas for Medical Sciences. hstoddard@unmc.edu
Students' expectations of medical school often do not match the realities they encounter during their first year. This session used data from a pre-post survey of students to inform and stimulate discussion about how medical schools should respond to discrepancies between expectation and actual experience.

Why Medical Students Volunteer? An Exploratory Study of Motivations and Behaviors

Kali Cyrus, University of Illinois at Chicago College of Medicine. kalidc@gmail.com
Beginning with an overview of why students choose to volunteer, this session presented findings from a survey as well as common themes mentioned by students in one-on-one interviews. Programming suggestions promoting volunteerism and work with the undeserved were presented, followed by discussion.

Effect of Attendance at Interactive Sessions on Exam Scores in Both Basic and Clinical Application Settings: Pilot Study

Jeff Holt, Mark White, Ying Sung, & John Szarek, The Commonwealth Medical College. JHolt@tmedc.org
Students have greater retention of science when content is integrated with clinical problems. This session shared the development of a combined lab stressing both neuroanatomy and clinical skills - demonstrating that students both enjoyed such integration in an exam and were able to successfully describe key pathways (e.g., eye movements, pupillary reflex abnormalities).

Students' Experience Taking a High Stakes Team Test

Ruth Levine, The University of Texas Medical Branch; Nicole Borges, Wright State University Boonshoft School of Medicine; Agata Butler & Dave Swanson, National Board of Medical Examiners; Britta Thompson, University of Oklahoma School of Medicine. rlevine@utmb.edu
This session detailed administration of the NBME Psychiatry Subject Test to third-year medical students, first as individuals and then as a "team" test - followed by a qualitative and quantitative assessment of their attitudes and experiences with each method. Most students reported positive learning outcomes, with themes of increased learning, exposure to other perspectives, and being a better team player.

From Innovation to Tradition: What Longitudinal Integrated Clerkship Students Say About Their Experience in Rotation-Based 4th Year

Jill Konkin & Carol Suddards, University of Alberta-Canada. jill.konkin@ualberta.ca
This study explored students' experiences in the fourth year of medical school after completing a longitudinal, integrated third-year clerkship experience. The overarching themes gleaned from their evaluation consisted of loss of agency, confidence, and sense of identity as a member of a clinical team and junior colleague to their preceptors.

Roundtables

Flip this Roundtable! How we are flipping classrooms at The Commonwealth Medical College

John Szarek & Jeffrey Holt, The Commonwealth Medical College. JSzarek@tmedc.org
In this age of boundless information, when teaching and learning is virtually limitless, this session posed the question: "Why are medical educators wasting precious time lecturing to students? This roundtable session demonstrated one possible solution - "flipping the classroom" - by engaging participants in the process.

The ePortfolio: A Tool for Assessing Competency

Carrie Calloway & Scott Cottrell, West Virginia University Health Sciences Center.

cacalloway@hsc.wvu.edu

ePortfolios can serve as an indicator of student professional growth and development, and self-reflection and entrustable professional activities can assist students and medical education faculty in identifying and articulating competencies and behaviors. This roundtable discussion explored strategies for implementing ePortfolios to assess competency attainment across the continuum.

Measuring Student's Diagnostic Reasoning

Edward Simanton & Matt Bien, University of South Dakota Sanford School of Medicine.

Edward.Simanton@usd.edu

Assessment of diagnostic reasoning includes conversations about testing formats, uses of testing data and future directions. This session elicited participants' knowledge and use of diagnostic reasoning in their respective training programs.

Neuroanatomy Based Clinical Skills

Laboratory

Jeff Holt & Ying Sung, The Commonwealth Medical College. JHolt@tcmedc.org

Most medical programs teach neuroanatomy and clinical skills separately in hopes that students integrate the two on their own. This session described a combined neuroanatomy and clinical skills lab facilitated by an anatomist and two generalist physicians, in which students describe pathways and predict potential abnormalities while practicing the neuro exam.

Tools and Methods for Tracking Student Competencies in Medical School

Machelle Linsenmeyer & Johnathan Franklin, Oklahoma State University Center for Health Sciences. machelle.davison@okstate.edu

In this session, the importance of assessing competencies throughout the curriculum is discussed, along with methods for determining what to assess (beyond the mandated competencies) and tools developed to collect data and information - including an online tracking and case logging system.

Learning Communities: Integration in a Residency Program

Nagaraj Gabbur, SUNY Downstate Medical Center.

Nagaraj.Gabbur@downstate.edu

This session prompted participants to discuss the concept of a Learning Community and how it can be used for resident education. Participants also

discussed how to extend the Learning Community concept for medical students, as well as possible strategies for expanding the concept.

Professional Identity Formation: Meaning, Manifestations, & Machinations

Mark Holden, Era Buck, Mark Clark, Julie Trumble, & Karen Szauter, University of Texas Medical Branch- Galveston. mholden@utmb.edu

This roundtable focused on: (1) the concept of identity formation; (2) exploration of the relationships between identity formation and professionalism; (3) reflection on relevant identity formation in other professions; and (3) consideration of factors which may promote or inhibit professional identity formation in medical education.

Using Science and Community to Teach Nutrition to Medical Students

Gabi Waite & Robin Danek, Indiana University School of Medicine-Terre Haute; Erik Southard, Indiana State University; Roy Geib, Indiana University School of Medicine- Terre Haute. gindl@iupui.edu

As evidenced by statistics showing deficiencies in graduates' nutritional knowledge and skills, essential nutrition teaching in medical school remains a major challenge. In this session, one example of a developing nutrition track is presented - including the science of nutrition, hands-on activities, and strategies to effectively communicate lifestyle changes.

Differences in OSCE and CLIPP Scores Between Campus Based and AHEC Based Students

Karen Glancy McClanahan & Irene Hong-McAtee, University of Kentucky. karengm@uky.edu

As part of students' third-year pediatrics rotation, one third of students in this program complete an AHEC rotation. This roundtable discussion centered on strategies to ensure a comparable experience when sending students to multiple sites.

Developing and Delivering Workshops on Feedback: New Models for Clinical Educators

Dennis Baker, Gregory Turner & Suzanne Bush, Florida State University College of Medicine.

dennis.baker@med.fsu.edu

This discussion provided participants with information and ideas for designing and delivering workshops for clinical educators on the topic of "giving feedback." Ideas/materials from an existing feedback workshop were shared, and participants generated and contributed ideas with the group.

Future of the Generalists

Elza Mylona, Stony Brook School of Medicine.

Elza.Mylona@stonybrookmedicine.edu

This session examined the current mission of The Generalists in Medical Education (TGME), and elicited ways to better serve the medical education community.

Digital Posters

Feasibility of Using High Fidelity Simulation Exercises to Evaluate and Enhance Neonatal Resuscitation Skills

Mohammad Attar, Jennifer McAllister & Hilary Haftel, University of Michigan Medical School.

mattar@med.umich.edu

In this poster, the authors detected frequent deficiencies in house officers' (n=46) neonatal resuscitation (NR) skills and no significant improvement after exposure to a single high fidelity simulation NR session during their rotation in the neonatal intensive care unit. They concluded that further practice and skills-based curricula may be necessary to achieve sustained improvement in NR skills.

Measuring Evidence-based-medicine Skills in an OSCE Setting

Matt Bien & Edward Simanton, University of South Dakota Sanford School of Medicine.

Matt.Bien@usd.edu

The skill of evidence-based-medicine [EBM] is considered critically important among the clinical skills that students must master in medical school. This poster featured the use of various methods, including OSCE cases, as authentic methods of assessing EBM among medical students.

A Unique Approach to Evaluating Patient-Physician Interactions

Susan Labuda-Schrop, Northeast Ohio Medical University. sschrop@neomed.edu

Learners all along the medical education continuum benefit from feedback on their interactions with patients. This poster presented one approach to providing learners with such feedback from a variety of stakeholder perspectives - including patients, non-physician healthcare professionals and faculty members.

Electronic Fetal Monitoring (EFM)

Education for Family Medicine Residents

Matthew Meunier & Barbara Apgar, University of Michigan Medical School; Stephen Ratcliffe, Lancaster General Health; Patricia Mullan, University of Michigan Medical School.

mattmeun@med.umich.edu

In this poster, directors of family medicine obstetrics curricula were surveyed to: (1) determine current methods of electronic fetal monitoring training for residents; (2) assess the need for a computer-based tutorial on this topic; and (3) assess how programs anticipate adapting curricula to proposed Family Medicine ACGME requirement changes.

The Video Textbook----A Pilot Project

Nagaraj Gabbur, SUNY Downstate Medical Center.

Nagaraj.Gabbur@downstate.edu

This poster described a project that used short videos produced as a movie scene to teach various medical topics, with the effectiveness of this method of learning to be compared with traditional lectures.

Improving the Educational Experience of the 4th Year: Addressing the Forgotten Curriculum

Rosemarie Conigliaro & Terry Stratton, University of Kentucky College of Medicine.

rconigli@montefiore.org

Despite ongoing changes in trainees' competencies, the fourth-year of many medical curricula remains largely unchanged and unknown. This poster: (1) provided a brief background on the current state of the fourth year in U.S. medical schools; (2) provided an overview of results of a survey of two cohorts of fourth-year students; and (3) described curricular changes in one institution based on these survey results.

Transition to Active Learning: Resistance and Change

Joan Bedinghaus, Medical College of Wisconsin.

jbedingh@mcw.edu

When curricula move from lecture-based courses to active learning methods, they sometimes encounter intense resistance. Using an evidence-based medicine course, this poster analyzed one school's experience with sources of resistance – as well as helpful tactics in managing remaining problems.

The Non-clinical Competencies of Medical School: A Modified Delphi Study of Medical Education Experts

Stephen Wolf, Tai Lockspeiser, Jennifer Gong, Morgan Valley, Emma Petroff, Gretchen Guiton, University of Colorado School of Medicine. Stephen.Wolf@ucdenver.edu

Even though medical students with no obvious clinical deficiencies sometimes struggle academically when entering residency training, non-clinical competencies expected of these new trainees seem to exist only implicitly. This poster identified and defined 12 non-clinical competencies necessary for a medical student's successful transition to graduate medical education.

Competency-based Individual Learning Plans for Medical Students in a Large Urban Medical School

Nagaraj Gabbur, SUNY Downstate Medical Center. Nagaraj.Gabbur@downstate.edu

Many medical schools have integrated the six ACMGE Competencies into their curricula. This poster discussed how one 3rd year clerkship has introduced these competencies to help medical students understand them through their own experiences.

Post Conference Workshops

Session with Journal Editors: Publishing in Online Outlets

Sonia Crandell, Wake Forest School of Medicine; Peter de Jong, IAMSE; Dave Solomon, Michigan State University College of Human Medicine; & Terry Stratton, University of Kentucky College of Medicine. tdstraoo@email.uky.edu

By offering a brief history on electronic publishing – as well as those unique features of such platforms – this workshop helped authors negotiate options to publish and disseminate educational scholarship in online medical education journals. In addition, the presenters shared their experiences as journal editors and editorial board members – offering practical advice on writing, preparing and submitting educational scholarship for publication.

Expanding the Role and Use of Mixed Method Approaches in Program Evaluation

Matt Vassar & Mabelle Linsenmeyer, Oklahoma State University Center for Health Sciences. matt.vassar@okstate.edu

Program evaluation, especially improving constituent processes of data collection, analysis, and interpretation, are timely and important

matters in medical education. This workshop introduced and demonstrated mixed method approaches for analyzing data in program evaluation activities.

Using Knowledge of Personality Type (MBTI) to Enhance Personal Awareness, Communication, Teaching, and Leadership

Dennis Baker & Greg Turner, Florida State University College of Medicine.

dennis.baker@med.fsu.edu

In examining learners' personalities, use of the Myers-Briggs Type Indicator (MBTI) assessment can enhance personal growth and communication – both of which can further enhance one's teaching and leadership skills. After completing the MBTI, participants in this workshop applied this knowledge to areas of personal and professional growth.

2012 Alpha Omega Alpha Robert J. Glaser Distinguished Teacher Award

In 2012 Amy Wilson-Delfosse, IAMSE President, received the 2012 **Alpha Omega Alpha Robert J. Glaser Distinguished Teacher Award winner**. The Alpha Omega Alpha Robert J. Glaser Distinguished Teacher Awards were established by the AOA medical honor society in 1988 to provide national recognition to faculty members who have distinguished themselves in medical student education. The award is named for long-time AOA executive secretary Robert J. Glaser, M.D. This award recognizes the significant contributions to medical education made by gifted teachers.



Presentation of the 2012 Alpha Omega Alpha Robert J. Glaser Distinguished Teacher Award to Amy Wilson-Delfosse.

The AAMC Awards Committee described Dr Wilson-Delfosse as follows:

“At Case Western Reserve University (CWRU) School of Medicine, Amy L. Wilson-Delfosse, Ph.D., is known for being a natural collaborator and teacher, whether in the classroom or in the lab. As associate professor in the department of pharmacology and assistant dean for basic science education, Dr. Wilson-Delfosse is an acclaimed educator at CWRU, receiving numerous teaching awards from both faculty and students. “She is devoted to the students of the school of medicine,” says Pamela B. Davis, M.D., dean of CWRU School

of Medicine. This is evinced by the many undergraduate, graduate, and professional students she mentors and advises each year.

In 2004, Dr. Wilson-Delfosse discovered a passion for curriculum development, refinement, and faculty coaching. She serves on several committees dedicated to basic science education, curriculum reform and evaluation, and student assessment, among other topics. Dr. Wilson-Delfosse helped design and was essential to the rollout of the school’s 2006 Western Reserve2 (WR2) curriculum transformation. WR2 revitalized the philosophies of the Western Reserve curriculum from the 1950s, which was the first time a school of medicine used an organ system-based approach to teaching basic science.

Dr. Wilson-Delfosse’s work on the new WR2 curriculum has changed the culture of education at CWRU. “With a focus on small, self-directed group learning, she watched a transformation among faculty and students alike,” says Dean Davis. Students now arrive for class ready with thoughtful questions, while faculty members view students as junior colleagues in learning. Dr. Wilson-Delfosse has aided this transition by running workshops to help CWRU educators become better discussion facilitators and give meaningful feedback to students.

Dr. Wilson-Delfosse also works to advance the WR2 curriculum as the director of the Case Inquiry Program, where she helps manage student clinical case discussions with the unique perspective of a basic scientist. “She recognizes that the most important thing faculty can do in this era of evolving information is to promote lifelong learning and train students to ask questions,” says Dean Davis. “She has an opportunity, in her eyes even an obligation, to impart teamwork skills while teaching basic science content.”

When she is not refining the Case Inquiry Program curriculum or faculty development workshops, Dr. Wilson-Delfosse is advancing basic science education at the international level. As the current president of the International Association of Medical Science Educators, Dr. Wilson-Delfosse works with medical schools around the globe to form a strong base for interprofessional collaboration among physicians, nurses, and allied health professionals. She assists schools seeking to integrate more of the clinical aspects of medical education into the first two years, and basic science into the last two years, of medical school.



Award winner Amy Wilson Delfosse, IAMSE president, at the AAMC Award ceremony together with Peter de Jong (IAMSE Editor-in-Chief) and Frazier Stevenson (IAMSE Past President).

In the lab, Dr. Wilson-Delfosse's research interests include cancer and Parkinson's disease. Her research is widely published and consistently funded by such organizations as the National Institutes of Health, the Michael J. Fox Foundation, and the National Parkinson's Foundation. Ever the team player, Dr. Wilson-Delfosse makes sure that the pharmacology department "engenders a collaborative, team science research approach in the lab," says Dean Davis.

Dr. Wilson-Delfosse received her BA degree from the College of Wooster and her PhD in pharmacology from Vanderbilt University."

For more information about the awards and about Dr. Wilson-Delfosse, go to the AAMC website: <https://www.aamc.org/newsroom/newsreleases/311210/121025.html>

Call for Student Research Projects / Internships



The next issue of *Medical Science Educator* will be dedicated to how student research projects are offered in the medical curriculum around the world. In the issue the 50 best abstracts of the Leiden International Medical Student Conference (LIMSC) will be published.

The Editorial Office of *Medical Science Educator* will attend the LIMSC conference and will participate in the Career and Internship Fair. In this event the almost 700 attendees of the conference will be searching for student research projects or internships in medical schools around the globe.

Are you aware of opportunities for international student research projects or internships at your school?

Do you want to be connected to interested students?

If yes, please submit a one-page description of your project (field of science, topic, institution, contact information) to jounal@iamse.org before March 8, 2013. At the conference we will bring your project under the attention of interested students. If a student wants to participate in your project, the student will reach out to you directly.

Announcements

Webcast Audio Seminar 2013 Spring series

The topic of the WAS Spring series will be: "Best Practices for Technology Applications in Health Professions Education". The series of lectures will start February 28, 2013. For more details and dates, see www.iamse.org.

13th Annual Team-Based Learning Conference

The Team-Based Learning Collaborative (TBLC) is a group of educators dedicated to supporting faculty from a variety of disciplines that have implemented, or wish to implement, Team-Based Learning. Dates of the meeting: February 28 - March 2, 2013, San Diego, CA, at the San Diego Marriot Mission Valley Hotel. For details, see: TBLCMeeting.org

Harvard Medical School CME Course Principles of Medical Education: Maximizing Your Teaching Skills.

The meeting will take place April 4 - 6, 2013, Omni Parker House Hotel, Boston, MA, USA. New or experienced teachers, from all specialties, will benefit from this highly-regarded course that covers the educational principles and skills needed to teach successfully in a wide range of clinical settings. Participants will learn how to: assess a trainee and provide effective feedback, present a lecture, lead a case-based discussion, teach at the bedside, balance the needs of students and patients, use educational technology, and challenge learners to move from "knowing" to "understanding." To view the course description and to register online, visit: www.cme.hms.harvard.edu/courses/foundations

Joint AACOM and AODME 2013 Annual Meeting

Make plans now to attend the Joint AACOM and AODME 2013 Annual Meeting, to be held April 24-27, at the Marriott Baltimore Waterfront Hotel in Baltimore, Maryland. The conference will focus on "Foundations for the Future", with sessions that explore themes developed through the AACOM-AOA Blue Ribbon Commission for the Advancement of Osteopathic Medical Education and emerging

innovations throughout the continuum of osteopathic medical education. Visit the site: <http://www.aacom.org/events/annualmtg/Pages/default.aspx> to learn more about the meeting.

IAMSE 2013 meeting

The next annual meeting of the International Association of Medical Science Educators (IAMSE) will take place in St Andrews, Scotland (UK). The meeting theme is: "Science education for health care professionals across the continuum". The meeting is designed for all those who teach and lead curricula in the sciences of medicine and health. Participants include basic scientists and clinical faculty from many health care disciplines. The IAMSE meeting offers opportunities for faculty development and networking across the continuum of health care education. Conference dates are June 8-11, 2013. Follow for more information the meeting website www.iamseconference.org

Association of Clinical Anatomists

The 30th annual meeting of the AACA will be held in Denver, Colorado at the Marriott City Center Hotel - July 9th - 13th, 2013. On July 9th, the Scientific Program will start and run through Friday, July 12th. The post-graduate course is scheduled for Saturday, July 13th. This year the course will be held out at the new University of Colorado Medical Center site in Aurora. We will be sectioning a structure during the meeting and the dataset will be ready for hands-on use by attendees on Saturday. See: <http://www.clinical-anatomy.org/>

AMEE Conference

The theme of AMEE 2013 is "*Colouring outside the lines*". The conference will be held in Prague, Czech Republic, from 24-28 August 2013. 2013 is an historic year in the life of AMEE, and represents forty years of AMEE conferences. Teaching, learning and assessment will of course form the basis of the AMEE 2013 programme as it did at the first conference, but the range of additional topics and sessions is truly amazing. The theme of this year's Conference is Colouring Outside the Lines, where the organization challenges presenters to cast

away preconceived ideas and think whether there are new ways of working to produce future healthcare professionals to meet the needs of society in these times of limited resources. See the website: www.amee.org.

Webcast Audio Seminar 2013

Fall series

The topic of the Fall WAS series will be: “Times are Changing: Evolution and Revolution in Medical Education 2013 Edition”. The series of 6 lectures will start September 12, 2013. For more details and dates, see www.iamse.org.

Individual Journal Subscriptions

Available

Medical Science Educator is accessible for IAMSE members. If you are not a member, you can obtain an individual subscription. Visit this link to apply: www.medicalscienceeducator.org/subscription.html

Announcements

Individuals wishing to post medical education related announcements in the Journal should send their requests directly to the Editor-in-Chief at editor@iamse.org. Announcements may be IAMSE-related, announcements from other medical education organizations, medical education conference information or international issues affecting medical education. Final inclusion in the journal is at the Editor-in-Chief's discretion.



**The American University of the Caribbean School of Medicine (AUC)
St. Maarten, Netherlands Antilles**

Associate Dean of Medical Education and Faculty Development

Since 1978, American University of the Caribbean School of Medicine (AUC) has provided students with quality medical education and has more than 4,500 graduates who are licensed and practicing medicine throughout the world. AUC is committed to providing a high-quality, internationally recognized program of medical education and is accredited by the Accreditation Commission on Colleges of Medicine (ACCM). AUC students are eligible to sit for the USMLE, obtain U.S. Federal Financial Aid if qualified, become active members of the American Medical Student Association (AMSA) and, upon graduation, obtain residency and licensure throughout the United States. AUC's curriculum is the U.S. medical school model, with two years of medical sciences taught at the St. Maarten campus, followed by two years of clinical sciences taught at affiliated hospitals in the United States and England.

The University is known for its student-centered environment, a faculty passionate about teaching, and a commitment to giving students who have the desire, the persistence, and the intellectual capacity an opportunity to become outstanding physicians. 96% of students passed USMLE Step 1 on their first attempt in 2012.

The University seeks an innovative leader in medical education with broad intellectual capacity and collaborative leadership style together with assertiveness, flexibility, creativity, integrity, transparency, and humor. We seek candidates who have skilled academic leadership background with demonstrated commitment to success in working with diverse communities and the capacity to develop and enhance student support, retention, and student evaluation.

Requirements include MD and/or Ph.D. in Medical Education or a closely related discipline with previous experience as a Department Chair and/or as an Assistant or Associate Dean of Medical Education in an accredited Medical School with expertise in curriculum development and curriculum mapping, assessment, and policy development to enhance academic integrity and quality. The successful candidate will possess the skills for guiding faculty to promote an environment that fosters not only student in-depth understanding of Basic Sciences concepts, but also integrating and bridging discipline based knowledge with practical application in Clinical Sciences. The candidate should be capable of leading the faculty to drive students to become critical thinkers and independent learners.

Application materials must include *curriculum vitae (CV)* and *letter of intent* in a single document (MS Word or PDF) apply online at www.aucmed.edu

Signed reference letters will be requested prior to committee interview. Closing date for applications is March 31, 2013 or until a successful candidate is identified. For confidential enquires please contact Gretchen Yarbrough gyarbrough@devry.edu or Kathleen Narvaez knarvaez@devry.edu

International Association of Medical Science Educators

2013 IAMSE ANNUAL MEETING St. Andrews, Scotland (UK), June 8-11, 2013

Science education for health care professionals across the continuum

The 17th IAMSE meeting offers opportunities for faculty development and networking, bringing together medical sciences and medical education across the continuum of health care education. The meeting is designed for all those who teach and lead curricula in the sciences of medicine and health.

REGISTRATION NOW OPEN!

The Planning Committee has worked very hard to negotiate a very reasonable pricing structure for the IAMSE meeting. By using the University Housing offered by St. Andrews instead of local hotels, we are able to provide our attendees accommodations at a highly reduced rate. The basic registration fee **includes** accommodations for Saturday, Sunday & Monday nights, including meals, with the exception of the Gala Dinner on Monday night.

KEY DATE: April 1, 2013: Early Bird deadline for registration

**For more information visit
www.iamseconference.org
and www.amee.org**



IAMSE



Instructions for Authors

Mission of the Journal

Medical Science Educator is the peer reviewed publication of the International Association of Medical Science Educators (IAMSE). The Journal offers all who teach in healthcare the most current information to succeed in their task by publishing scholarly activities, opinions, and resources in medical science education. Published articles focus on teaching the sciences fundamental to modern medicine and health, and include basic science education, clinical teaching, and the use of modern education technologies.

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Manuscripts should be prepared in accordance with the *Uniform Requirements for Manuscripts Submitted to Biomedical Journals* (see <http://www.icmje.org/>) and the Committee on Publication Ethics (COPE) Code of

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