Programs Supporting Careers in Health Sciences for Elementary and Secondary School Students

Journal Articles

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The 21st Century's information economy has been creating more jobs that require not only a college education but also a fair amount of expertise in the fields of science, technology, engineering and math--collectively known as STEM. The last several decades have seen the industrial- and manufacturing-based economy shift to a service economy fueled by information, knowledge and innovation. According to the U.S. Bureau of Labor Statistics, between 1996 and 2006, the United States lost three million manufacturing jobs. In that same timeframe, 17 million service sector jobs were created, specifically in the areas of health care, education, environment, security and energy. From 2008-2018, many of the fastest-growing jobs in the service sector are and will be STEM-related, high-end occupations that include doctors, nurses, health technicians and engineers. Industries projected to have the most employment growth are in scientific, technical and management consulting; computer systems design; and employment services. In order to help prepare youth for these careers, individuals need to think about STEM learning opportunities beyond the traditional school day. Afterschool programs are currently serving more than 1.3 million middle school students, with many programs providing engaging STEM content. Combining STEM learning with afterschool programming offers middle school students a fun, challenging, hands-on introduction to the skills they will need in high school, college and the workplace. This issue brief highlights afterschool programs that incorporate STEM activities, giving middle school students time to develop an interest in STEM and inspiring them to learn. This brief is a second in a series of four issue briefs examining critical issues facing middle school youth and the vital role afterschool programs play in addressing these issues. (Contains 17 endnotes.) For related reports, see "Afterschool: Providing Multiple Benefits to Middle School Students. MetLife Foundation Afterschool Alert. Issue Brief No. 42" (ED511973); "Afterschool: Key to Health and Wellness for Pre-Teens and Teens. MetLife Foundation Afterschool Alert. Issue Brief No. 45" (ED522620); and "Afterschool: Supporting Career and College Pathways for Middle School Age Youth. MetLife Foundation Afterschool Alert. Issue Brief No. 46" (ED522622).]


BACKGROUND: The worldwide shortage of doctors and the low representation of minorities in medicine outline the need for enrichment programmes that expose a diverse population of youth to health careers. This report describes the innovative Summer Premed Program run at the University of California, Irvine School of Medicine, from the perspective of our diverse group of participating high school students.

METHODS: Our unique and highly interactive programme focused on providing youths with a glimpse of life in medical school. Students participated in interactive workshops such as a cadaver lab, robotics, patient interviews and bedside ultrasound. To determine the success of the programme, a feedback survey was distributed to all students at the end of the programme. RESULTS: During the summers of 2012, 2013 and 2014, 418 high-school students participated in the programme and 19.4 per cent were under-represented in medicine. Of the 418 students, 371 (89%) completed evaluations. The average rating of all the workshops ranged from 3.26 to 4.68 (out of maximum of 5) with cadaver lab, suturing workshops and patient interviews each having the highest rating of approximately 4.7. Additionally, resulting from this programme, students gave an average rating of 4.42 for comfort in interviewing patients, and 4.55 for professional development. DISCUSSION: The results reveal that the Summer Premed Program at the University of California, Irvine School of Medicine, was successful towards exposing a diverse range of youths to medical school while motivating them to pursue careers in

The most effective ways to promote learning and inspire careers related to science, technology, engineering, and mathematics (STEM) remain elusive. To address this gap, we reviewed the literature and designed and implemented a high-fidelity, medical simulation-based Harvard Medical School MEDscience course, which was integrated into high school science classes through collaboration between medical school and K-12 faculty. The design was based largely on the literature on concepts and mechanisms of self-efficacy. A structured telephone survey was conducted with 30 program alumni from the inaugural school who were no longer in high school. Near-term effects, enduring effects, contextual considerations, and diffusion and dissemination were queried. Students reported high incoming attitudes toward STEM education and careers, and these attitudes showed before versus after gains (P < .05).
Students in this modest sample overwhelmingly attributed elevated and enduring levels of impact on their interest and confidence in pursuing a science or healthcare-related career to the program. Additionally, 63% subsequently took additional science or health courses, 73% participated in a job or educational experience that was science related during high school, and 97% went on to college. Four of every five program graduates cited a healthrelated college major, and 83% offered their strongest recommendation of the program to others. Further study and evaluation of simulation-based experiences that capitalize on informal, naturalistic learning and promote self-efficacy are warranted. © 2014 The American Physiological Society.


Background:- There has been much emphasis in recent years on attracting students from lower socio economic backgrounds to medical school, but they are still vastly under represented. Context:- We have developed a 'Refugee Day', a simulated learning environment in an East Yorkshire school, which over the last 4 years has involved over 1200 15 year old students. School teachers, engineers, army personnel and medical staff work with school students to complete a range of activities, all aiming to simulate life in a refugee camp. A medical workshop aims to give school students some basic knowledge of the common medical conditions encountered in such a setting. Innovation:- To our knowledge this simulation is unique. It gives school students the opportunity to engage with professionals and discuss possible career plans. School students interact with doctors in an informal and non threatening setting, allowing them to explore medicine as a career. Research has shown that school students from working class backgrounds have difficulty identifying with medicine. The day challenges many of their perceptions of the medical profession, and may encourage students to consider a career in medicine. Implication:- From our perspective learning in a simulated environment effectively engages school students with professionals in an informal environment, facilitating the discussion of moral and career issues. We feel that there is scope for such ideas to be used more widely. Medical schools could offer their expertise to local schools and sixth form colleges. Alternative scenarios might include a road traffic accident or the aftermath of an earthquake. © 2010 Blackwell Publishing Ltd


Drexel University College of Medicine hosts two, three-week long Mini-Medical School Summer Camps each summer. These programs offer high-school seniors and freshmen in college the opportunity to experience various aspects of medical school and the life of a physician: attending lectures, observing surgeries, shadowing clinical physicians, etc. The purpose of this study is to see if the program increases students' interest in pursuing a career in medicine, the aspects of the program that accomplish this, and assess general satisfaction of the program. Information was collected from surveys administered to students before and after completion of the program. The program failed to show a difference in students' interest of pursuing a career in medicine before and after the program. Experiences in the operating room and ambulatory care (shadowing) were shown to be most influential on a student's decision to pursue a career in medicine. Students indicated the most enjoyed activity for both sessions was observing surgeries in the operating room. The majority of students would do the program again and recommend the program to their friends. Future studies should be conducted on similar programs to look at variables such as different age groups or socioeconomic statuses, and the impact these factors have on pursuing careers in medicine. © 2017 National Medical Association


Minority enrollment in pharmacy schools across the nation continues to be low despite the increased diversity of the United States population. High school recruitment programs may be a means to increase minority interest and representation within the profession of pharmacy. A summer camp was offered to minority high school students with an interest in a future healthcare career. The goal of the camp was to change the perception of pharmacy as a future career choice in minority high school students. During the camp, students participated in community pharmacy visits, pharmacy practice and pharmaceutical science laboratory activities, campus tours along with faculty and pharmacy student interactions. Students indicated a positive change in their perception of a career in pharmacy after completion of the
pharmacy summer camp. The camp may be used as a model to stimulate interest and awareness of pharmacy as a future career option among minority high school students. © 2013 Elsevier Inc.

Cahill, H., Coffey, J., & Sanci, L. (2015). 'I wouldn't get that feedback from anywhere else': Learning partnerships and the use of high school students as simulated patients to enhance medical students' communication skills curriculum development. *BMC Medical Education, 15*(1) doi:10.1186/s12909-015-0315-4

Background: This article evaluates whether the use of high school students as simulated patients who provide formative feedback enhances the capacity of medical students in their fifth year of training to initiate screening conversations and communicate effectively with adolescents about sensitive health issues. Methods: Focus group interviews with medical students (n = 52) and school students aged 15-16 (n = 107) were conducted prior to and following involvement in Learning Partnerships workshops. Prior to workshops focus groups with school students asked about attitudes to help-seeking in relation to sensitive health issues, and following workshops asked whether the workshop had made a difference to their concerns. Prior to workshops focus groups with medical students asked about their needs in relation to initiating conversations with adolescents about sensitive health issues, and following workshops asked whether the workshop had made a difference to their concerns. Surveys were also completed by 164 medical students and 66 school students following the workshops. This survey featured 19 items asking participants to rank the usefulness of the workshops out of 10 (1 = not at all useful, 10 = extremely useful) across areas such as skills and understanding, value of learning activities and overall value of the workshop. SPSS software was used to obtain mean plus standard deviation scores for each item on the survey. Results: The Learning Partnerships workshops assisted medical students to improve their skills and confidence in communicating with adolescents about sensitive health issues such as mental health, sexual health and drug and alcohol use. They also assisted young people to perceive doctors as more likely potential sources for help. Conclusions: These findings suggest that the innovative methods included in Learning Partnerships may assist in broader education programs training doctors to be more effective helping agents and aid the promotion of adolescent friendly health care. This research provides evidence that a new way of teaching may contribute to enhancing doctors' capacity and willingness to initiate screening conversations and enhance adolescents' preparedness to seek help. This has implications for educational design, content and communication style within adolescent health. © 2015 Cahill et al.; licensee BioMed Central.


Canadian medical students are more likely to come from urban and high-income areas and to have well-educated, professional parents. Physicians who grew up in rural areas are more likely to serve in rural and lower-income areas. We identify perceptions held by rural high school students regarding the affordability and attainability of a medical education. We distributed a survey to high school students who attended the MedQUEST Health Career Exploration Program in southwestern Ontario. The survey assessed socioeconomic background and perceived barriers to a medical education (including affordability as well as encouragement and discouragement from others). Of the 119 attendees, 106 (89.1%) completed the survey. Of the students who were interested in becoming physicians, most expected to fund their medical education through scholarships (56 [69.1%]), parental support (50 [61.7%]) or student employment (45 [55.6%]). However, less than half of all respondents (48 [45.3%]) provided reasonably correct estimates for annual medical tuition fees. If at least 1 parent had a postsecondary education, respondents were less likely to cite affordability as a barrier to attending medical school (p = 0.05). Although students interested in obtaining a medical education cited affordability as a potential barrier, many were not aware of the actual cost of attending medical school. We found an association between perceived affordability of medical school and parents' level of education. To define this relation further, research is needed to collect more accurate data on family income. Students may benefit from more information about funding opportunities for medical school.

Purpose Mini-Medical school programs have become an increasingly popular means of encouraging high school students to consider medical professions. However, there is little research evaluating the long-term effect of these programs on influencing career choice. The purpose of our study was to determine the motivational factors for attending the Mini-Medical school programs at our institution, student satisfaction with their experience, and whether it impacts intended secondary education and career choices. Methods An online anonymous survey was distributed to Drexel University College of Medicine Mini-Medical school program graduates to determine factors influencing student participation and program satisfaction. Results The most influential factors in attending the program were to confirm an interest in medicine (n = 55, 95%) and parental advice (n = 29, 50%). Most maintained an interest in medicine: 57% (n = 33) pursued a pre-med degree, 55% (n = 32) planned to apply to medical school within 3 years; and 12% (n = 7) were either in medical school or matriculating in the fall of 2015. 91% (n = 53) participants noted the program's influence on choosing a pre-med undergraduate track.

Conclusion Our results suggest Mini-Medical school programs significantly impacted students' decision to pursue a medical career through fostering interest and effectively answering students' questions about the field. © 2016 National Medical Association


This article describes the Health Sciences and Technology Academy, an outreach and engagement program by West Virginia University to encourage higher education faculty members and administrators, public school teachers, and community leaders to assume the responsibility of mentoring high school students. The primary goal is to increase the college going rate among underrepresented students in West Virginia. Additional goals are to improve science and math skill acquisition, to empower communities through leadership development of their youth, and to increase the number of health care providers as well as the number of math and science educators in West Virginia's currently underserved communities.

Christie, B. A. (2012). (2012). Creating partnerships between your university and community-based out-of-school time programs to improve the STEM pipeline. Paper presented at the In 2001, after receiving seed money from the Honda Foundation, Loyola Marymount University’s College of Science and Engineering developed a community outreach program with the goal of increasing the pipeline of girls and underrepresented minorities studying science, technology, engineering, and mathematics (STEM) at the college level. To accomplish this goal, we started the Science and Engineering Community Outreach Program (SECOP). SECOP is a two-week residential pre-college summer school program with a focus on science and engineering. Engineering and mathematics faculty provide a similar curriculum taught in Engineering 101 and Pre-calculus College courses. The afternoon classes are project-oriented. Students design mousetrap cars using SolidWorks, and build their cars in the Mechanical Engineering Laboratory. The high school students purchase supplies for the mousetrap car from Home Depot and must keep their budget to $10. At night, students work on group projects that include designing and building robots using LEGO Mindstorms NXT. To recruit students, we created a partnership between our College and five community-based out-of-school time programs in Southern California. By working with community organizations, we have reached highly motivated students who have a strong aptitude for science and mathematics. Over the past 11 years, 233 students from 73 different high schools in the Greater Los Angeles Area have participated in SECOP. We have received over $500,000 in funding from foundations and engineering-based corporations. The demographics of the high school students include 140 females (60%), and 93% African American, Hispanic or Native American. The outcomes for the students who participated in SECOP have been outstanding. We have collected data on the alumni who have graduated high school and 4-6 years after they have graduated college. We contacted the alumni by phone and searching for them on facebook. Of the students who attended SECOP and now have graduated from high school, 99% have or are attending college. Sixty-six percent have select STEM majors in college and 39% selected engineering in particular. On a recent search of the alumni from 2001-2005 with an 80% return rate, we found that 97% have graduated from college and 29% have gone onto graduate or professional school including 3 in medical school, 1 in dental school, 1 in law school, 4 working on PhDs and 13 working toward masters or having completed masters degrees. Seventeen (22%) of the college graduates are working as professional engineers, architects or computer

BACKGROUND: Most witnessed out-of-hospital cardiac arrests (OHCA) do not receive bystander cardiopulmonary resuscitation (CPR). The incidence of laypersons’ CPR could be increased by widespread training. We evaluated the effect of distribution of CPR educational material to high-school students in the area of Como, Italy. METHODS AND RESULTS: From January 2008 to October 2009, we distributed 3200 resuscitation manikins to pupils (62% boys, mean age 16.5 ± 0.8 years) at 20 high schools in the area of Como. All students received a kit including a personal manikin and a 27 min educational digital video disc. Furthermore, they received 40 min school training in the fundamental maneuvers of CPR utilizing the manikin. Afterwards, they were encouraged to train friends and relatives at home (second tier), utilizing the kit. Eight months later, a questionnaire was randomly submitted to a sample of 600 students (19% of the distributed manikins). The 600 kits had been used to train 1058 from the second tier (mean, 1.77 persons per pupil; 95% confidence interval 1.62-1.93). Boys had a significantly lower multiplier effect than girls: 1.45 ± 1.01 vs. 2.26 ± 1.89 (P < 0.0001). Ninety-five percent of pupils considered themselves sufficiently trained in CPR and 62.3% declared their availability to effectively practice CPR if necessary. One pupil performed an effective CPR during her mother’s OHCA.

CONCLUSIONS: CPR training can be disseminated using personal manikins distributed to pupils. Most students declared themselves trained and willing to start bystander CPR if necessary. One successful CPR was effectively performed. © 2011 Italian Federation of Cardiology.


Biomedical preparatory programs (pipeline programs) have been developed at colleges and universities to better prepare youth for entering science- and health-related careers, but outcomes of such programs have seldom been rigorously evaluated. We conducted a matched cohort study to evaluate the Stanford Medical Youth Science Program’s Summer Residential Program (SRP), a 25-year-old university-based biomedical pipeline program that reaches out to low-income and underrepresented ethnic minority high school students. Five annual surveys were used to assess educational outcomes and science-related experience among 96 SRP participants and a comparison group of 192 youth who applied but were not selected to participate in the SRP, using ~2:1 matching on sociodemographic and academic background to control for potential confounders. SRP participants were more likely than the comparison group to enter college (100.0 vs. 84.4 %, p = 0.002), and both of these matriculation rates were more than double the statewide average (40.8 %). In most areas of science-related experience, SRP participants reported significantly more experience (>twofold odds) than the comparison group at 1 year of follow-up, but these differences did not persist after 2-4 years. The comparison group reported substantially more participation in science or college preparatory programs, more academic role models, and less personal adversity than SRP participants, which likely influenced these findings toward the null hypothesis. SRP applicants, irrespective of whether selected for participation, had significantly better educational outcomes than population averages. Short-term science-related experience was better among SRP participants, although longer-term outcomes were similar, most likely due to college and science-related opportunities among the comparison group. We discuss implications for future evaluations of other biomedical pipeline programs.


BACKGROUND AND OBJECTIVES: The affinity model predicts that students from rural areas who train in smaller towns will be more likely to choose rural practice. Most pipeline programs based on this model begin in college or medical school. Many rural students first encounter academic and career planning challenges prior to college, and a few programs are focused on high school students. METHODS: We

This research aimed to evaluate the effectiveness of the Rural Student Recruitment (RSR) program. This program was an initiative to address the low number of rural students enrolled in medicine at the University of Western Australia. RSR identifies students throughout rural and remote areas of Australia interested in pursuing a career in medicine. The program provides support to these students through the various stages of the selection process and subsequently through the course. Setting: Medical School, the University of Western Australia. Participants: Rural students enrolled in medicine at the University of Western Australia. Results: Of the 1591 participants in the RSR program, 11.6% have been successful in being offered a place. Participation was consistently higher for women, although men were proportionately more successful at gaining entry (14.5% versus 10.4%). It was found that the distribution of successful students in the RSR program generally reflects population density across rural Western Australia, with the majority of students coming from the South West, and the minority from the university of Western Australia. RSR identifies students throughout rural and remote areas of Australia interested in pursuing a career in medicine. The program provides support to these students through the various stages of the selection process and subsequently through the course. Setting: Medical School, the University of Western Australia. Participants: Rural students enrolled in medicine at the University of Western Australia. Results: Of the 1591 participants in the RSR program, 11.6% have been successful in being offered a place. Participation was consistently higher for women, although men were proportionately more successful at gaining entry (14.5% versus 10.4%). 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It was found that the distribution of successful students in the RSR program generally reflects population density across rural Western Australia, with the majority of students coming from the South West, and the minority from the
Pilbara and Kimberley. However, over the last three years (2006-2008) an increase in access from very remote regions was noted. This has been associated with a modification to the entry process that now includes a remoteness weighting for the secondary school attended. Conclusions: The conclusion from this analysis was that the RSR program in concert with refinements in entry criteria has been effective in increasing the number of medical students from a rural background. © 2009 The Authors. Journal compilation © 2009 National Rural Health Alliance Inc.


Used effectively, stereoscopic three-dimensional (3D) technologies can engage students with complex disciplinary content as they are presented with informative representations of abstract concepts. In addition, preliminary evidence suggests that stereoscopy may enhance learning and retention in some educational settings. Biological concepts particularly benefit from this type of presentation since complex spatially oriented structures frequently define function within these systems. Viewing biological phenomena in 3D as they are in real life allows the user to relate these spatial relationships and easily grasp concepts making the key connection between structure and function. In addition, viewing these concepts interactively in 3D and in a manner that leads to increased engagement for young prospective scientists can further increase the impact. We conducted two studies evaluating the use of this technology as an instructional tool to teach high school students complex biological concepts. The first study tested the use of stereoscopic materials for teaching brain function and human anatomy to four classes. The second study evaluated stereoscopic images to support the learning of cell structure and DNA in four different high school classes. Most important, students who used stereoscopic 3D had significantly higher test scores than those who did not. In addition, students reported enjoying 3D presentations, and it was among their top choices for learning about these complex concepts. In summary, our evidence adds further support for the benefits of 3D images to students learning of science concepts. © 2015 The American Physiological Society.


With the growing number of minority citizens receiving health care, increasing the number of minority students who will become nurses is important. Minority representation in professional nursing is low, and innovative steps are needed to encourage enrollment into nursing programs. A large university in the southwest United States has taken a proactive role by conducting a summer camp that introduces high school students to the profession of nursing. Campers learned foundational skills and applied them using an infant simulation scenario. End-of-camp simulation revealed active learning occurred. Simulation was an effective strategy to educate high school campers. © 2013 International Nursing Association for Clinical Simulation and Learning.


Background: The Stanford Youth Diabetes Coaches Program (SYDCP) is a school based health program in which Family Medicine residents train healthy at-risk adolescents to become diabetes self-management coaches for family members with diabetes. This study evaluates the impact of the SYDCP when disseminated to remote sites. Additionally, this study aims to assess perceived benefit of enhanced curriculum. Methods: From 2012-2015, 10 high schools and one summer camp in the US and Canada and five residency programs were selected to participate. Physicians and other health providers implemented the SYDCP with racial/ethnic-minority students from low-income communities. Student coaches completed pre- and posttest surveys which included knowledge, health behavior, and psychosocial asset questions (i.e., worth and resilience), as well as open-ended feedback questions. T-test pre-post comparisons were used to determine differences in knowledge and psychosocial assets, and open and axial coding methods were used to analyze qualitative data. Results: A total of 216 participating high school students completed both pre-and posttests, and 96 nonparticipating students also completed pre- and posttests. Student coaches improved from pre- to posttest significantly on knowledge (p<0.005 in 2012-13, 2014 camp, and 2014-15); worth (p<0.1 in 2014-15); problem solving

Background: The European Resuscitation Council guidelines recommend First Aid education at all levels of schooling. Schools should prepare students for the challenges of the contemporary world, including First Aid assistance in cases of casualties and crisis response, to ensure their own safety as well as that of victims and witnesses. The present study aims to evaluate First Aid classes for secondary schools students and the correlation with acquired knowledge regarding conduct under conditions of an imminent threat to health or life. Methods: The study included 500 people: secondary school students of second forms, second and third classes of technical colleges and university students of various faculties in the Lublin province. This paper uses a diagnostic survey and employs a specially developed questionnaire. Questions in the survey were constructed on the basis of the European Resuscitation Council Guidelines of 2010. Results: More than half its respondents (55.8%) assessed First Aid lessons as quite interesting. Statistical analysis showed that people who have assessed classes as having better quality were statistically more likely to know that everyone has the obligation to provide First Aid (p = 0.00001) and more likely to have given such assistance (p <0.00001). The study indicates that respondents assessing conducted classes in First Aid as interesting more often gave correct answers to questions about First Aid (p <0.05). Conclusion: After analyzing the results of the study, it was shown that most students are satisfied with the First Aid classes at their school. Furthermore, the classes used phantoms and had a practical nature. Among students assessing First Aid classes as "well and very well" led, a greater level of satisfaction with the First Aid classes at their school. Furthermore, the classes used phantoms and had a practical nature. Among students assessing First Aid classes as "well and very well" led, a greater level of satisfaction with the First Aid classes at their school. Furthermore, the classes used phantoms and had a practical nature.


This presentation is concerned with the professional relationships between teachers and paediatricians in supporting children with special educational needs to reach their full potential. In England, both professions are subject to government legislation and guidance with regard to their own professional practice, including Every Child Matters (DfES 2003) which impacts on both professions. Additionally, the nature of each profession is shaped by their respective professional bodies. While multiple policies have advocated closer collaborative professional relationships, I contend that changes to structures, organisation and processes alone cannot guarantee effective interprofessional working. It is the mutually expressed professional qualities such as respect, advocacy, understanding and empathy that paediatricians and teachers exhibit, leading to improved interprofessional working which are outlined in this study. Three themes are identified through the literature as having an impact on the teacher/paediatrician relationship; they are policy into practice, professional hierarchy and professional outcomes. In taking a social constructivist approach, the perspectives of teachers and paediatricians are sought with regard to interprofessional working. Phase One of the enquiry comprised of single profession focus groups, where each profession outlined the professional qualities they considered important in bringing about effective collaboration. It is the findings from this Phase that are outlined in this presentation and are presented through the framework of the previously mentioned themes. Additionally, a conceptual framework is developed whereby paediatricians and teachers can be brought together into a new community of shared practice through the exercising of professional qualities. Such a community recognises complementary competences and owes its cohesiveness to mutual engagement, joint enterprise and a shared repertoire (Wenger 1998). I contend that such communities are characterised by shared goals, shared language and shared identity and are maintained by the recognition of difference, the mutuality of attentiveness and respectful encounters (Veite and Peeler 2007). (Contains 1 table and 3 figures.)
knowledge regarding the recognition of cardiac arrest and performing resuscitation was ascertained. This suggests that such young people turn more often to rescue operations, taking into account both their own safety and that of the victim. It is desirable to continue further investigation into diversification of teaching methods, to increase both the number of hours devoted to teaching First Aid and to involve medical professionals in teaching these lessons. © Versita Sp. z o.o.

Pathways to Nursing was implemented as a partnership between Northern Kentucky University School of Nursing and Health Professions, a local high school in the Northern Kentucky region, a local hospital system, and a large regional medical practice. The goal of this project was to increase interest in nursing as a career among local high school students in order to impact the nursing shortage and improve the health of Northern Kentuckians. Pathways to Nursing activities allowed high school students to explore post-secondary nursing education by participating in nursing career day activities at the university and summer nursing camp which included an overnight stay at the university and nurse shadowing days at the local hospital. High school students were exposed to various clinical experiences, diverse nursing roles, nursing skills laboratory activities and human simulation activities. Students also met with nursing faculty, academic advisors, and university admissions counselors. One hundred and twenty-four high school students participated in Nurse Career Days over the two-year period of the program, and 45 students participated in Summer Nurse Camp over two summers. Ninety-four percent of the high school students who participated in Nurse Career Day stated they "probably choose" or "definitely choose" the university to attend nursing school; 93.6% stated they "might want to be a nurse" or "definitely would want to be a nurse", and 93.7% rated the information covered as very relevant. Sixty-two percent of the students reported that they "definitely want to be a nurse" after attendance at Summer Nurse Camp. The goal of the Pathways to Nursing program was to provide Northern Kentucky high school students the opportunity to explore nursing through active learning experiences that augment career and academic interests. Collaborative relationships were developed between the University, the School of Nursing and Health Professions (SNHP), a local hospital system and a regional medical practice to encourage Northern Kentucky high school students to pursue a career in nursing. The following objectives were used to complete this project. 1. Build collaborative relationships among all partners to plan, implement and evaluate all phases of the Pathways to Nursing program. 2. Complete Pathways to Nursing activities throughout the year that allow high school students to explore post secondary nursing education and diverse clinical experiences. 3. Implement cooperative learning experiences for "Pathways to Nursing" high school students through educational and mentoring activities conducted by university undergraduate and graduate nursing students.

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INTRODUCTION: Addressing systemic barriers experienced by low-income and minority students to accessing medical school, the University of Calgary's Cumming School of Medicine has spearheaded a year-round, mini-med school outreach initiative for Aboriginal students. METHOD: Junior and senior high school youth generally attend the half-day program in classes or camps of 15-25, breaking into small groups for multisession activities. Undergraduate medical education students mentor the youth in stations offering experiential lessons in physical examination, reading x-rays, and anatomy. All resources from the medical school are offered in-kind, including a pizza lunch at midday, whereas community partners organize transportation for the attendees. RESULTS: Opening the medical school and its resources to the community offers great benefits to resource-constrained schools often limited in terms of science education resources. The model is also an effort to address challenges among the medical professions around attracting and retaining students from underserved populations. CONCLUSION: The prospect of increasing admission rates and successful completion of medical education among students from marginalized communities poses a real, though difficult-to-measure, possibility of increasing the workforce most likely to return to and work in such challenging contexts. A mini-medical school for Aboriginal youth highlights mutual, long-term benefit for diverse partners, encouraging medical educators and community-based science educators to explore the possibilities for deepening partnerships in their own regions.

**INTRODUCTION:** Rural background is an acknowledged predictor of later rural medical practice. This study aimed to explore why only small numbers of high school students from rural South Australia seek entry to the University of Adelaide Medical School. **METHOD:** Questionnaires were designed to explore the interest in, knowledge of and attitudes about studying medicine of rural high school students, their parents and their careers counsellors. A stratified sample of 15 high schools in rural South Australia was selected. Data were collected from all participants on perceptions and knowledge of the entry processes and subject requirements for studying medicine. Student participants were also asked about their interest in studying medicine and becoming a doctor. **RESULTS:** Four hundred and sixty-one rural year 11 and 12 students, 512 parents of rural year 11 and 12 students, and 12 rural high school careers advisors returned useable data. Students, parents and career advisors were found to hold inaccurate perceptions of the minimum Tertiary Entrance Rank, and they incorrectly believed prerequisite subjects were required in order to study medicine at the University of Adelaide. Analysis identified a group of students interested in a career as a doctor but who had never considered studying medicine. The majority of students who had seriously considered studying medicine reported a lack of knowledge of admission processes and the requirements for studying medicine. Among students who found becoming a doctor appealing, those who had never considered medicine had less confidence regarding and knowledge of requirements and entry processes into medical courses than those who had. **CONCLUSION:** Some keen rural students have inadequate or inaccurate information about medical courses and admissions processes, which will deter them from applying to study medicine. Another group of students were identified who were attracted to a medical career but had not sought information on entry to a university undergraduate medical course. Both groups might be encouraged to progress their application to a medical school through peer teaching or detailed visits to rural high schools, targeting medical careers promotion and provision of accurate and timely information on applying for and studying medicine.


The General Medical Council states that United Kingdom graduates must function effectively as educators. There is a growing body of evidence showing that medical students can be included as teachers within a medical curriculum. Our aim was to design and implement a near-peer-led teaching program in an undergraduate medical curriculum and assess its acceptability among "year 1" students. Students received six tutorials focusing on aspects of cardiac, respiratory, and blood physiology. Tutorials ran alongside standard module teaching. Students were taught in groups of ~30 students/group, and an active teaching approach was used in sessions where possible. Using anonymous evaluations, student feedback was collected for the program overall and for each tutorial. The program was voluntary and open to all first-year students, and 94 (of 138) medical students from "year 1" at Brighton and Sussex Medical School were recruited to the study. The tutorial program was popular among students and was well attended throughout. Individual tutorial and overall program quantitative and qualitative feedback showed that students found the tutorials very useful in consolidating material taught within the module. Students found the small group and active teaching style of the near-peer tutors very useful to facilitating their learning experience. The end-of-module written examination scores suggest that the tutorials may have had a positive effect on student outcome compared with previous student attainment. In conclusion, the present study shows that a near-peer tutorial program can be successfully integrated into a teaching curriculum. The feedback demonstrates that "year 1" students are both receptive and find the additional teaching of benefit. (Contains 4 tables and 1 figure.)


Medical schools, although the gatekeepers of much biomedical education and research, rarely engage formally with K-12 educators to influence curriculum content or professional development. This segregation of content experts from teachers creates a knowledge gap that limits inclusion of current biomedical science into high school curricula, affecting both public health literacy and the biomedical pipeline. The authors describe how, in 2009, scientists from Tufts Medical School and Boston public school teachers established a partnership of formal scholarly dialogue to create 11th to 12th-grade high school curricula about critical health-related concepts, with the goal of increasing scientific literacy and
influencing health-related decisions. The curricula are based on the great diseases (infectious diseases, neurological disorders, metabolic disease, and cancer). Unlike most health science curricular interventions that provide circumscribed activities, the curricula are comprehensive, each filling one full term of in-class learning and providing extensive real-time support for the teacher. In this article, the authors describe how they developed and implemented the infectious disease curriculum, and its impacts. The high school teachers and students showed robust gains in content knowledge and critical thinking skills, whereas the Tufts scientists increased their pedagogical knowledge and appreciation for health-related science communication. The results show how formal interactions between medical schools and K-12 educators can be mutually beneficial.


Teaching is an increasingly recognized responsibility of the resident physician. Residents, however, often assume teaching responsibilities without adequate preparation. Consequently, many medical schools have implemented student-as-teacher (SAT) programs that provide near-peer teaching opportunities to senior medical students. Near-peer teaching is widely regarded as an effective teaching modality; however, whether near-peer teaching experiences in medical school prepare students for the teaching demands of residency is less understood. We explored whether the anatomy-based SAT program through the Human Structure didactic block at Mayo Medical School addressed the core teaching competencies of a medical educator and prepared its participants for further teaching roles in their medical careers. A web-based survey was sent to all teaching assistants in the anatomy-based SAT program over the past five years (2007-2011). Survey questions were constructed based on previously published competencies in seven teaching domains--course development, course organization, teaching execution, student coaching, student assessment, teacher evaluation, and scholarship. Results of the survey indicate that participants in the anatomy-based SAT program achieved core competencies of a medical educator and felt prepared for the teaching demands of residency.


Objective: We investigated the Results obtained with a basic cardiopulmonary resuscitation (b-CPR) program (PROCES) specifically designed for secondary school students (14-16 years old) and taught by emergency physicians. Methods: We used a multiple-choice test with 20 questions (10 on theory and 10 on skills) answered before and immediately after and 1 year after receiving the b-CPR course. Satisfactory learning was considered when at least 8 out of 10 skill questions were correctly answered. We investigated student variables associated with better immediate and deferred (1 year after) PROCES performance. We compared the Results with those obtained using a more standardized program to teach b-CPR to police cadets. Results: We enrolled 600 high school students. PROCES achieved significant improvement in overall, theory and skill marks immediately after the course (P<0.001), with a significant decay in all of them 1 year after the course (P<0.001). Satisfactory learning was achieved by 57% of school students immediately after PROCES and by 37% when assessed 1 year later. Students without pending study subjects (P=0.001) and those from private schools (P<0.01) achieved significantly better performance immediately after PROCES and only female students achieved greater performance 1 year after the course (P<0.05). With respect to police cadets instructed through a standardized course, immediate satisfactory learning of school students was lower (79 vs. 57%, respectively; P<0.001), whereas deferred satisfactory learning was higher (23 vs. 37%, respectively; P<0.05). Conclusion: Emergency physicians can satisfactorily instruct secondary school students in b-CPR using PROCES, and this specific program achieves a reasonable amount of satisfactory learning. © 2009 Wolters Kluwer Health | Lippincott Williams & Wilkins.


Engagement of academic medical centers in community outreach provides the public with a better understanding of basic terms and concepts used in biomedical sciences and increases awareness of important health information. Medical students at one academic medical center initiated an educational
outreach program, called PULSE, that targets secondary students to foster their interest in healthcare and medicine. High school student participants are engaged in a semester-long course that relies on interactive lectures, problem-based learning sessions, mentoring relationships with medical students, and opportunities for shadowing healthcare providers. To date, the curriculum has been offered for 7 consecutive years. To determine the impact that participation in the curriculum has had on college/career choices and to identify areas for improvement, an electronic questionnaire was sent to former participants. Based on a 32% response rate, 81% of former participants indicated that participation in the course influenced their decision to pursue a medical/science-related career. More than half (67%) of respondents indicated intent to pursue a MD/PhD or other postgraduate degree. Based on responses obtained, additional opportunities to incorporate laboratory-based research and simulation sessions should be explored. In addition, a more formalized mentoring component has been added to the course to enhance communication between medical students and mentees. Health/medicine-related educational outreach programs targeting high school students may serve as a pipeline to introduce or reinforce career opportunities in healthcare and related sciences. © 2015 The American Physiological Society.


Making the study of the human anatomy and physiology authentic and clinically relevant poses many challenges. Described herein is a program that, through the use of medical school cadavers, provides high school students a unique experience to enhance their clinically based study of human anatomy and physiology. The program incorporates many learning modalities as well as problem-based team learning and can be a feasible addition to many high school anatomy programs. © 2017 National Association of Biology Teachers. All rights reserved. Please direct all requests for permission to photocopy or reproduce article content through the University of California Press's Reprints and Permissions web page.


PURPOSE: Premedical students commonly shadow physicians to gain an understanding of what careers in medicine entail. The authors reviewed the literature to explore (1) whether shadowing achieves this goal consistently and effectively, (2) the ethical issues involved, and (3) other reasons that individuals shadow physicians. METHOD: The authors searched the MEDLINE database via Ovid for English-language articles published from 1948 to March 2011. Eligible articles described physician shadowing programs and/or assessed the value of physician shadowing independently or in comparison with other educational methods. RESULTS: Of 770 articles identified, 13 articles about physician shadowing programs met inclusion criteria. Two of the 13 programs involved shadowing only, whereas 11 included other educational initiatives. Participants varied; shadowers included students (high school, college, medical school), recent medical school graduates, or international medical graduates. Few studies addressed shadowing by premedical students. Most studies involved programs outside the United States. Shadowing program objectives and characteristics differed. Data reported from focus groups, interviews, and surveys suggest that shadowing experiences generally increased participants’ interest in medicine (or a specialty) or improved participants’ confidence in transitioning to a new position. Some articles raised ethical and practical concerns related to shadowing. CONCLUSIONS: The few shadowing programs described in the literature were heterogeneous and often involved other activities. Further research is warranted; objective outcomes measures would be useful. The authors propose developing guidelines and introducing a code of conduct for premedical students, to enhance the consistency of shadowing experiences and address ethical and practical considerations.


Most mental disorders often onset during the adolescent years, providing opportunities for educators, health care providers, and related stakeholders to work collaboratively in addressing adolescent mental health care needs. This report describes early implementations of various components of the School-Based Pathway to Care Model currently applied in Canada, identifies lessons learned, and suggests future directions. The School-Based Pathway to Care Model engages students, teachers, student service providers, parents/families, health care providers, and the wider community through various training programs and both formal and informal linkages between the school, community, and health providers.
Preliminary evaluation of the model in whole and in part shows promising outcomes for its application in secondary schools within the wider framework of enhancing system capacity for addressing mental health needs of students. Future focus should be directed towards more rigorous research on the model and its various components. (Contains 2 figures.)


To enhance diversity of applicants to University of Oklahoma College of Medicine, a Summer Medical Program for High School Students was started in 2009. This comprehensive pipeline program included sessions on applying to medical school, interaction with a panel of minority physicians and health care professionals role models, clinically oriented didactics taught by physician faculty, shadowing experiences in clinics and hospitals, and presentation of student research reports. Students' assessments in 2009 showed increased understanding of the medical school application process, the medical curriculum and the medical field, and an increase in students' likeliness to choose a medical career. Importance of long-term mentoring and follow-up with students to sustain their medical interests is discussed.


High school students in the United States are apathetic about science, technology, engineering and mathematics (STEM), and the workforce pipeline in these areas is collapsing. The lack of understanding of basic principles of biology means that students are unable to make educated decisions concerning their personal health. To address these issues, we have developed a simple, inquiry-based outreach lesson centered on a mouse dissection. Students learn key concepts in immunology and enhance their understanding of human organ systems. The experiment highlights aspects of the scientific method and authentic data collection and analysis. This hands-on activity stimulates interest in biology, personal health and careers in STEM fields. Here, we present all the information necessary to execute the lesson effectively with middle and high school students. © 2012 Springer Science+Business Media, LLC.


Background: Less than 6% of U.S. medical school applicants are African-American. The lack of diversity among physicians, by race as well as other measures, confers a negative impact on the American healthcare system because underrepresented minority (URM) physicians are more likely to practice in underserved communities and deliver more equitable, culturally competent care. Methods: MERIT (Medical Education Resources Initiative for Teens) is a nonprofit organization based in Baltimore, Maryland, USA. MERIT prepares URM high school students for health careers by providing a holistic support system for seven consecutive years. The program model, which utilizes weekly Saturday sessions, summer internships, and longitudinal mentoring, is built on four foundational pillars: (1) Ignite the Fire, (2) Illuminate the Path, (3) Create the Toolkit, and (4) Sustain the Desire. Results: Since 2011, MERIT has supported 51 students in the Baltimore City Public School System. For the past two years, 100% (n = 14) of MERIT seniors enrolled in universities, compared to only 20.2% of Baltimore City students overall. While it is too early to know whether MERIT alumni will realize their goals of becoming healthcare professionals, they are currently excelling in universities and over 75% (n = 17) are still planning to pursue graduate degrees in health-related fields. Discussion: After piloting an effective program model, MERIT now has three key priorities moving forward: (1) Creating a sustainable and thriving organization, (2) increasing the number of scholars the program supports in Baltimore, and (3) expanding MERIT to other cities. © 2016 Education for Health.


Much has been written about the need for and barriers to achievement of greater diversity in the biomedical workforce from the perspectives of gender, race, and ethnicity; this is not a new topic. These discussions often center around a "pipeline" metaphor that imagines students flowing through a series of experiences to eventually arrive at a science career. Here we argue that diversity will only be achieved if the primary focus is on (1) what is happening within the pipeline, not just counting individuals entering and leaving it; (2) de-emphasizing the achievement of academic milestones by typical ages; and (3)

Health and educational disparities are national issues in the United States. Research has shown that health care professionals from underserved backgrounds are more likely than others to work in underserved areas. The Association of American Medical Colleges' Project 3000 by 2000, to increase the number of underrepresented minorities in medical schools, spurred the West Virginia School of Medicine to start the Health Sciences and Technology Academy (HSTA) in 1994 with the goal of supporting interested underrepresented high school students in pursuing college and health professions careers. The program was based on three beliefs: (1) if underrepresented high school students have potential and the desire to pursue a health professions career and are given the support, they can reach their goals, including obtaining a health professions degree; (2) underrepresented high school students are able to predict their own success if given the right resources; and (3) community engagement would be key to the program’s success. In this Perspective, the authors describe the HSTA and its framework and philosophy, including the underlying theories and pedagogy from research in the fields of education and the behavioral/social sciences. They then offer evidence of the program’s success, specifically for African American students, including graduates’ high college-going rate and overwhelming intention to choose a health professions major. Finally, the authors describe the benefits of the HSTA’s community partnerships, including providing mentors to students, adding legislative language providing tuition waivers and a budgetary line item devoted to the program, and securing program funding from outside sources.


Objectives - The purpose of this project was to develop a presentation that can be used to increase the number of high school students who recognize diagnostic medical sonography (DMS) professions as career alternatives and will consider pursuing DMS careers. Methods - An interactive program was developed that includes a digital presentation, question-and-answer session, and scanning demonstration. The program was presented to students at their high schools. Handout materials were provided, and a questionnaire was distributed to obtain feedback regarding the program’s content and effectiveness. Refinements to the program were made based on feedback. A Student t test was used to determine the statistical significance of changes in students’ level of knowledge about DMS and their interest in pursuing a DMS career before and after the program. The student-preferred component of the program was assessed by 1-way analysis of variance. Results - Six programs were provided to a total of 148 high school students. Of 120 students who returned questionnaires, 90% indicated that their level of knowledge of DMS increased after the program, and 60% indicated that their level of interest in pursuing a DMS career had increased. The increases in both knowledge and interest were statistically significant (P < .0001). Forty-nine percent of students indicated that the scanning demonstration was the most interesting aspect of the program. Conclusions - This program was very well received by students and teachers. It significantly improved students’ knowledge about DMS and their interest in pursuing a DMS career. Presentation materials used in this program are available to DMS professionals who would like to provide similar programs to students in their geographic areas. The PowerPoint presentation and related documents can be downloaded from the American Institute of Ultrasound in Medicine’s website at [http://www.aium.org/misc/dms.aspx](http://www.aium.org/misc/dms.aspx). © 2011 by the American Institute of Ultrasound in Medicine.
Community engagement efforts in brains and neurosciences projects involving higher education institutions are currently sporadic in Malaysia and likely to contribute the apparent lack of neuroscience awareness in the society. In this paper, we highlight 'The Brain Apprentice' project as a knowledge transfer effort to raise neuroscience awareness using school-centred neuroscience clubs. These groups promote the appreciation of neuroscience beyond conventional classroom approaches and the training of neuroscience graduate interns as student facilitators in the teaching and learning of neuroscience. The Brain Apprentice was delivered through the establishment of two school-based neuroscience clubs, Sekolah Kebangsaan Kubang Kerian 3 (primary level) and Sekolah Menengah Sains Tengku Muhammad Faris Petra (secondary level). The teaching and learning of neuroscience was delivered through practical sessions and competitions. Questionnaires were collected from the students based on the following four domains: general satisfaction, impact of knowledge transfer, satisfaction with graduate interns, and knowledge and practical relevance of neuroscience. The National Brain Bee championship has resulted in the first Malaysia representative competing at the International Brain Bee 2012. Students, who had participated as neuroscience club members were exposed to the basic principles of neuroscience, which boosted their interest in science and neuroscience. The graduate interns had also been provided with opportunities to hone in their soft skills and be involved in community-engagement efforts. This project offered a suitable model of community-engagement in raising awareness about and the profile of neuroscience both in terms of knowledge exposure and from the perspective of career options in the field. © Penerbit Universiti Sains Malaysia, 2014.


Background: Organ shortage for transplantation is a crucial problem all over the world. Educational intervention may appeal to young people's altruism, increasing organ donation and decreasing the opposition. Aim: This study assessed the influence of an educational program, including organ donation and transplantation, to forming students’ altruistic behaviors. Methods: A total 680 students of 25 secondary schools were asked about their attitudes, intentions, and knowledge about organ donation and transplantation from September 2008 to June 2009 during a 45-minute lesson. Results: In this study, altruistic attitudes were measured through questions about the expression of will to give organs away after death; to give one kidney to relatives; to use the bone marrow from a foreign person; and to sign a donor card. Attitudes were assessed by questions about conversations with relatives, an evaluation of the educational project. More than 1500 donor card were distributed and more than 90% of students wanted to sign them; 73.6% agreed to sign a donor card with the ID card. Before the project, only 8% of students had a signed donor card. Almost everybody is ready to agree to give their organs after death (80.6% male; 92.2% female), or to relatives (100% male; 90.38% female), or bone marrow (80% male; 55.7% female). The students talked to their family, informing them about their decision (36.9% male; 45.9% female). Conclusions: The proposed educational project successfully encouraged teenagers to make well-considered choices with regard to organ donation and created altruistic behaviors. © 2010 Elsevier Inc. All rights reserved.


Background Child and adolescent mental health disorders are present in around 10% of the population. Research indicates that many young people possess negative attitudes towards mental health difficulties among peers. Aims To assess the impact of a mental health teaching programme on adolescent pupils' understanding. Method Two-group pre-test-post-test control group study in two English secondary schools. Experimental classes (School E) received a six-lesson teaching intervention on mental health; control classes (School C) did not. Participants were 14- and 15-year-old pupils. The intervention consisted of six lessons on mental health issues common to young people: stress; depression; suicide/self-harm; eating disorders; being bullied; and intellectual disability. School C was given access to these lesson plans and materials on completion of the study. Understanding was measured at two time points. Time 1 (T1) and Time 2 (T2), 8 months apart, by a Mental Health Questionnaire. Behavioural, emotional and relationship strengths and difficulties were measured by the self-rated Strengths and
Difficulties Questionnaire (SDQ) with five subscales: hyperactivity, emotional symptoms, conduct problems, peer problems and prosocial behaviour. Results At T2, pupils in School E compared with those in School C showed significantly more sensitivity and empathy towards people with mental health difficulties. They also used significantly fewer pejorative expressions to describe mental health difficulties. There was a significant reduction in SDQ scores on conduct problems and a significant increase on prosocial behaviour among School E pupils compared with controls. Pupils valued the intervention highly, in particular the lessons on suicide/self-harm. Conclusions Teaching 14- and 15-year-olds about mental health difficulties helps to reduce stigma by increasing knowledge and promoting positive attitudes. The intervention also reduced self-reported conduct problems and increased prosocial behaviour. Generally, participating pupils were positive about the importance of lessons on mental health, and said that they had learnt much about the lesson topics.


In the UK widening access (WA) activities and policies aim to increase the representation from lower socio-economic groups into Higher Education. Whilst linked to a political rhetoric of inclusive education such initiatives have however failed to significantly increase the number of such students entering medicine. This is compounded by a discourse that portrays WA applicants and students as lacking the essential skills or attributes to be successful in medical education. Much of the research in this area to date has been weak and it is critical to better understand how WA applicants and students negotiate medical admissions and education to inform change. To address this gap we amalgamated a larger dataset from three qualitative studies of student experiences of WA to medicine (48 participants in total). Inductively analysing the findings using social capital as a theoretical lens we created and clustered codes into categories, informed by the concepts of "weak ties" and "bridging and linking capital", terms used by previous workers in this field, to better understand student journeys in medical education. Successful applicants from lower socio-economic groups recognise and mobilise weak ties to create linking capital. However once in medical school these students seem less aware of the need for, or how to create, capital effectively. We argue WA activities should support increasing the social capital of under-represented applicants and students, and future selection policy needs to take into account the varying social capital of students, so as to not overtly disadvantage some social groups.


This paper summarizes my experiences teaching a 28-hour course on the bacterial world for undergraduate students in the humanities and the social sciences at the Hebrew University of Jerusalem. This course was offered in the framework of a program in which students must obtain credit points for courses offered by other faculties to broaden their education. Most students had little biology in high school and had never been exposed to the basics of chemistry. Using a historical approach, highlighting the work of pioneers such as van Leeuwenhoek, Koch, Fleming, Pasteur, Winogradsky and Woese, I covered a broad area of general, medical, environmental and evolutionary microbiology. The lectures included basic concepts of organic and inorganic chemistry necessary to understand the principles of fermentations and chemosynthesis, and basic molecular biology to explain biotechnology using transgenic microorganisms and molecular phylogeny. Teaching the basics of microbiology to intelligent students lacking any background in the natural sciences was a rewarding experience. Some students complained that, in spite of my efforts, basic concepts of chemistry remained beyond their understanding. But overall the students' evaluation showed that the course had achieved its goal. © FEMS 2015. All rights reserved.


BACKGROUND: Although the population of diverse applicants applying to medical school has increased over recent years (AAMC Diversity in Medical Education: Facts and Figures 2012); efforts persist to ensure the continuance of this increasing trend. Mentoring students at an early age may be an effective method by which to accomplish diversity within the applicant pool. Having a diverse physician population is more likely able to adequately address the healthcare needs of our diverse population. PURPOSE: The purpose of this study is to initiate a pipeline program, called the Medical Student Mentorship Program

A cell is a minifactory in which structures and molecules are assembled, rearranged, disassembled, packaged, sorted, and transported. Because cellular structures and molecules are invisible to the human eye, students often have difficulty conceptualizing the dynamic nature of cells that function at multiple


Educational attainment is inversely related to socio-economic status. The achievement gap widens as children progress through the system. Take up of science options is particularly poor and difficulties are compounded by lack of relevant science-based work experience in deprived areas. The interaction of these factors is examined in some detail in an area of socio-economic deprivation. High attainment in sciences is usually considered a core requirement for acceptance into medicine and widening access to medicine for school leavers is therefore very difficult in these circumstances. A partnership between hospitals and local schools, including science-based work placements, is described. Cooperation between the NHS and schools by provision of work experience and teaching materials could help to address these issues as well as potential staffing difficulties in other healthcare science careers in the future. Expenditure can be justified on the grounds of known links between health, education and employment. © Royal College of Physicians, 2008. All rights reserved.


Purpose: The purpose of this paper was to describe the development and implementation of a health disparities summer internship program for minority high school students that was created to increase their knowledge of health disparities, provide hands-on training in community-engaged research, support their efforts to advocate for policy change, and further encourage youth to pursue careers in the health professions. Procedures: Fifty-one high school students who were enrolled in a well-established, science-enrichment after-school program in Brooklyn, New York, participated in a 4-week summer internship program. Students conducted a literature review, focus groups/interviews, geographic mapping or survey development that focused on reducing health disparities at 1 of 15 partnering CBOs. Findings: Overall, student interns gained an increase in knowledge of racial/ethnic health disparities. There was a 36.2% increase in students expressing an interest in pursuing careers in minority health post program. The majority of the participating CBOs were able to utilize the results of the student-led research projects for their programs. In addition, research conclusions and policy recommendations based on the students' projects were given to local elected officials. Conclusions: As demonstrated by our program, community-academic partnerships can provide educational opportunities to strengthen the academic pipeline for students of color interested in health careers and health disparities research.

Rashied, S. J. (2008). Working with schools in deprived areas to raise aspirations for medicine and other eye, students often have difficulty conceptualizing the dynamic nature of cells that function at multiple

Academic partnerships can provide educational opportunities to strengthen the academic pipeline for students of color interested in health careers and health disparities research.
scales across time and space. To represent these dynamic cellular processes, the Virtual Cell Productions team at North Dakota State University develops freely available multimedia materials to support molecular and cellular biology learning inside and outside the high school and university classroom. © 2015 Reindl et al.

The purpose of this study was to examine factors related to the persistence of university seniors pursuing a baccalaureate degree and preparing for medical school admission. This topic is important as a vast majority of students who begin their undergraduate studies identifying as “pre-med” change this objective early in their academic development. The study was conducted at a mid-sized public institution in the Midwestern United States and included ten semi-structured interviews to gain a better understanding of factors contributing to students’ decision to pursue a degree in preparation for medical school and their persistence throughout the undergraduate progression. Results indicated several elements contributed to students’ goal orientation and perseverance, such as an interest and aptitude for science, a dedicated and enthusiastic work ethic, a willingness to sacrifice, a desire to work in a helping profession, and a positive interaction with a health professional.

Roberts, T., & Kozu, T. (2015). Should students be admitted to medical school directly from high school or as university graduates? (pp. 57-71)

Robinson-Hill, R. The journey of a science teacher: Preparing female students in the training future scientists after school program Available From ERIC. (1826517219; ED563559). What affect does female participation in the Training Future Scientist (TFS) program based on Vygotsky's sociocultural theory and Maslow's Hierarchies of Needs have on female adolescents' achievement levels in science and their attitude toward science and interest in science-based careers? The theoretical framework for this study was developed through a constructivist perspective, using dialogic engagement, coinciding with Lev Vygotsky's sociocultural learning theory. This action research project used mixed methods research design, targeted urban adolescent females who were members of Boys & Girls Club of Greater St. Louis (BGCSTL) after-school program. The data collection measures were three qualitative instruments (semi-structured interviews, reflective journal entries and attitudinal survey open-ended responses) and two quantitative instruments (pre-test and posttests over the content from the Buckle-down Curriculum and attitudinal survey scaled responses). The goal was to describe the impact the Training Future Scientist (TFS) after-school program has on the girls' scientific content knowledge, attitude toward choosing a science career, and self-perception in science. Through the TFS after-school program participants had access to a secondary science teacher-researcher, peer leaders that were in the 9th-12th grade, and Science, Technology, Engineering and Math (STEM) role models from Washington University Medical School Young Scientist Program (YSP) graduate and medical students and fellows as volunteers. The program utilized the Buckle-down Curriculum as guided, peer-led cooperative learning groups, hands-on labs and demonstrations facilitated by the researcher, trained peer leaders and/or role models that used constructivist science pedagogy to improve test-taking strategies. The outcomes for the TFS study were an increase in science content knowledge, a positive trend in attitude change, and a negative trend in choosing a science career. The dissertation citations contained here are published with the permission of ProQuest LLC. Further reproduction is prohibited without permission.

Increasing the college graduation rates of underrepresented minority students in science disciplines is essential to attain a diverse workforce for the 21st century. The Research Internship and Science Education (RISE) program attempts to motivate and prepare students from the Atlanta Public School system, where underrepresented minority (URM) students comprise a majority of the population, for biomedical science careers by offering the opportunity to participate in an original research project. Students work in a research laboratory from the summer of their sophomore year until graduation, mentored by undergraduate and graduate students and postdoctoral fellows (postdocs). In addition, they receive instruction in college-level biology, scholastic assessment test (SAT) preparation classes, and help with the college application process. During the last 4 yr, RISE students have succeeded in the
identification and characterization of a series of proteins involved in the regulation of nuclear organization and transcription. All but 1 of 39 RISE students have continued on to 4-year college undergraduate studies and 61% of those students are currently enrolled in science-related majors. These results suggest that the use of research-based experiences at the high school level may contribute to the increased recruitment of underrepresented students into science-related careers. © 2011 by the Genetics Society of America.


Objectives Basic life support (BLS) training in schools is associated with improved outcomes from cardiac arrest. International consensus statements have recommended universal BLS training for school-aged children. The current practice of BLS training in London schools is unknown. The aim of this study was to assess current practices of BLS training in London secondary schools. Setting, population and outcomes A prospective audit of BLS training in London secondary schools was conducted. Schools were contacted by email, and a subsequent telephone interview was conducted with staff familiar with local training practices. Response data were anonymised and captured electronically. Universal training was defined as any programme which delivers BLS training to all students in the school. Descriptive statistics were used to summarise the results. Results A total of 65 schools completed the survey covering an estimated student population of 65,396 across 19 of 32 London boroughs. There were 5 (8%) schools that provide universal training programmes for students and an additional 31 (48%) offering training as part of an extracurricular programme or chosen module. An automated external defibrillator (AED) was available in 18 (28%) schools, unavailable in 40 (61%) and 7 (11%) reported their AED provision as unknown. The most common reasons for not having a universal BLS training programme are the requirement for additional class time (28%) and that funding is unavailable for such a programme (28%). There were 5 students who died from sudden cardiac arrest over the period of the past 10 years. Conclusions BLS training rates in London secondary schools are low, and the majority of schools do not have an AED available in case of emergency. These data highlight an opportunity to improve BLS training and AEDs provision. Future studies should assess programmes which are cost-effective and do not require significant amounts of additional class time. © 2017 Published by the BMJ Publishing Group Limited.


An urgent need exists for graduate and professional schools to establish evidence-based STEM (science, technology, engineering, and math) pipeline programs to increase the diversity of the biomedical workforce. An untapped yet promising pool of willing participants are capable high school students that have a strong STEM interest but may lack the skills and the guided mentoring needed to succeed in competitive STEM fields. This study evaluates and compares the impact of the Loma Linda University (LLU) Summer Health Disparities Research Program on high school (HS) and undergraduate (UG) student participants. The primary focus of our summer research experience (SRE) is to enhance the research self-efficacy of the participants by actively involving them in a research project and by providing the students with personalized mentoring and targeted career development activities, including education on health disparities. The results of our study show that our SRE influenced terminal degree intent and increased participant willingness to incorporate research into future careers for both the HS and the UG groups. The quantitative data shows that both the HS and the UG participants reported large, statistically significant gains in self-assessed research skills and research self-efficacy. Both participant groups identified the hands-on research and the mentor experience as the most valuable aspects of our SRE and reported increased science skills, increased confidence in science ability and increased motivation and affirmation to pursue a science career. The follow-up data indicates that 67% of the HS participants and 90% of the UG participants graduated from college with a STEM degree; for those who enrolled in graduate education, 61% and 43% enrolled in LLU, respectively. We conclude that structured SREs can be highly effective STEM strengthening interventions for both UG and HS students and may be a way to measurably increase institutional and biomedical workforce diversity. © 2014 Salto et al.

Background: There is a global shortage of medical manpower. One approach to resolve such deficiencies is to effectively promote health careers to high-school students. Summer programmes held by medical faculties provide ideal opportunities for pre-medical students to examine the possible career opportunities in medicine. Methods: The Royal College of Surgeons in Ireland has recently launched a 'Mini-Medical School' (MMS) programme for suburban and rural high-school students in the South Eastern Region of Ireland. This paper illustrates the MMS project and describes the participants’ reaction and evaluation of the programme and the factors influencing their desire to practise medicine in future. Results: A total of 90 students completed the online survey (response rate 75%). Eighty-two per cent of the students indicated definitive and strong desire to study medicine after secondary school. There was no difference in interest between male and female students (P-value 0.665). The main factors influencing this interest were personal. Forty-four per cent of participants attributed this to the opportunity to help others while 30% to the intellectual challenge, whereas family, friends and other factors accounted for the rest of influential factors to study medicine. The majority agreed (60%) that the programme was quite accessible and easy to have a place. Opinions about the content of the programme focussed mainly on the interactive sessions. Forty-seven per cent liked the live patient-doctor interaction session the most, and 43% found the live video session very informative. Conclusion: The MMS is a highly effective platform for both the medical specialties and the high-school students. © 2012 The Authors ANZ Journal of Surgery © 2012 Royal Australasian College of Surgeons.


Medicine education, meaning teaching about rational use of medicines, is one way to promote health literacy of children. This paper describes the implementation of medicine education as a part of health education in Finland. Data were collected using a nationwide postal survey from a representative sample (n = 1700) of Finnish primary and lower secondary school teachers in spring 2010. A response rate of 56% (n = 928) was achieved. The final study population was formed of 667 teachers who had taught health-related topics. χ²- and non-parametric Mann-Whitney U- and Kruskal-Wallis tests were used to statistically compare the data. Seventy-six percent of primary and 89% of lower secondary teachers had taught or were willing to teach medicine education. The actual implementation rate of medicine education was low because only a minority of teachers had taught specific topics related to medicines, i.e. what medicines are and the prerequisites for proper use of medicines (21% and 11% of primary, and 48% and 35% of lower secondary school teachers, respectively). In primary schools, these topics were taught most by teachers with experience of medicating own child's long-term illness (P < 0.05 and P < 0.001, respectively). In lower secondary school, these topics were taught most by teachers trained in health education (P < 0.0001 and P < 0.0001, respectively). These findings highlight the need of adequate teacher education as well as continuing education in medicine education. © 2014 © 2014 Institute of Health Promotion and Education.


OBJECTIVES: Increased student diversity in medical schools is considered necessary. However, very few medical school applicants from under-resourced educational backgrounds achieve competitive academic entrance scores. Pre-admission development programmes that aim to produce competitive applicants may be inefficient in countries where under-represented communities are majority populations. This study set out to determine: (i) whether an academic development programme (ADP) integrated into an existing South African medical training programme retained ADP students and enabled them to graduate within a reasonable period of time; (ii) the academic impact of the ADP, and (iii) whether performance in high school matriculation examinations predicted performance in medical school. METHODS: This retrospective study analysed records of medical students admitted between 1991 and 2001. Non-ADP and ADP students were compared with respect to: student retention; time to graduation; matriculation scores, and performance in medical school. The association between matriculation scores and third-year examination results was determined. RESULTS: The average student retention rates for the non-ADP (1992-2001) and ADP (1991-2000) cohorts were 92% and 70%, respectively. Non-ADP and ADP students who graduated were compared with respect to four parameters: the mean additional time required to graduate by each group was 0.16 years (95% confidence interval [CI] 0.13-0.18) and 0.38
years (0.27-0.48), respectively. Mean matriculation scores were 44.5 (95% CI 44.4-44.7) and 37.4 (95% CI 37.0-37.7) points, respectively (effect size = 3.2). Mean marks for third-year courses were 65.0% (95% CI 64.6-65.4) and 58.7% (95% CI 57.7-59.6), respectively (effect size = 1.0). Mean marks for final-year courses were 68.3% (95% CI 68.1-68.5) and 64.2% (95% CI 63.6-64.7), respectively; the effect size remained constant at 1.2. Third-year marks for non-ADP and ADP students, respectively, showed moderate (11%) and low (3%) association with matriculation scores. CONCLUSIONS: Although the retention of ADP students was lower than that of non-ADP students, the ADP enabled those who graduated to overcome the effects of under-resourced schooling and to perform well in final-year examinations. © 2010 Blackwell Publishing Ltd.


Objectives: This study was designed to elucidate why students from backgrounds of lower socio-economic status (SES) and who may be first in their family (FIF) to enter university continue to be under-represented in medical schools. Methods: Academically able high school students (n = 33) from a range of socio-economic backgrounds participated in focus groups. School careers advisors (n = 5) were interviewed. Students discussed their career and education plans and ideas about a medical career. Careers advisors discussed enablers and barriers to a medical career for their students. Results: Students of lower SES and of FIF status attending schools situated in poorer geographic locations had limited access to suitable work experience and, despite their participation in gifted and talented classes, were considered to be at greater risk of not achieving the high level of academic achievement required for admission to medical school. Conclusions: There is utility in exploring intersecting differences and Appardurai's theory of the 'capacity to aspire' for the purpose of understanding the causes of the under-representation of disadvantaged students in medical schools. A focused materialist approach to building the aspirations of disadvantaged students, particularly those attending schools located in poorer areas, is required if effective pre-entry equity programmes are to be developed and evaluated. Alternatively, medical schools might rethink their reliance on very high academic attainment in the admission process. Discuss ideas arising from the article at www.mededuc.com discuss. © 2014 John Wiley & Sons Ltd.


Innovative teaching and learning is increasingly becoming part of medical education. We report the evaluation of a medical microbiology board game, Med Micro Fun With Facts (MMFWF), based on Trivial Pursuitâ€” principles. The game was developed to stimulate medical students' interest in microbiology and expose students to the subject content of an Infections module in an informal, yet healthy competitive way, involving active group dynamics. Members of staff in the medical curriculum participated in direct observation of the play process. The nominal group technique was used to identify their perception of the game as a learning tool. The game itself and the process of student play generated positive feedback from academic members of staff. Measured against the criteria of diffusion of innovation theory, the game fulfils criteria for an innovation to be accepted. Used as supplementary to formal lectures, MMFWF has the potential to enhance students' learning experiences in medical microbiology.


Background: General practitioners play an important role in the primary care of adolescents in both community and clinical settings. Yet studies show that GPs can lack confidence, skills and knowledge in adolescent health. This study evaluates the effectiveness of an innovative training intervention on medical participants' knowledge and confidence as adolescent health educators in a school setting. Methods: 15 general practitioners, 12 general practice registrars and 18 medical students participated in an adolescent health education workshop followed by field experience in health education sessions in secondary schools. The mixed method design included a pre and post intervention survey and focus group interviews. Results: Mean scores on the Confidence to Teach scale increased significantly (3.34 ± 0.51 to 4.09 ± 0.33) (p < .001) as did confidence to communicate with adolescents (3.64 ± 0.48 to 4.19 ± 0.33) (p < .001). Mean knowledge scores increased significantly (7.00 ± 1.22 to 8.98 ± 1.11) (p < .001). Participants highlighted the value of learning about adolescent health issues and generic teaching skills especially lesson planning and design, practicing experiential teaching strategies and finding the

The considerable impact of problem-based learning (PBL) on academic achievement of students in...
medical education has prompted the K-12 community to start implementing this non-traditional, student-centered, and inquiry-driven teaching approach in its classrooms. This paper examines the current reported evidence of PBL effectiveness in secondary education. To our knowledge, there has been no systematic review of the literature that evaluates the impact of PBL on student academic achievement in high school education. Based on the exhaustive review of the current literature it is not possible to claim with a high degree of confidence that PBL is indeed more effective in increasing student content knowledge. While it is evident from the results of the reviewed studies that PBL positively influences student academic achievement, there are several reasons that prevent the generalization of these findings to a wider, secondary education population. The current reported literature lacks sufficient, rigorous evidence that supports superiority of PBL over traditional methods of instruction. However, it needs to be remembered that PBL fosters not only development of content knowledge, but also a wide range of skills, such as communication and collaboration skills, decision-making, problem-solving, critical-thinking, and self-directed learning. Keeping in mind that these skills are highly valued in secondary education, the inefficiency of traditional methods to aid in development and strengthening of these particular student abilities was the main reason to start considering and adopting various instructional approaches, including PBL. © 2014 Educational Review.


BACKGROUND: The School Health Education Program (SHEP) is a collaboration of the John A. Burns School of Medicine and the State of Hawai'i Department of Education that was founded to improve the health of Hawai'i's youth. This program allows premedical and medical students (collectively referred to as "medical students" from here on) to serve as health educators for high school students in six priority areas of health education. OBJECTIVES: To confirm the efficacy of this community health partnership program and to determine the factors resulting in its success. METHODS: A total of 1714 students from seven of Hawai'i's public high schools were surveyed for improvement in their content knowledge and decision-making confidence after participating in SHEP presentations. A sub-group of 235 high school students were asked about their comfort level and trust in their interactions with medical students as compared to their health teachers. RESULTS: The knowledge content and confidence in decision making increased significantly after participating in SHEP activities (p<.0001). High school students were found to be more comfortable and more trusting in learning about health topics from medical students as compared to health teachers (p<.0001). Reasons given included the medical students' content knowledge as well as their presentation methods and positive attitude. CONCLUSIONS: The unique dual role of medical students as future physicians and as students allowed them to retain their credibility as health educators while developing a strong rapport with the high school students. Through SHEP, medical students can gain valuable experience through researching and teaching health topics while high school students receive additional health knowledge through this teaching.