Co-curricular Programs in an Accelerated Curriculum

Catherine Kim[1], Mary Blazek[1], Jesse Burk-Rafel[1], John Burkhardt[1], Mark Cohen[1], Michelle Daniel[1], Susan Goold[1], Joel Heidelbaugh[1], Kevin Karlic[1], Kenneth Abbott[1], Katherine Klein[1], Rajesh Mangrulkar[1], Lisa Schneider[1], Caren Stalburg[1], Jennifer Weizer[1], Brent Williams[1]

Corresponding author: Dr Catherine Kim cathkim@umich.edu
Institution: 1. University of Michigan
Categories: Educational Strategies, Teaching and Learning, Curriculum Evaluation/Quality Assurance/Accreditation

Received: 24/06/2020
Published: 14/12/2020

Abstract

Introduction: In 2017, nearly half of U.S. medical schools reported shortening or planning to shorten the pre-clerkship phase of medical school, a trend that may be accelerated by pass/fail Step 1 reporting of the U.S. medical licensing examination. The impact upon longitudinal electives addressing non-traditional content is unknown. Our purpose was to describe the challenges in maintaining such an elective.

Methods: Our institution has a longitudinal elective program aimed at promoting relationships with faculty, professional networks and peers along with completion of capstone projects. In 2015, the pre-clerkship phase was shortened from 16.5 months to 12 months. We assessed enrollment and student satisfaction with program aims.

Results: Challenges included less time for classroom activities and difficulties maintaining community during the post-clerkship phase. Modifications included sharing sessions across electives, integrating activities across matriculating years, and offering additional electives in the post-clerkship years that reinforced content. Enrollment (n=268, 78%) and satisfaction remained high regarding connectedness (71%), knowledge enhancement (87%), and professional development (84%). In response to the COVID pandemic, the program has transitioned to virtual delivery and enrollment and satisfaction have remained high.

Conclusions: Despite an abbreviated pre-clerkship curriculum, enrollment in and satisfaction with a longitudinal elective remained high. Future study will identify how the program can adapt to increasingly individualized student schedules in the post-clerkship phase while satisfying desire for community.
Keywords: Abbreviated curriculum; elective; undergraduate medical education

Introduction

In the United States, many medical schools no longer follow a traditional "2+2" model of medical education (Flexner, 1910), in which two years of basic science instruction are followed by two years of clinical experience. In 2017-2018, 68 medical schools responding to the Association of American Medical Colleges sponsored Graduation Questionnaire (n=147 institutions) reported shortening or planning to shorten the length of the pre-clerkship phase to a single year (American Association of Medical Colleges, 2018). Such changes address student desires for earlier patient contact, provide opportunities for application of foundational science in the clinical setting, and allow medical students more post-clerkship opportunities to explore specialties before committing to a single field. A relatively abbreviated pre-clerkship phase emphasizing active learning and integration of foundational and clinical sciences may also contribute to small performance gains on United States Medical Licensing Examination Step 1, when Step 1 is administered following core clerkships (Daniel et al., 2017; Jurich et al., 2018). An abbreviated pre-clerkship phase may also allow for earlier administration of Step 2, if residency programs begin requiring scores from this exam in response to the recent decision to make Step 1 of the U.S. Medical Licensing Examination pass/fail (National Board of Medical Examiners, 2020).

Concurrently, elective programs addressing content outside of the traditional curriculum have increased in popularity, averaging 30% participation when last reported in 2010 (Green et al., 2010). Such programs are often focused upon biomedical research or enhancing skills in a particular clinical area, such as oncology or radiology (Bierer and Chen, 2010), but the content of such co-curricula (i.e., curricula alongside a traditional clinical skills core curriculum) can vary widely and may reflect increasingly diverse student backgrounds (Association of American Medical Colleges, 2018) and specific institutional strengths. In a previous report, we described our student-driven process for structuring electives in the Paths of Excellence (Paths) program (Williams et al., 2014; Burk-Rafel et al., 2016). Key features of the Path program are 1) its longitudinal nature, beginning in the pre-clerkship and continuing into the post-clerkship phase, alongside traditional didactic activity, and 2) incorporation of a wide range of content, beyond traditional biomedical research.

After we designed and piloted our Path electives within a traditional "2+2" model of medical education, the medical school shortened the pre-clerkship phase of our medical school curriculum from 16.5 months to 12 months. How an intensive and abbreviated pre-clerkship curriculum impacts student enrollment in or satisfaction with such co-curricular electives is unknown. Given the popularity of both abbreviated pre-clerkship curricula and co-curricular programs in the U.S, our aim was to describe for other educators the challenges faced by a co-curricular program in an abbreviated pre-clerkship (and expanded post-clerkship) curriculum, strategies for addressing these challenges, and student enrollment and satisfaction outcomes.

Methods

Overview of the Paths Program

The development of the University of Michigan Medical School Paths program and basic design has previously been described (Williams et al., 2014; Burk-Rafel et al., 2016; Hughey et al., 2019). In 2012, prior to the implementation of the abbreviated pre-clerkship phase, the feasibility of a co-curricular program was tested by offering a single concentration in global health and disparities (n=21 students) (Williams et al., 2014). Subsequently, medical students developed, pilot-tested, and distributed a student preferences survey to all matriculants (n=468, with 97% response
rate among first-year medical students). Based upon factor analysis and a capacity optimization algorithm applied to survey responses, eight concentrations were identified that would broadly match the interests of the surveyed students (Burk-Rafel et al., 2016). Six Path electives (Global Health and Disparities, Ethics, Health Policy and Economics, Medical Humanities, Innovation and Entrepreneurship, and Scientific Discovery) were available in 2015, representing 84% of students' first choices. Two additional Paths (Patient Safety and Quality Improvement, and Scholarship of Learning and Teaching) were added in 2016, representing 92% of students' first choices for a concentration.

During the pre-clerkship phase, the Path program includes a series of 6 to 8 in-person group sessions, individual faculty advisor meetings, and other Path-specific events such as mixers, field trips, and cross-disciplinary symposia intended to create community and to enhance learning of Path-related content. For example, students enrolled in the Ethics Path could participate in the hospital-based ethics consultation service; students in the Health Policy and Economics Path could attend a state legislative session; students in the Patient Safety and Quality Improvement Path could participate in "shark tank" competitions. In addition to the activities described above, each Path requires completion of a capstone project prior to graduation. Capstone projects reflect the diversity of Path content, and notably, do not require publication in an academic journal. For example, students in the Innovation and Entrepreneurship Path have submitted invention disclosures; students in the Medical Humanities Path have authored works of fiction, including poetry; and students in the Ethics Path have designed ethics curricula.

Program evaluation

As part of its admissions process, the University of Michigan collects data on matriculant demographics, undergraduate major(s) and institutions, grade point average, and Medical College Admission Test (MCAT) percentiles. As part of its standard program evaluation process, students enrolled in a Path are asked to respond to electronic surveys during their second year of medical school focusing on their attitudes and self-assessed learning within the framework of the Kirkpatrick model (Kirkpatrick and Kirkpatrick, 2006). We also asked students their perception of connectedness using a one-item Likert question "I feel connected to my Path community (faculty, students, and others)."

Path participants and non-participants were compared using t-tests, chi-square, and multivariate logistic and linear regression as appropriate. Using similar procedures, we examined whether survey respondents differed from non-respondents and report on the student perceptions of Path impact and connectedness. The degree of participation did not differ significantly by matriculation year, so results are presented for 2015 and 2016 combined (results for individual years not shown). Data were analyzed using Stata 15 (StataCorp, College Station, TX).

Results/Analysis

Challenges of Abbreviated Pre-Clerkship Curriculum

An abbreviated 12-month pre-clerkship phase – with an extended post-clerkship phase – created several challenges to the Path program's goals for pre- and post-clerkship community and continuity. For pre-clerkship students, there was less time available for classroom activities such as seminars and one-on-one meetings, and also a shortened timeframe for completion of required Path activities, some of which entail coordination with organizations outside the medical school. For example, the Innovation and Entrepreneurship Path relies on didactic content from a University of Michigan entrepreneurship program, and the Global Health and Disparities Path requires completion of a community-based field project focusing on leadership and teamwork in the pre-clerkship period. The shortened pre-clerkship phase has placed greater demands upon students' attention, with difficulty balancing core curricular and
elective obligations. For example, prior to the abbreviated curriculum, the majority of students were able to make progress on their capstone project before beginning clerkships; most students were unable to do so with the abbreviated curriculum.

For post-clerkship students, there has been more flexibility to pursue interests developed during pre-clerkship and clerkship years, but minimal shared didactic content or scheduling, as students disperse to complete electives, interviews, and sub-internships. This has made it challenging to maintain community and continuity during the post-clerkship phase, a challenge already present in the previous 2+2 educational model, but more pronounced with an expanded post-clerkship phase.

Adaptations to Abbreviated Pre-Clerkship and Expanded Post-Clerkship Phases

During the pre-clerkship phase, elective didactic sessions were timed to align with core curricular modules historically associated with higher pass rates and more available time. Additionally, where possible, required activities and pre-work were reduced. Explicit attention was given to helping students balance the core curriculum and their elective co-curriculum.

During the post-clerkship phase, elective faculty and staff made a variety of changes to promote community and ensure program continuity. To encourage community with other students and faculty within the Paths, several Paths are offering experiences integrated across the first- through fourth-year classes. These shared events are available to all matriculants within a specific Path, regardless of year, to encourage increased numbers of participants despite variation in schedule. In addition to promoting Path community, these events encourage near-peer mentorship between classes. For example, the Medical Humanities Path has encouraged attendance across all cohorts at a University of Michigan Museum of Art evening session led by the museum educator and Path faculty.

To maintain program continuity, several Paths introduced one-month post-clerkship electives focusing on Path-specific content; these allow students to continue capstone-related work. For example, the Global Health and Disparities Path has developed multiple electives focusing upon disparities locally and globally, and the Innovation and Entrepreneurship Path planned partnerships with Fast Forward Medical Innovation at Michigan Medicine and the Ross School of Business at the University of Michigan, which offers courses to help students build skills, network, and accelerate innovations toward commercial opportunities. Students completing post-clerkship didactic requirements (e.g. regarding residency preparedness, opioid and controlled substance prescription, and diagnostic and therapeutic device training) have opportunities to choose activities that are relevant to their Path; for example, students in the Patient Safety and Quality Improvement Path can engage in patient safety projects. All Path students are encouraged to perform independent study during the post-clerkship phase, to work on their capstone, and initiate or extend projects from their first year of medical school.

In recognition of students’ evolving interests over phases of medical school, Paths have also explored shared sessions in the post-clerkship phase. For example, post-clerkship students in the Health Policy and Economics Path and the Ethics Path attended a shared session that focused upon equity in health insurance. The Global Health and Disparities Path and Health Policy Path have also created shared sessions. As Path concentration continue to mature, we anticipate more shared sessions.

Enrollment and satisfaction

Path enrollment for 2015 and 2016 matriculants was high (n = 267/342, 78%), despite the abbreviated curriculum, and significantly higher than the 30% reported by other institutions for their elective programs (Green et al., 2010). Medical students participating in the Paths program were similar to non-participants across multiple demographic and academic factors, except Path participants had slightly higher MCAT score percentiles than non-participants.
Table 1. Comparison of participants in the Paths of Excellence program vs. non-participants among 2015 and 2016 matriculants.

|                                   | All matriculants | Participants | Non-participants | p-value |
|-----------------------------------|------------------|--------------|------------------|---------|
| n=343                             | n=267            | n=76         |                  |         |
| Age at matriculation (years)      | 23.9 (2.8)       | 23.8 (2.7)   | 24.1 (2.9)       | 0.40    |
| Women (n, %)                      | 192 (56%)        | 149 (56%)    | 43 (57%)         | 0.91    |
| Race/ethnicity (n, %)             |                  |              |                  | 0.37    |
| Non-Hispanic White                | 200 (58%)        | 156 (58%)    | 44 (58%)         |         |
| Asian                             | 56 (16%)         | 44 (16%)     | 12 (16%)         |         |
| African-American                  | 24 (7%)          | 15 (6%)      | 9 (12%)          |         |
| Hispanic                          | 30 (9%)          | 24 (9%)      | 6 (8%)           |         |
| Not specified                     | 33 (9%)          | 28 (10%)     | 5 (7%)           |         |
| Matriculated more than one year   | 236 (69%)        | 179 (67%)    | 57 (75%)         | 0.19    |
| after college                     |                  |              |                  |         |
| Biologic science major (includes | 213 (62%)        | 161 (60%)    | 52 (68%)         | 0.20    |
| neuroscience)                     |                  |              |                  |         |
| Humanities major (languages, art, | 39 (11%)         | 35 (13%)     | 4 (5%)           | 0.057   |
| history)                          |                  |              |                  |         |
| Social sciences major (psychology,| 43 (13%)         | 32 (12%)     | 11 (14%)         | 0.56    |
| sociology, anthropology, economics)|                |              |                  |         |
| Engineering                       | 38 (11%)         | 30 (11%)     | 8 (11%)          | 0.86    |
| Undergraduate grade point average | 3.78 (0.2)       | 3.79 (0.2)   | 3.76 (0.2)       | 0.11    |
| Undergraduate science grade point | 3.75 (0.2)       | 3.76 (0.2)   | 3.71 (0.3)       | 0.14    |
| average                           |                  |              |                  |         |
| MCAT percentile                   | 91.1 (9.4)       | 92.1 (8.1)   | 87.3 (12.8)      | <0.0001 |

Specific Paths

|                                 |                  |              |                  |         |
| Global Health and Disparities    | 57 (21%)         |              |                  |         |
| Ethics                           | 25 (9%)          |              |                  |         |
| Medical Humanities               | 35 (13%)         |              |                  |         |
| Health Policy and Economics      | 35 (13%)         |              |                  |         |
| Scientific Discovery             | 26 (10%)         |              |                  |         |
| Innovation and Entrepreneurship  | 44 (16%)         |              |                  |         |
| Patient Safety and Quality       | 24 (9%)          |              |                  |         |
| Improvement*                     |                  |              |                  |         |
| Scholarship of Learning and      | 21 (8%)          |              |                  |         |
| Teaching*                        |                  |              |                  |         |

N (percent) or means (standard deviations) shown.

This small percentile difference corresponds to a several point absolute score difference, which is of unlikely "clinical" significance, but an area warranting further inquiry. Of note, the majority of students had matriculated more than a year after completing their undergraduate degree, and almost 40% of students had majors other than the biological sciences, reflecting national trends (Association of American Medical Colleges, 2018).

Student characteristics were mostly similar across Paths with several exceptions; students who enrolled in the Medical Humanities Path were more likely to have majored in humanities as undergraduates compared to other Paths (29% vs. 11%, p=0.004). Students who enrolled in the Innovation and Entrepreneurship Path were more likely to have majored in engineering compared to other Paths (25% vs. 9%, p=0.002) and were less likely to be women (27% vs. 60%, p<0.0001) than students in other Paths.

Of the Path participants, 72% (n=193) responded to survey questions regarding the Path. Survey respondents were
similar to non-respondents, except that non-respondents were more likely to be from an under-represented minority backgrounds (Hispanic, African-American or to have unspecified race/ethnicity) than respondents (p=0.01) and non-respondents had lower grade point averages (3.75 vs. 3.81, p=0.001) and MCAT percentiles (89.8 vs. 92.1, p=0.02) than respondents. When these factors were considered in a single logistic regression model, African-American or Hispanic race/ethnicity were the only factors significantly associated with not responding to the survey.

Survey responses are shown in Table 2.

**Table 2. Student perceptions of program characteristics.**

|                                                                 | Strongly disagree or disagree | Neither agree nor disagree | Agree or strongly agree |
|-----------------------------------------------------------------|-------------------------------|---------------------------|------------------------|
| I feel connected to my Path community (faculty, students, and others) (n=192) | 20 (10%)                     | 35 (18%)                  | 137 (71%)              |
| My Path provided knowledge enhancement (n=192)                   | 11 (6%)                       | 14 (7%)                   | 167 (87%)              |
| Overall, the Path has contributed to my professional development (n=192) | 9 (5%)                        | 21 (11%)                  | 162 (84%)              |
| I would recommend my Path to other students (n=192)              | 12 (6%)                       | 22 (11%)                  | 158 (82%)              |

| To what extent did your faculty advisor provide an impact on your professional development? (n=176) | 16 (8%) | 45 (23%) | 115 (60%) |
| (If you have done projects), To what extent do you feel that through your Path projects that you have an impact upon the field? (n=136) | 25 (18%) | 39 (29%) | 72 (53%) |

The majority of students rated their Path favorably regarding knowledge enhancement (87%) and professional development (84%). Most student respondents (71%) also agreed or strongly agreed with the statement "I feel connected to my Path community (faculty, students, and others)." As one student noted in their comments, "I enjoy how the Paths of Excellence provide a tight knit and collaborative community, bringing together students and faculty with similar interests and passions." Despite these positive associations reported with the path, most respondents felt they had, at best, a moderate impact on their field of interest. Aspects of the Paths with moderate/strong impact upon professional development included interactions with other students in the Path (n=155, 81%), small group sessions (n=155, 81%), group work (n=119, 62%), and guest or panel speakers (n=138, 72%) Students did not rate the on-line electronic platform for disseminating and storing information as helpful (n=35, 18%).
Discussion

In the U.S., shortened pre-clerkship phases have become increasingly popular, a trend that may be further accelerated by recent changes in the licensing examination reporting. Such shortened phases must still accommodate core curricula, and thus the ability to introduce non-core material in this time period may be limited. During implementation of a co-curricular program within the setting of an abbreviated pre-clerkship model, we found that group activities faced multiple challenges. These included increased competition for student attention and time during the pre-clerkship phase, and increased difficulty in maintaining program cohesion in the post-clerkship phase. Despite these challenges, the program remained popular and students highly satisfied. This may be because both the co-curricular program and the abbreviated pre-clerkship core curriculum offer multiple learner benefits. Most notably, both types of innovations offer greater flexibility for students to engage in activities that reflect their increasingly diverse pre-matriculation interests, by giving them more post-clerkship time as well as an increased exposure to areas outside the traditional medical curriculum through the Paths program.

Several adaptations to these challenges included reducing requirements for the co-curricular program during the pre-clerkship phase and altering the elective schedule to accommodate the intensive core curricular schedule, while integrating offerings across medical student cohorts, curricular phases, and Path concentrations. Students perceived such programs as useful for their professional identity and sense of connectedness with others of similar interests; anecdotally, several students reported that their Path participation helped secure their residency match.

This report adds to our knowledge about medical school scholarly concentration programs, which have historically focused upon scholarly research activities rather than the broad array of content offered by our medical school (George et al., 2015). This report also adds to our knowledge about the student experience in the post-clerkship years, which is more individualized than in the 2+2 model due to the greater amount of time spent post-clerkship; we have found that our longitudinal program needed to modify expectations and formats in order to accommodate the learners’ presence off-campus. Despite these obstacles, the majority of students reported a sense of community with others in their Path. Other investigators have noted that small group activities enhanced connectedness and resulted in an increased sense of community among medical students (Brandl et al., 2017; Farlow et al., 2017); in our medical school, we have built an additional avenue to community that is different from those based on other medical specialty interests or student backgrounds.

We note that the delivery of the program transitioned to a virtual platform during the 2019-2020 year during the COVID pandemic. The content of the program was preserved and transition to a virtual platform did not affect delivery and satisfaction with the program. The opportunities for interaction in small groups with shared interests were rated favorably by participating students. Due to this feedback and increased familiarity with online platforms by both students and faculty, the program has increased the number of meetings in the post-clerkship years as well as meetings for students within each concentration across classes.

Our report has several limitations. First, given the diversity of the paths, it is unclear whether outcome measures beyond student satisfaction and extending across all of the Paths should be used, particularly if measuring long-term outcomes after students graduate from medical school. Measures such as academic publication and federally funded grants are appropriate for biomedical research. However, for students with interests outside of traditional research, different measures need to be considered. Such measures might include participation in organizations relevant to the concentration, patents or other documentation of intellectual property, or non-traditional means of dissemination such as podcasts and social media. Currently, no consensus as to best outcome measures exists. Second, as with most educational interventions, students were not randomly allocated to participate in the Paths as they self-selected for these opportunities, and factors that predisposed students to enroll in the Paths could affect favorable ratings.
Conclusion

These data suggest that the adaptations to the new clerkship model facilitated maintenance of high student satisfaction in the face of many perceived challenges. In the future, we plan to identify expectations for the program prior to entry and the value added for different learners, with assessments that evaluate specific program elements and go beyond satisfaction to include meaningful professional development outcomes. Due to the increased acceptance of virtual programs during the COVID pandemic by students and faculty, the program has increased its points of contact in the post-clerkship years. Nationally, we hope to see more reports detailing approaches for elective programs to adapt to innovative, accelerated core curricula.

Take Home Messages

- Enrollment in and satisfaction with co-curricular pre-clerkship electives are still high even in accelerated programs.
- Maintaining programs during the post-clerkship phase is a challenge, but may be partially addressed by integrating across classes and content areas.
- Program maintenance in the post-clerkship phase has been enabled by virtual platforms, with which there has been increased familiarity due to the COVID pandemic.

Notes On Contributors

Catherine Kim, MD MPH is the Director of the Paths of Excellence program, the longitudinal program described in this article. She is an internist and epidemiologist as well as educator at the University of Michigan. ORCID ID: https://orcid.org/0000-0001-9237-0532

Mary Blazek, MD is the Director of the Medical Humanities Path of Excellence. She is a geriatric psychiatrist. ORCID ID: https://orcid.org/0000-0002-5579-8430

Jesse Burk-Rafel, MD MRes determined Path content and structure as a medical student. He recently completed his residency in internal medicine. ORCID ID: https://orcid.org/0000-0003-3785-2154

John Burkhardt MD PhD is a Director of the Scholarship of Learning and Teaching Path of Excellence. He is an emergency medicine physician who examines physician workforce issues. ORCID ID: http://orcid.org/0000-0001-6273-8762

Mark Cohen, MD is Director of the Innovation and Entrepreneurship Path. He is an endocrine surgeon who studies how innovation is taught and implemented in academic health systems. ORCID ID: https://orcid.org/0000-0002-2517-0757

Michelle Daniel, MD is dean of curriculum at the University of Michigan and an emergency medicine physician. ORCID ID: https://orcid.org/0000-0001-8961-7119

Susan Goold, MD is Director of the Health Policy and Economics Path of Excellence. She is an internist with expertise in policy and health management. ORCID ID: https://orcid.org/0000-0002-0258-9774

Joel Heidelbaugh, MD is a family medicine physician and educator who studies population-health initiatives in education.
Kevin Karlic, BS is a medical student and student representative for the Paths of Excellence. ORCID ID: https://orcid.org/0000-0001-8699-1498

Kenneth Abbott, MS is a medical student and student representative for the Paths of Excellence. ORCID ID: https://orcid.org/0000-0003-0073-1906

Katherine Klein, MD is director of the post-clerkship phase of undergraduate medical education. She is a radiologist who focuses upon mammography. ORCID ID: https://orcid.org/0000-0003-0541-3886

Rajesh Mangrulkar, MD is associate dean for the University of Michigan Medical school and an internist. ORCID ID: https://orcid.org/0000-0003-0139-0357

Lisa Schneider, MA is director of the Paths of Excellence program.

Caren M Stalburg, MD MA is a Director of the Scholarship of Learning and Teaching Path of Excellence. She is a gynecologist and educator. ORCID ID: https://orcid.org/0000-0002-2619-9738

Jennifer Weizer, MD is Director of the Patient Safety and Quality Improvement Path of Excellence and an ophthalmologist. ORCID ID: https://orcid.org/0000-0002-8625-5615

Brent Williams, MD MPH is a Director of the Global Health and Disparities Path of Excellence and an internist. ORCID ID: http://orcid.org/0000-0001-8937-4532

Acknowledgements

This project was performed with financial support from the American Medical Association. Grant title: Accountable Medical Student Education at the University of Michigan: Improving Learning and Health. No grant number is assigned to this funding. The funding sources had no role in the design of this study and they will not have any role in the study’s implementation, data analysis or dissemination of study results.

Bibliography/References

American Association of Medical Colleges (2018) Curriculum change in U.S. medical schools: implementation of change in 2017-2018. Available at: https://www.aamc.org/data-reports/curriculum-reports/interactive-data/curriculum-change-us-medical-schools (Accessed: 03/01/2020).

Association of American Medical Colleges (2018) FACTS: Applicants, matriculants, enrollment, graduates, MD-PhD, and Residency Applicants Data. Available at: https://www.aamc.org/data-reports/students-residents/interactive-data/2019-facts-applicants-and-matriculants-data (Accessed: 01/04/2020).

Bierer, S. and Chen, H. (2010) 'How to measure success: the impact of scholarly concentrations on students—a literature review’, Acad Med, 85, pp. 438-52. https://doi.org/10.1097/ACM.0b013e3181cccbd4

Brandl, K., Schneid, S., Smith, S., Winegarden, B., et al. (2017) 'Small group activities within academic
Kim C, Blazek M, Burk-Rafel J, Burkhardt J, Cohen M, Daniel M, Goold S, Heidelbaugh J, Karlic K, Abbott K, Klein K, Mangrulkar R, Schneider L, Stalburg C, Weizer J, Williams B (2020) 'Communities improve the connectedness of students and faculty', Med Teach, 39(8), pp. 813-9. https://doi.org/10.1080/0142159X.2017.1317728

Burk-Rafel, J., Mullan, P., Wagenschutz, H., Pulst-Korenberg, A., et al. (2016) 'Scholarly concentration program development: a generalizable, data-driven approach', Acad Med, 91(11), pp. S16-S23. https://doi.org/10.1097/ACM.0000000000001362

Daniel, M., Fleming, A., Grochowski, C., Harnik, V., et al. (2017) 'Why not wait? Eight institutions share their experiences moving United States Medical Licensing Examination Step 1 after core clinical clerkships', Acad Med, 92(11), pp. 1515-24. https://doi.org/10.1097/ACM.0000000000001714

Farlow, J., Ulrich, B., Schiess, D., Piropato, A., et al. (2017) 'Further evidence for curricular influence on student connectedness', Med Teach, 39(10), p. 1103. https://doi.org/10.1080/0142159X.2017.1358811

Flexner, A. (1910) Medical Education in the United States and Canada. Washington, DC: Science and Health Publications, Inc.

George, P., Green, E., Park, Y. and Gruppuso, P. (2015) 'A 5-year experience with an elective scholarly concentrations program', Med Educ Online, 20, p. 29278. https://doi.org/10.3402/meo.v20.29278

Green, E., Borkan, J., Pross, S., Adler, S., et al. (2010) 'Encouraging scholarship: medical school programs to promote student inquiry beyond the traditional medical curriculum', Acad Med, 85, pp. 409-18. https://doi.org/10.1097/ACM.0b013e3181cd3e00

Hughey, K., Bell, J., Mullan, P., Rana, G., et al. (2019) 'Scaling up a pilot program for co-curricula at the University of Michigan Medical School led to a new educational paradigm', Acad Med, epub ahead of print. https://doi.org/10.1097/ACM.0000000000002783

Jurich, D., Daniel, M., Paniagua, M., Fleming, A., et al. (2018) 'Moving the United States Medical Licensing Examination Step 1 after core clerkships: an outcomes analysis', Acad Med. https://doi.org/10.1097/ACM.0000000000002458

Kirkpatrick, D. and Kirkpatrick, J. (2006) Evaluating Training Programs: the Four Levels. Edited by Inc., B.-K. P. San Francisco, CA. National Board of Medical Examiners (2020) Change to pass/fail score reporting for Step 1. Available at: https://www.usmle.org/inCus/ (Accessed: 24/02/2020).

Williams, B., Mullan, P., Haig, A., Malani, P., et al. (2014) 'Developing a professional pathway in health equity to facilitate curricular transformation at the University of Michigan Medical School', Acad Med, 89(8), pp. 1153-6. https://doi.org/10.1097/ACM.000000000000286

Appendices

None.
Declarations

The author has declared that there are no conflicts of interest.

This has been published under Creative Commons "CC BY 4.0" (https://creativecommons.org/licenses/by-sa/4.0/)

Ethics Statement

This research was declared IRB exempt by the University of Michigan IRB.

External Funding

AAMC, grant title Accountable Medical Student Education at the University of Michigan: Improving Learning and Health

MedEdPublish: rapid, post-publication, peer-reviewed articles on healthcare professions’ education. For more information please visit www.mededpublish.org or contact mededpublish@dundee.ac.uk.