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ORIGINAL CONTRIBUTION

Faculty development using a virtual community of practice: Three-year outcomes of the Academic Life in Emergency Medicine Faculty Incubator program

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Abstract

Introduction: The Academic Life in Emergency Medicine (ALiEM) Faculty Incubator program is a longitudinal, 1-year, virtual faculty development program for early- and mid-career faculty members that crosses specialties and institutions. This study sought to evaluate the outcomes among 3 years of participants.

Methods: This cross-sectional survey study evaluated postcourse and 1-year outcomes from three graduated classes of the ALiEM Faculty Incubator program. The program evaluation survey was designed to collect outcomes across multiple Kirkpatrick levels using pre/post surveys and tracking of abstracts, publications, speaking opportunities, new leadership positions, and new curricula.

Results: Over 3 years, 89 clinician educators participated in the program. Of those, 59 (66%) completed the initial survey and 33 (37%) completed the 1-year survey. Participants reported a significant increase in knowledge (4.1/9.0 vs. 7.0/9.0). The number of abstracts, publications, and invited presentations significantly increased after course completion and continued postcourse. A total of 37 of 59 (62.7%) developed a new curriculum during the course and 19 of 33 (57.6%) developed another new curriculum after the course. A total of 29 of 59 (49.2%) began a new leadership position upon course completion with 15 of 33 (45.5%) beginning another new leadership position 1 year later.

Discussion: The ALiEM Faculty Incubator program demonstrated an increase in perceived knowledge and documented academic productivity among early- and mid-career medical educators.

INTRODUCTION

The competency frameworks that describe physician abilities in North America presume that most physicians who have completed residency

training have acquired the necessary skills to function as an educator, leader, and scholar.^{1,2} However, the sophistication of practice required of new faculty members to succeed in academic roles typically exceeds the foundational abilities acquired during residency training.

Furthermore, support for the development of an academic role is often lacking in graduate medical education programs, which ultimately may contribute to burnout among faculty members.³ Faculty development addresses this gap by providing learning activities to impart a physician with the knowledge, skills, and behaviors necessary to serve as an educator, leader, and scholar.^{3,4} In addition, well-designed faculty development programs can lead to high personal and professional satisfaction and impact beliefs about personal leadership capabilities.⁵

Traditional faculty development activities (e.g., single-session workshops, longitudinal courses, mentoring programs) present a number of challenges. First, resources are often developed and tailored within the institution to meet local needs and may not be scalable or generalizable beyond the institution, necessitating the duplication of similar programs across institutions.⁶ Second, many programs lack a theoretical framework or primarily depend on outcomes-driven programming (e.g., tangible increase in scholarly output).^{5,7} Third, developing new resources requires institutionally funded administrators and designers. The educational design is often based on in-person delivery of content, which requires faculty members to navigate complex scheduling requirements. This can lead to limited sessions with variable attendance and infrequent engagement between sessions. Moreover, large-scale faculty development activities are resource-intensive, which can threaten sustainability. Virtual programs that span institutions offer advantages, but there is a lack of rigor in evaluating the effectiveness and outcomes of online faculty development programs.⁷

The Academic Life in Emergency Medicine (ALiEM) Faculty Incubator is a year-long virtual faculty development program for early- and mid-career faculty members that crosses specialties and institutions with a goal of developing the skills to perform education scholarship and establishing a community of practice.⁸ The program leverages digital technology to create an asynchronous, longitudinal curriculum, connecting early- and mid-career faculty members across the global medical education community.⁸ The program utilizes the virtual community of practice model to create a community of people interacting around a common educational question, problem, or passion to share information and advice, problem solve, and support each other in a virtual medium.⁹⁻¹¹ The curriculum was also informed by Kolb's theory of experiential learning, where participants learn by directly applying acquired knowledge to real-world problems, which were subsequently discussed as a group.¹² Members of the program include both leaders and participants, which provides a train-the-trainer model supporting faculty members to assume progressive leadership within the program and contributes to program sustainability and innovation. Our initial evaluation of this program demonstrated active engagement of participants.⁸ In this study, we sought to evaluate the initial and delayed outcomes of the ALiEM Faculty Incubator program for the first 3 years of cohorts.

METHODS

Study design

This was a cross-sectional survey study evaluating the outcomes of the ALiEM Faculty Incubator program. We scaffolded this research

study with the Kirkpatrick program evaluation framework in mind.^{13,14} Specifically, we were aiming to study the reactions (level 1), learning (level 2), behaviors (level 3), and outcomes (level 4) of the first three cohorts. This study was approved by the McMaster University Institutional Review Board.

Program content

The ALiEM Faculty Incubator is a 1-year virtual program that was conducted primarily via Slack (Slack Technologies).¹⁵ Each month had a dedicated topic focused on a different component of education scholarship. A full list of topics, objectives, and activities has been published elsewhere.⁸ A list of the current topics and timing is available at <https://www.aliem.com/faculty-incubator/>. Each month-long curricular block was led by a team of four mentors composed of two core/senior mentors and two alumni/junior mentors. The core/senior mentors were responsible for guiding the general discussion, mentoring the alumni/junior mentors, and planning the block activities (including the small group assignments). The alumni/junior mentors were responsible for leading the discussion of clinical challenges (referred to as "dangerous questions") and the weekly journal club. Each week there was a dedicated discussion on a specific component of the designated curricular block, which included both a clinical challenge facilitated by the mentors and a journal article that was discussed. Participants also had monthly required small-group assignments and a larger required longitudinal project to further integrate application of each core topic. The first year, participants engaged in 12 curricular blocks (one block per month). In subsequent years, we only had 10 blocks of content. Based on participant feedback we assigned 2 months (July and December) as *rest* blocks. While not explicitly evaluated in our study, it has been estimated that participants needed to dedicate 8 hours per month to the program.

Survey development and design

Unlike traditional research surveys, program evaluation surveys must be designed *de novo* and tailored to the needs of the program. We designed and refined content for two surveys: (1) immediate postprogram experience and (2) 1-year postprogram, aiming to capture distal outcomes that emerged after the initial incubator experience. Members of the research team (M.G., L.M.Y., J.S., T.C.) reviewed survey items in detail to optimize content validity.¹⁶ This included assessments of comprehension, retrieval, judgment, and response.¹⁶

To optimize response process validity (e.g., readability, usability, and intended use), we piloted the survey with both internal and external faculty members of the program who were not participants in the study, conducting usability testing and cognitive interviewing to identify areas for improvement and revising the survey based on feedback (see Data Supplement S1,

Appendixes S1 and S2, available as supporting information in the online version of this paper, which is available at <http://onlinelibrary.wiley.com/doi/10.1002/aet2.10626/full>, for the final versions of the surveys).

Outcome measures

For Kirkpatrick level 1, we evaluated the participants' perception of the most valuable aspects, the role of the program in professional development, and the difference in comparison to other faculty development programs immediately after program completion. We used the retrospective pre/post methodology to survey our participants.¹⁷ We also evaluated the perceived utility, most valuable aspects, and role in professional development at 1 year after program completion. For Kirkpatrick level 2, we evaluated participants' change in medical education knowledge after program completion, as well as the percentage of each skill that was learned after program completion and at 1-year postprogram. We also evaluated their intention to continue collaborating with group members upon program completion. For Kirkpatrick level 3, we evaluated continued collaborative efforts with the group members at 1-year post-program completion. For Kirkpatrick level 4, we evaluated abstracts, manuscripts, invited presentations, new leadership positions, and new curricula developed upon course completion. We also stratified the abstracts, manuscripts, and presentations by whether they were the direct result of a project completed for the program or an indirect result of the program (e.g., opportunity arose due to continued collaboration or networking with a participant but was not initiated during the program).

Survey distribution

Surveys were distributed via individualized emails to each participant. Following a modified Dillman method,¹⁸ emails were sent a minimum of three times to each participant. The surveys were also posted on the internal alumni page for the ALiEM Faculty Incubator participants.

Data analysis

Descriptive statistics were used to describe study demographics and level 1 and 2 outcomes (Microsoft Excel 2020, Microsoft Corp.). Using SPSS version 26 (IBM), we used Student's t-test to analyze differences between the various level 2, 3, and 4 outcome variables. We also conducted a post hoc analysis to compare the demographics and initial survey characteristics of those who completed the 1-year follow-up and those who were lost to follow-up in the 1-year survey. To analyze our qualitative feedback, we conducted generic thematic analyses of free-text responses using an iterative approach with an interpretive paradigm.¹⁹

RESULTS

Participant demographics

Eighty-nine participants completed the ALiEM Faculty Incubator program between 2016 and 2019. Of those, 59 participants (66.3%) completed the initial survey and 33 (37.1%) completed the 1-year follow-up survey. Respondent demographics are shown in Table 1. A post hoc analysis of the 26 individuals who were lost to follow-up revealed no significant differences in demographics and productivity reported in the first survey.

Impact on professional development

When asked how the ALiEM Faculty Incubator helped their professional development, six themes emerged: increased knowledge of medical education theory, new mentorship experiences, new networking opportunities, developing a community of practice, increased collaboration skills, and scholarly opportunities (Appendix S3). When this was evaluated at 1-year follow up, respondents reported that the program allowed them to be more effective teachers, provided mentorship, helped them build a network and virtual community of practice, increased collaboration opportunities, increased leadership opportunities, and strengthened their understanding of medical education scholarship and research.

Comparison with prior faculty development experiences

When asked to compare the ALiEM Faculty Incubator with existing faculty development programs, the participants highlighted the following differences: more diverse participants, a comprehensive and longitudinal curriculum, regular and active engagement, use of an online platform to facilitate engagement and interactivity, scholarship opportunities, strong mentorship, development of international networks leading to collaborations, and the focus on participant-driven education.

Attained knowledge and skills

Using a retrospective pre/post assessment,¹⁶ the participants reported a mean (\pm SD) baseline knowledge of 4.2/9.0 (\pm 1.6), which increased to 7.0/9.0 (\pm 1.1) upon completion of the course (Figure 1). Participants also reported increased skills in digital collaboration ($n = 44$, 74.6%), critical appraisal of the literature ($n = 40$, 67.8%), and networking ($n = 40$, 67.8%), which were sustained at 1 year post-course. A full list of the skills learned from this course is included in Appendix S4.

When asked to rate the usefulness of the program 1 year post-completion, the mean (\pm SD) score was 6.6/9.0 (\pm 2.2). Of the 10

Parameter	Respondent demographics (n = 59)
Age (years), mean (\pm SD)	36.4 (\pm 4.8 years)
Gender	
Male	52.5%
Female	47.5%
Years after completion of residency, mean (\pm SD)	5.1 (\pm 3.2)
Academic rank	
Fellow	1 (1.7%)
Clinical Instructor	6 (10.2%)
Assistant Professor	44 (74.6%)
Associate Professor	5 (8.5%)
Other	3 (5.1%)
Degrees completed	
Medical degree	59 (100%)
Master's degree	17 (28.8%)
Previous medical education courses	
Local faculty development courses	27 (45.8%)
National courses	34 (57.6%)
Master of education courses	8 (13.6%)
Medical education fellowship	7 (11.9%)

TABLE 1 Respondent demographics for postcourse survey

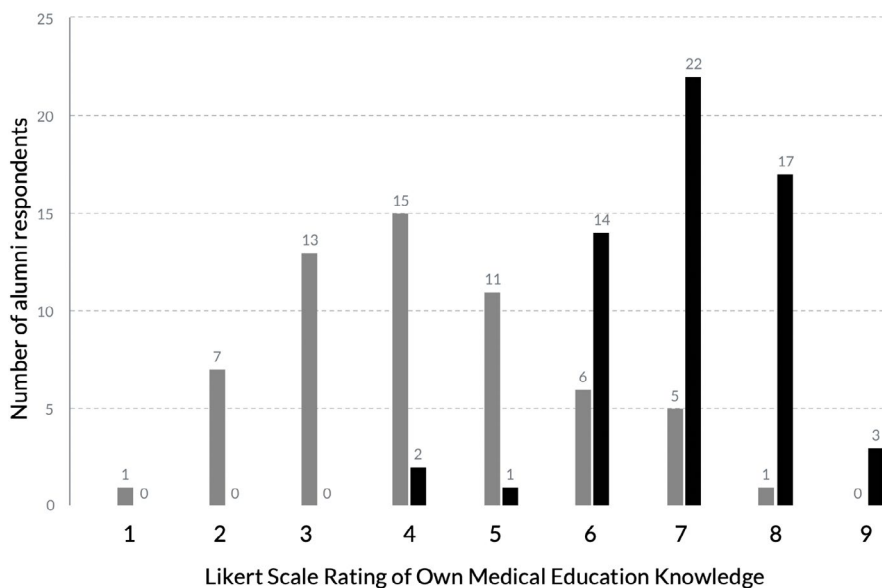


FIGURE 1 A comparison of the retrospective pre/post report of medical education knowledge. Pre = Gray. Answer to question: "Now that you have completed the Faculty Incubator, how much do you feel you knew about medical education BEFORE starting the program?" Post = Black. Answer to question: "How much do you know about medical education AFTER completing the Faculty Incubator program?"

curricular elements, collaborative writing opportunities, the ability to ask for help, and the ability to connect with mentors were deemed the most valuable in eliciting engagement, while the book club was the least valuable (Appendix S5).

Scholarship and presentations

Participants had significant increases in abstracts, publications, and invited presentations when comparing pre- and postcourse

data (Figure 2, Table 2). This continued in the year following course completion, where participants reported a median of two new abstracts (IQR = 1–4, range = 0–14), and one new publication (IQR = 0–2, range = 0–5) that they reported directly attributable to the program (Table 3). Participants also identified indirect benefits (e.g., coauthored a project with someone they met via the program but did not start until after the program ended) that were separate from the above. This included two new abstracts, two new publications, and four invited presentations indirectly related to the course.

Leadership positions and curricular advances

In addition, 29 of 59 participants (49.2%) reported beginning a new leadership position at the completion of the course. At 1 year, an additional 15 of 33 participants (45.5%) reported beginning a new leadership position. The leadership positions included local and national committees (e.g., curriculum development, education, patient safety, residency branding, student task force, wellness) and medical school, residency, and fellowship leadership positions (e.g., clinical education, informatics, patient safety, medical education fellowship, simulation). Upon completion of the course, 37 of 59 participants (62.7%) created a new curriculum. At 1 year, 19 of 33 participants (57.6%) developed a second curriculum.

Continued collaborations

Immediately after the course, 46 of 59 participants (78.0%) planned to continue their collaborative relationships with other ALiEM Faculty Incubator participants and faculty members, while 13 of 59 (22.0%) stated they might continue their relationships. At 1 year, 28 of 33 (84.8%) continued their relationships. The main reported reasons for staying connected were peer support, the ability to network, to collaborate on scholarship, and to return as a junior faculty member for the ALiEM Faculty Incubator program.

Sustainability and areas for improvement

Twenty-four (27.0%) of the total participants subsequently became program faculty members, leading at least one focused block per year after graduating from the program. Of those who became program faculty members, they continued in that role for a mean (\pm SD) of 2.1 (\pm 1.2) years.

Participants were asked on both the initial and 1-year follow-up survey to describe barriers to engagement as a participant and alumni, respectively. The predominant themes that emerged in the initial survey were available time, ability to connect with other participants, variable engagement of participants, limitations of the digital platform, high expectations for engagement, and barriers specific to distance learning. The primary barriers alumni reported to engaging at 1-year follow up were available time, ability to connect with other alumni, and lack of knowledge regarding how to stay engaged as alumni.

Finally, participants' suggestions for improving the program included decreasing the overall workload, revising the expectations for longitudinal projects, holding participants accountable for deliverables, increasing mentor availability and support, and providing more clarity and guidance regarding assignments. When asked about suggestions to improve the alumni experience at 1 year post-program, the majority of responses related to a desire for increased opportunities for engagement with the program, either as mentors or collaborators, or through informal networking opportunities.

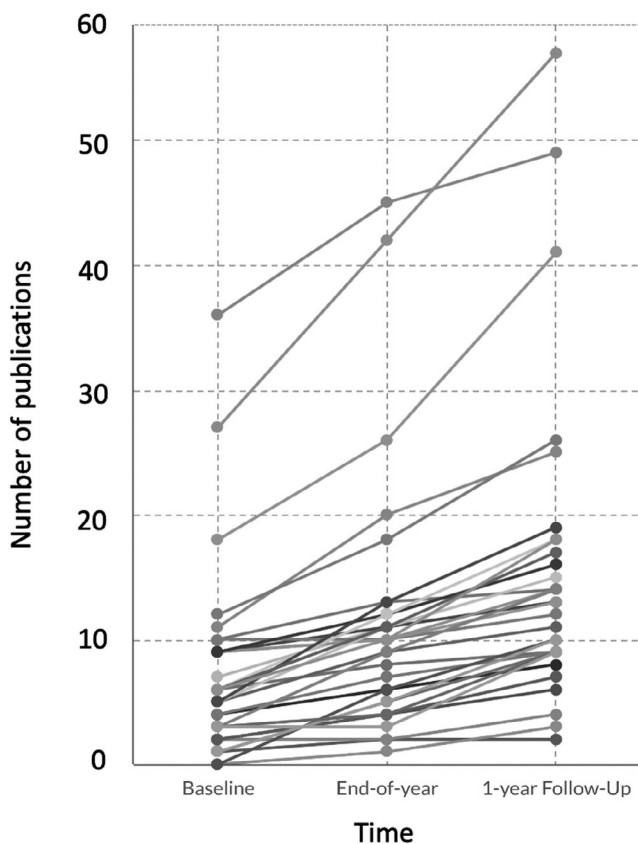


FIGURE 2 Visual representation of scholarly manuscript publication for participants over 3 years

TABLE 2 Comparison of perceived knowledge and total lifetime academic productivity prior to and upon completion of the 12-month program

Outcome	Preprogram	Upon completion of the program
Perceived knowledge	4.2/9.0 (\pm 1.6)	7.0/9.0 (\pm 1.1)
Abstracts	5 (IQR = 2–9, range = 0–16)	6 (IQR = 3–10, range = 0–18)
Publications	5 (IQR = 2–9, range = 0–36)	10 (IQR = 5–12, range = 1–45)
Invited presentations	3 (IQR = 1–7, range = 0–136)	4 (IQR = 2–10, range = 0–197)

Note: Data are reported as mean (\pm SD) or median (IQR, range). Abbreviation: IQR, interquartile range; SD, standard deviation.

DISCUSSION

This evaluation of the ALiEM Faculty Incubator program, a longitudinal, asynchronous virtual curriculum for early- and

Outcome	Percentage of participants	Mean (±SD)
Abstracts directly related to the program	30.3%	1.7 (0.8)
Abstracts indirectly related to the program	27.3%	2.0 (1.3)
Publications directly related to the program	69.7%	1.9 (1.1)
Publications indirectly related to the program	42.4%	2.1 (0.8)
Invited presentations directly related to the program	15.2%	2.8 (1.5)
Invited presentations indirectly related to the program	15.2%	3.8 (2.6)
New leadership positions	45.5%	1.3 (0.5)

TABLE 3 Academic productivity 1 year postcourse

Abbreviation: IQR, interquartile range; SD, standard deviation.

mid-career clinician educators, demonstrated that a novel approach to developing faculty competencies as educators, scholars, and leaders leads to increased participant knowledge, academic productivity, and sustained networks within the virtual community of practice.

Interestingly, we found a significantly higher level of academic productivity when compared with other published programs. For example, one program that enrolled a similar cohort of clinician educators reported that 42% of participants had an abstract and 20% had a peer-reviewed publication directly resulting from the course.²⁰ In comparison, the ALiEM Faculty Incubator program led to abstracts and manuscripts by the majority of participants with an average of two abstracts and three publications by course completion with a continued trend 1 year after the program. One potential reason for this difference was the use of a continuous longitudinal curriculum that spans the entire year. While many faculty development programs are designed as single sessions or a limited number of discrete sessions spaced across a given year, the ALiEM Faculty Incubator program differs by emphasizing longitudinal engagement throughout the year using a virtual platform.⁸

This model also facilitates the development of a virtual community of practice, wherein the participants are able to engage in shared knowledge creation and develop stronger networks of collaborators.^{9-11,21} One benefit of this virtual community is the development of additional learning, teaching, and research opportunities external to and after completion of the program. This is evidenced by the significant number of participants who reported involvement in abstracts, publications, and invited presentations as an indirect effect of the program. Additionally, all participants stated that they might or would continue their collaborative relationships and networks with 84.8% continuing their relationships at 1 year. The impact of the virtual community of practice was further evidenced in several of the thematic analyses from the open-ended questions.

Participants are able to comment asynchronously at any time using the platform, which accommodates busy and varying schedules, while also facilitating real-time discussions as questions arise. Using the digital medium is also beneficial because it ensures that each participant has an equal voice, avoiding the potential for conversation domination by a small number of more vocal participants. Our prior study found high levels of engagement with this model,⁸

thereby increasing the opportunity to engage in discussion and experiential learning.¹² Given the current challenges with COVID-19, a particular benefit is the avoidance of the inherent difficulties of traveling for in-person conference sessions.²² It is also important to consider the impact of limited continuing medical education funding and time away from work and family.

Based on feedback from the participants, we revised the program to increase engagement among members and enhance mentorship opportunities. This included the addition of a dedicated monthly faculty mentor to facilitate engagement for each area (e.g., general discussion, journal club, dangerous questions) and smaller, focused mentorship groups.²³ We also created a dedicated alumni forum to facilitate continued networking across classes.

LIMITATIONS

It is important to consider several limitations. First, the surveys rely on self-reporting, which is subject to reporting, recall, and social desirability bias. While the defined start and endpoints reduce the risk of recall bias, it remains possible that some abstracts, papers, or presentations may have been misclassified by timing. Additionally, reliance on self-assessment may overestimate what the participants actually learned. However, the use of a retrospective pre and post assessment may reduce this risk by allowing them to determine their perceived knowledge with a better context of their prior knowledge deficits.¹⁷ Moreover, the degree to which the program influenced new leadership positions or curricula is not able to be determined. However, several participants explicitly stated that the program directly led to these achievements. The restriction to the 1-year postcourse follow-up period may also have been insufficient to capture some of the longer-term outcomes. Finally, while we were able to achieve a 66% initial response rate and 37% delayed response rate, there is a chance that nonresponders may differ from responders in important ways. Those participants who were the most engaged in the program may have been the most likely to have perceived a benefit from the program, and therefore may have been more likely to respond. Unfortunately, the blinded nature of the responses limits the ability to further delineate the distribution of the respondents.

CONCLUSION

The Academic Life in Emergency Medicine Faculty Incubator program demonstrated an increase in perceived knowledge and documented academic productivity among early- and mid-career medical educators. Given limited funding and available time, this may provide an ideal model for the busy clinician educator to develop a virtual community of practice and advance their expertise in education scholarship, while avoiding unnecessary travel, maintaining physical distancing during the COVID-19 pandemic, and integrating into their unique schedules. Future research is needed to determine whether these benefits are maintained for longer time periods than 1 year and to directly compare this approach with other faculty development models.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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