BRIEF REPORT

Bridging Undergraduate and Graduate Medical Education: A Resident-as-Educator Curriculum Embedded in an Internship Preparation Course

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ABSTRACT

Background: Many graduate medical education programs have implemented curricula to develop trainees into the next generation of medical teachers; however, coordination of in-person teaching curricula is challenging due to full trainee schedules.

Methods: To address limited in-person time, we developed a largely asynchronous resident-as-educator curriculum. Our elective curricular activities are embedded within the fourth-year internship preparation course at the University of Wisconsin School of Medicine and Public Health and include trainees from internal medicine, family medicine, and pediatrics.

Results: Trainee self-assessment of teaching skills improved after our curriculum, and students evaluated resident sessions favorably.

Discussion: Trainees can be effective teachers in an internship preparation course after a brief, asynchronous teaching curriculum. To disseminate our curriculum, we designed a resident-as-educator curriculum website.

INTRODUCTION

At the University of Wisconsin School of Medicine and Public Health (UWSMPH), we developed an asynchronous Resident-as-Educator (RAE) curriculum embedded within our fourth-year medical student Internship Preparation Course (IPC) to promote the professional development of our trainees, the next generation of clinician-educators. In this brief report, we present early outcomes of our pilot RAE curriculum.

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In response to perceived lack of preparedness for the residency transition by upcoming interns and program directors alike, IPCs have proliferated.[1] IPCs are resource intensive, often requiring a significant amount of donated faculty time.[2] Our RAE curriculum recruits trainees to fulfill the need for educators in our IPC, while providing a unique near-peer perspective to IPC students.

Many institutions have implemented RAE curricula to meet the call for trainee instruction in teaching.[3] While many of these curricula improve resident teaching skills, most are designed to be delivered in-person, resulting in challenges coordinating busy resident and faculty mentor schedules.[4,5] Our curriculum successfully employs blended learning to overcome this logistical barrier, benefiting the professional development of future clinician-educators while serving the student and institutional needs of a resource-intensive IPC.
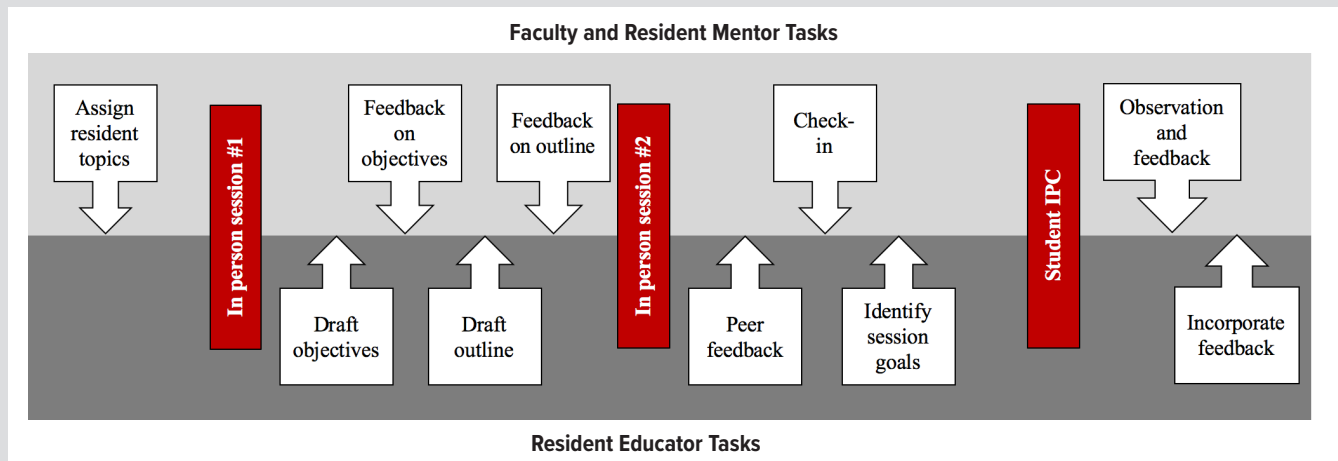
METHODS
Setting

We piloted our RAE curriculum concurrent with the UWSMPH IPC in academic year 2014-2015. In 2014-2016, the IPC was an elective for 8, then 15 students entering internal medicine internships. In 2016-2017, the IPC became a requirement for all 148 graduating students. Our IPC addresses essential intern skills, such as management of common acute conditions, communication skills, and awareness of resources for personal well-being and professional development.

Population

We piloted our RAE curriculum with a group of internal medi-

Figure. Resident as Educator Curriculum Timeline

Faculty and Resident Mentor Tasks

| Assign resident topics | In person session #1 | Feedback on objectives | Feedback on outline | In person session #2 | Check-in | | Student IPC | Observation and feedback |

| | | Draft objectives | Draft outline | | Peer feedback | Identify session goals | | Incorporate feedback |

Resident Educator Tasks

Curriculum occurs in an asynchronous manner focusing on task-based learning, with individualized formative feedback from peers and mentors. Two in-person learning sessions occur before the internship preparation course, with electronic feedback occurring between these meetings and after the internship preparation course.

cine residents in 2014-2015 (n = 10) and 2015-2016 (n = 12) in the Department of Medicine. In academic year 2016-2017, we expanded to family medicine and pediatrics. This expansion was a result of increased trainee interest, adoption of the IPC as a requirement for all graduating medical students, and the addition of pediatric and family medicine faculty mentors.

Program Description

Our RAE curriculum is elective for trainees, and instruction is embedded within IPC preparation at our institution. We designed the curriculum to enhance the classroom teaching skills of trainee educators serving as IPC instructors. We employ the pedagogical principles of situated learning,[6] deliberate practice,[7] task deconstruction,[8] peer feedback,[9] and mentorship. The steps to create an effective classroom teaching session are broken down into discrete tasks. Trainee educators immediately apply learned content to development of their assigned teaching session and receive ongoing peer and faculty feedback. Trainees who have participated in our curriculum in a previous year serve as peer mentors.

Our curriculum emphasizes writing effective learning objectives, structuring teaching sessions to promote engagement, and giving and receiving feedback. We incorporate a scaffolded approach to promote development of trainee educators participating in successive years of our curriculum. The first year focuses on basics of classroom teaching and providing effective feedback. Second-year trainee educators are introduced to more nuanced classroom management skills, such as responding to error, managing interactive activities, and assessment principles. Third-year trainees serve as peer mentors and develop an individual goal pertaining to medical education. Course materials are on our website (see https://rae.medicine.wisc.edu).

Innovative to our curriculum is the largely asynchronous format (Figure). Trainee educators convene for just two 1-hour face-to-face sessions to emphasize key curricular objectives and participate in open discussion. The first focuses on development of an effective classroom teaching session, including writing learning objectives and incorporating various teaching methods. The second session emphasizes effective feedback and provides time for troubleshooting and generating ideas. The remaining curricular activities occur asynchronously. Time between the sessions is spent developing course materials by applying RAE curriculum lessons and receiving individualized feedback on materials from peer and faculty mentors. The development of course materials is deconstructed into discrete tasks, such as writing learning objectives or developing a session outline (see Figure), with frequent opportunities for feedback.

Ethics

Per the University of Wisconsin-Madison Health Sciences institutional review board (IRB), this program evaluation is exempt from oversight.

Evaluation

We conducted anonymous pre- and post-self-assessments of teaching skills using a locally developed tool (Appendix A and B). Self-assessment data is available for 2016-2017 for 27 of the 40 trainees. A faculty mentor directly observed sessions and provided feedback to trainee educators. Student evaluations of session quality were collected. Students were asked to respond to the following statement on a Likert scale of 1 (strongly agree) to 7 (strongly disagree): "[Session title] was effective." Data from direct observation and feedback were not conducive to robust analysis and are not included in this report.

Statistical Analysis

To evaluate differences in trainee educator self-assessment, data

was aggregated and analyzed using the Mann-Whitney test because the participants' identity was hidden. Effect size was calculated and reported with Cliff d values. A Spearman correlation analysis was performed. Student evaluation of session data is presented using descriptive statistics only.

RESULTS

In 2017, our RAE curriculum included trainee educators from our internal medicine residency (n = 17), family medicine residency (n = 5), and pediatrics residency and fellowships (n = 19). These volunteers accounted for 19.1% of the 89 internal medicine residents, 10.4% of the 48 family medicine residents, and 35.8% of the 53 pediatric residents and fellows that academic year. Of these 41 trainee educators, 68% (n = 28) were PGY-2 or 3 level of training (range PGY 1-6), and 27% (n = 11) had participated in RAE the prior year.

Self-assessment of educator skills improved significantly among trainees participating in our RAE curriculum. (See Table). There were multiple associations between topics (Appendix C).

Trainee educators taught 40 sessions in the IPC in the 2016-2017 academic year. Student evaluation data of teaching sessions revealed overall high satisfaction with resident teaching sessions. Of the 40 sessions given by residents, medical students rated 89% (median, interquartile range [IQR] 81%-95%) as a 1 (strongly agree), 2 or 3 (agree) out of 7 on overall session effectiveness, with median Likert score per trainee teaching session of 2.17 (IQR range: 1.78-2.33).

DISCUSSION

Our blended RAE curriculum resulted in enhanced teaching self-efficacy among trainee educators and effective teaching of medical students in our IPC. The success of our largely asynchronous pilot RAE curriculum demonstrates teaching skill development can occur with limited face-to-face instruction by faculty mentors. This structure obviates the barrier of limited time for an in-person RAE curriculum[4,5] while effectively developing a larger pool of effective educators to execute a resource-intensive IPC. In addition, the ongoing RAE participation year after year, in the setting of many time demands, reflects that trainees find this experience valuable.

Table. Resident and Fellow Self-Assessment Before and After Participating in the Resident as Educator Curriculum

	Pre-assessment Median (IQR) (n=27)	Post-assessment Median (IQR) (n=26)	P value (Mann-Whitney)
I am confident in my teaching skills.	3.5 (3,4)	4 (3,4)	0.09
I can develop focused, relevant goals and learning objectives for a teaching session.	4 (3,4)	4 (4,4)	0.01[a]
I can use learning objectives to structure a teaching session.	4 (3,4)	4 (4,4)	0.001[a]
I appreciate the merits of different teaching formats and when each are appropriate.	4 (4,4)	4 (4,4.25)	0.24
I feel confident in my ability to lead a lecture-style learning session.	4 (3,4)	4 (4,4.25)	0.049[a]
I feel confident in my ability to lead a small group-based learning session.	4 (3,4)	4 (3.75,5)	0.029[a]
I feel confident in my ability to lead a case-based learning session.	4 (3,4)	4 (4,4.25)	0.01[a]
I feel confident in my ability to lead a simulation-based learning session.	3 (3,4)	4 (3, 4.25)	0.003[a]
I can develop printed materials that learners find useful in mastery of a topic I am presenting.	4 (3,4)	4 (3.75,4)	0.043[a]
I have a framework for giving feedback.	3 (2,3)	4 (3,4)	0.0003[a]
I feel comfortable giving positive feedback to my peers.	4 (4,4)	4 (4,4.25)	0.12
I feel comfortable giving constructive feedback to my peers.	3 (3,4)	4 (3.75,4)	0.0009[a]
I can incorporate constructive feedback to improve a presentation or teaching session.	4 (3,4)	4 (4,4)	0.044[a]
I can develop a teaching session that effectively teaches what I think is most important for my learners.	3 (2,3)	4 (3,4)	0.0001[a]
I feel comfortable in acting as a mentor to help others improve their skills as an educator.	3 (2,4)	4 (3,4)	0.007[a]

[a] Indicates significance at the $P \leq 0.05$ level
Data from 2016-2017. (1 = strongly disagree, 5 = strongly agree)

Similar to other RAE curricula with reports of resident self-assessment, our asynchronous blended curriculum significantly increased residents' perceived preparedness, confidence, and classroom teaching skills.[10]

There are many opportunities for continued innovation building on our curriculum and assessment. First, this curriculum was initially piloted in only 1 clinical department with expansion to 2 additional departments; piloting this curriculum in other departments would be useful to confirm generalizability. Second, our intentional focus on classroom-based teaching does not necessarily develop teaching skills in other venues. Our locally developed assessment plan may limit our ability to draw generalizable conclusions. Given the curriculum is embedded within the IPC and prioritizes high-quality, individualized feedback from trainee and faculty mentors, the number of trainee educators that can fully participate is limited. Given the lack of a comparator group and self-selection of our participants, we cannot make firm conclusions regarding the curriculum's efficacy. Finally, the previous lack of a centralized electronic platform for curriculum delivery, sub-

mission of tasks, and feedback limited our ability to disseminate our curriculum widely in a high-fidelity manner.

Many of the identified limitations of the pilot curriculum are being addressed. As highlighted, our RAE curriculum was expanded from including only internal medicine residents to trainees from family medicine and pediatrics with similar success in improving the self-efficacy of trainee educators. Assessment revision is ongoing and now dictated largely at the medical school level due to interim adoption of the IPC as a required fourth-year course for all graduating students. Ideally, we would apply a validated instrument to measure success of our RAE curriculum.

A recent advancement of the curriculum is the development of a course website, currently being piloted to supplement the RAE curriculum. The website houses several modules relevant to trainee educators in the IPC with embedded self-assessment activities. We have used the website to disseminate train-the-trainer materials for faculty within and outside our institution interested in implementing our RAE curriculum. (See https://rae.medicine.wisc.edu).

CONCLUSION

Our asynchronous RAE curriculum enhanced self-efficacy in teaching skills among trainee educators. Students find trainee teaching highly effective. We hope to continue to broaden the curriculum's impact and increase its ease of implementation by future groups through a course website that provides a centralized platform for ease of dissemination.

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Resident-as-Educators Course, Pre-Course Survey

Background Information:

Year of Residency: PGY-1   PGY-2   PGY-3

Have you participated in this course previously?   Yes   No

     If yes, will this be your second or third year participating?   Second   Third

Please answer the following questions based on your current level of comfort and knowledge with the following areas of teaching and educating.

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

I am confident in my teaching skills	1	2	3	4	5	n/a
I can develop focused, relevant goals and learning objectives for a teaching session	1	2	3	4	5	n/a
I can use learning objectives to structure a teaching session	1	2	3	4	5	n/a
I appreciate the merits of different teaching formats and when to each are appropriate	1	2	3	4	5	n/a
I feel confident in my ability to lead a lecture-style learning session	1	2	3	4	5	n/a
I feel confident in my ability to lead a small group-based learning session	1	2	3	4	5	n/a
I feel confident in my ability to lead a case-based learning session	1	2	3	4	5	n/a
I feel confident in my ability to lead a simulation-based learning session	1	2	3	4	5	n/a
I can develop printed materials that learners find useful in mastery of a topic I am presenting	1	2	3	4	5	n/a
I have a framework for giving feedback	1	2	3	4	5	n/a
I feel comfortable giving positive feedback to my peers	1	2	3	4	5	n/a
I feel comfortable giving constructive feedback to my peers	1	2	3	4	5	n/a
I can incorporate constructive feedback to improve a presentation or teaching session	1	2	3	4	5	n/a
I can develop a tool used to evaluate a presentation or teaching session	1	2	3	4	5	n/a
I feel comfortable in acting as a mentor to help others improve their skills as an educator	1	2	3	4	5	n/a

If you have previously participated in the residents as educator course in preparation for the intern bootcamp course, was the course helpful in preparing you to be a better teacher?

     Yes   No

     If yes, in what ways do you think you have improved in your skills as an educator?

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Resident-as-Educator Course, Post-Course Survey

Background Information:

Year of Residency: PGY-1   PGY-2   PGY-3

How many times have you participated in the Resident as Educators Course?   1   2   3

Please answer the following questions based on your current level of comfort and knowledge with the following areas of teaching and educating.

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

I am confident in my teaching skills	1	2	3	4	5	n/a
I can develop focused, relevant goals and learning objectives for a teaching session	1	2	3	4	5	n/a
I can use learning objectives to structure a teaching session	1	2	3	4	5	n/a
I appreciate the merits of different teaching formats and when to each are appropriate	1	2	3	4	5	n/a
I feel confident in my ability to lead a lecture-style learning session	1	2	3	4	5	n/a
I feel confident in my ability to lead a small group-based learning session	1	2	3	4	5	n/a
I feel confident in my ability to lead a case-based learning session	1	2	3	4	5	n/a
I feel confident in my ability to lead a simulation-based learning session	1	2	3	4	5	n/a
I can develop printed materials that learners find useful in mastery of a topic I am presenting	1	2	3	4	5	n/a
I have a framework for giving feedback	1	2	3	4	5	n/a
I feel comfortable giving positive feedback to my peers	1	2	3	4	5	n/a
I feel comfortable giving constructive feedback to my peers	1	2	3	4	5	n/a
I can incorporate constructive feedback to improve a presentation or teaching session	1	2	3	4	5	n/a
I can develop a tool used to evaluate a presentation or teaching session	1	2	3	4	5	n/a
I feel comfortable in acting as a mentor to help others improve their skills as an educator	1	2	3	4	5	n/a

Did you find this course helpful in your preparation for your teaching session? Why or why not?

Do you have any suggestions for improvements to the course?

Would you recommend this experience to future residents?

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Results of Spearman correlation tests for post-test responses.

	Confident in Teaching Skills	Develop Objectives	Objectives to structure a session	Merits of teaching formats	Confident to lead lecture style	Confident to lead small group	Confident to lead case based	Confident to lead simulation	Develop printed materials	Framework for feedback	Comfort giving positive feedback	Comfort giving constructive feedback	Incorporate constructive feedback	Develop teaching session	Comfort acting as mentor
Confident in Teaching Skills		0.008	0.118	0.206	0.821	0.395	0.518	0.843	0.147	0.814	0.639	0.661	0.544	0.963	0.763
Develop Objectives	0.008		0.556	0.896	0.535	0.630	0.640	0.566	0.909	0.255	0.822	0.260	0.505	0.504	0.684
Objectives to structure a session	0.118	0.556		0.257	0.052	0.105	0.014	0.088	0.013	0.173	0.746	0.014	0.133	0.074	0.534
Merits of teaching formats	0.206	0.896	0.257		0.716	0.048	0.019	0.945	0.577	0.691	0.050	0.040	0.400	0.434	0.381
Confident to lead lecture style	0.821	0.535	0.052	0.716		0.028	0.091	0.024	0.001	0.017	0.387	0.251	0.170	0.090	0.059
Confident to lead small group	0.395	0.630	0.105	0.048	0.028		0.000	0.009	0.004	0.020	0.175	0.010	0.082	0.012	0.000

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Confident to lead case based	0.518	0.640	0.014	0.019	0.091	0.000		0.030	0.104	0.199	0.097	0.005	0.003	0.017	0.010
Confident to lead simulation	0.843	0.566	0.088	0.945	0.024	0.009	0.030		0.001	0.002	0.644	0.040	0.326	0.026	0.016
Develop printed materials	0.147	0.909	0.013	0.577	0.001	0.004	0.104	0.001		0.000	0.746	0.020	0.461	0.006	0.004
Framework for feedback	0.814	0.255	0.173	0.691	0.017	0.020	0.199	0.002	0.000		0.192	0.002	0.070	0.003	0.001
Comfort giving positive feedback	0.639	0.822	0.746	0.050	0.387	0.175	0.097	0.644	0.746	0.192		0.083	0.018	0.329	0.110
Comfort giving constructive feedback	0.661	0.260	0.014	0.040	0.251	0.010	0.005	0.040	0.020	0.002	0.083		0.001	0.000	0.006
Incorporate constructive feedback	0.544	0.505	0.133	0.400	0.170	0.082	0.003	0.326	0.461	0.070	0.018	0.001		0.000	0.010
Develop teaching session	0.963	0.504	0.074	0.434	0.090	0.012	0.017	0.026	0.006	0.003	0.329	0.000	0.000		0.008
Comfort acting as mentor	0.763	0.684	0.534	0.381	0.059	0.000	0.010	0.016	0.004	0.001	0.110	0.006	0.010	0.008	

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