

# The Impact of the COVID-19 Pandemic and Virtual learning on Medical Education: A Professional Examination Outcomes Analyses and Survey -Based Study

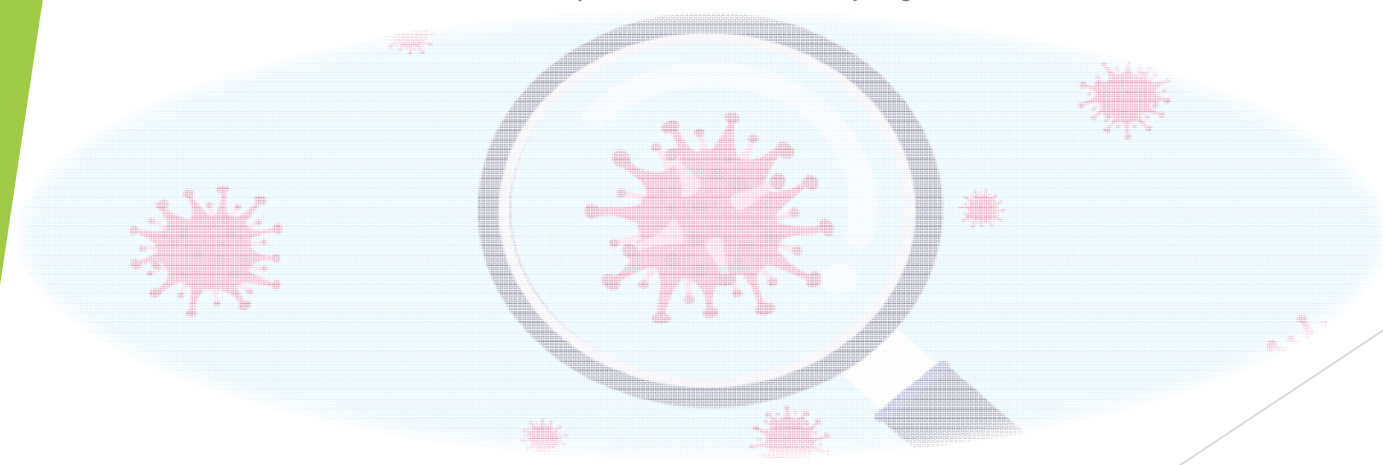
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# Conflict of interest

-None



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# Acknowledgement

- Jacqueline Kitchen, MD
- Jennifer Quaintance
- Paula Monaghan-Nichols Ph.D

# Introduction

COVID-19 is one of the most significant medical and public health challenge facing the US in recent decades.

Online/Virtual learning was a predominant adopted method of medical education during COVID-19 pandemic to reduce exposure to virus during medical education.

The phase of transition to the classroom learning has started and the option of online participation in hybrid setting is an option currently.

The objective of this survey study is to compare traditional in-person classroom/bedside learning with online/virtual medical education and to study its impact on medical education, ABIM, ITE & NBME Shelf exam performance, bedside skills development, learning during telehealth care encounters, and on learners' satisfaction.

To provide guidance for the best medical education model(s) in the post pandemic era



## COVID-19 Pandemic Learning Guidelines

During COVID-19 pandemic, the ACGME and AMA released statements and webinars to educate and recommend safe learning styles and smooth transitions to virtual learning and other virtual learning opportunities for residents.

March of 2020, the AMA recommended to remove medical students from direct patient care activities through at least April 14, 2020 and supported online learning.

Centers for Medicare & Medicaid Services (CMS) has announced that it will continue to allow attending physicians to supervise resident physicians through telemedicine technology.

No major recent updated guidelines

# Methods

- UMKC medical students and resident physicians from multiple specialties including Internal medicine, Combined Internal medicine and Pediatrics, Neurology, Obgyn, and Psychiatry voluntarily participated in an online de-identified survey using Redcap for storage.
- Descriptive statistics were performed using Statsdirect, excel, and Redcap statistical tools. Informed consent, survey questionnaire, and study design were approved, and IRB exempt status was granted by UMKC IRB committee.

# Student Survey Results

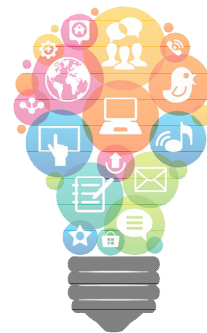
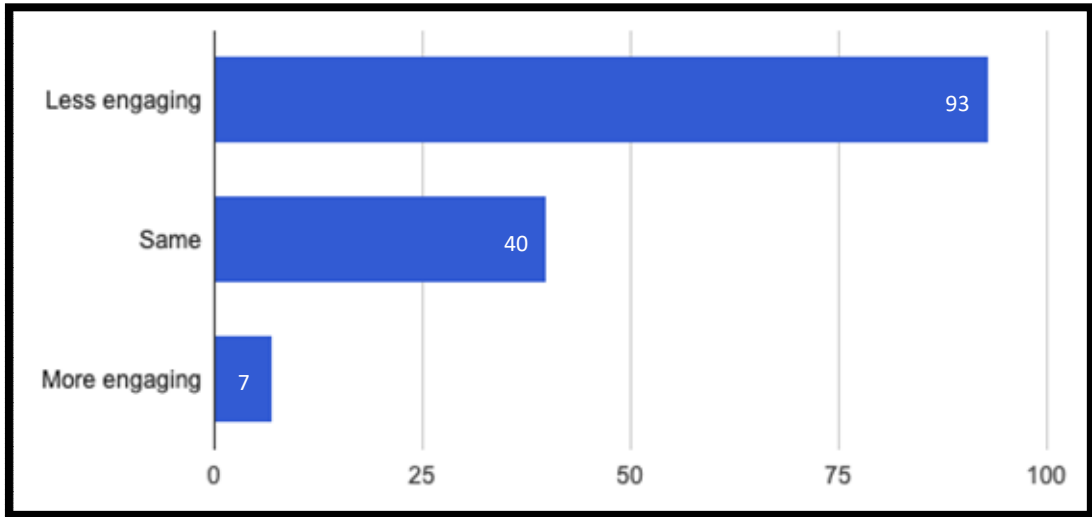




# Results

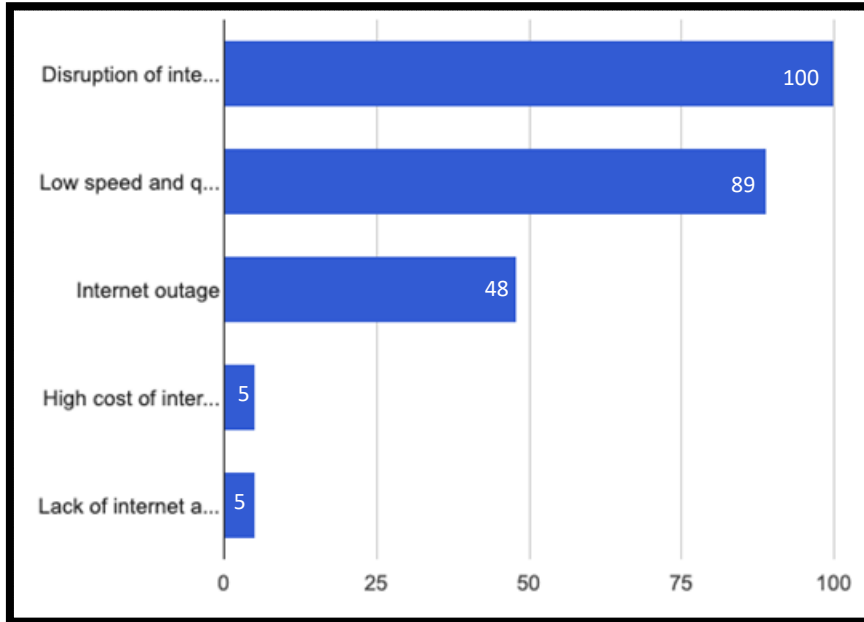
- 141 (23.5%) out of 600 total medical students participated in the survey.
- When comparing with in-person/traditional classroom and bedside learning, 93 (66.4 %) medical students reported the online virtual education to be less engaging.
- The mean satisfaction on a scale of 1 to 10, 10 being the highest, for online virtual, in-person, and hybrid models were 6.12, 7.01, and 7.08 respectively.
- Medical students ranked their bedside skill development as mean of 5.02, 7.90, and 7.04 for online virtual, in-person, and hybrid models respectively.
- For comfortable learning settings, 0/141 students selected telehealth encounter and 113 (81.9%) students selected in-person clinic visits
- For future model of medical education, 105 (76.1%) medical students preferred hybrid model of learning, 25 (18.1%) preferred in-person, while 8 (5.8%) preferred virtual only model of learning for medical education.

# When comparing your online education versus when your education was in person, how engaging were the lectures?

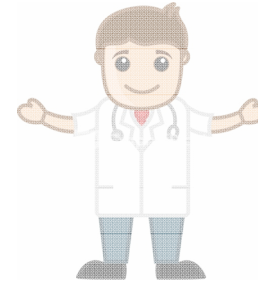
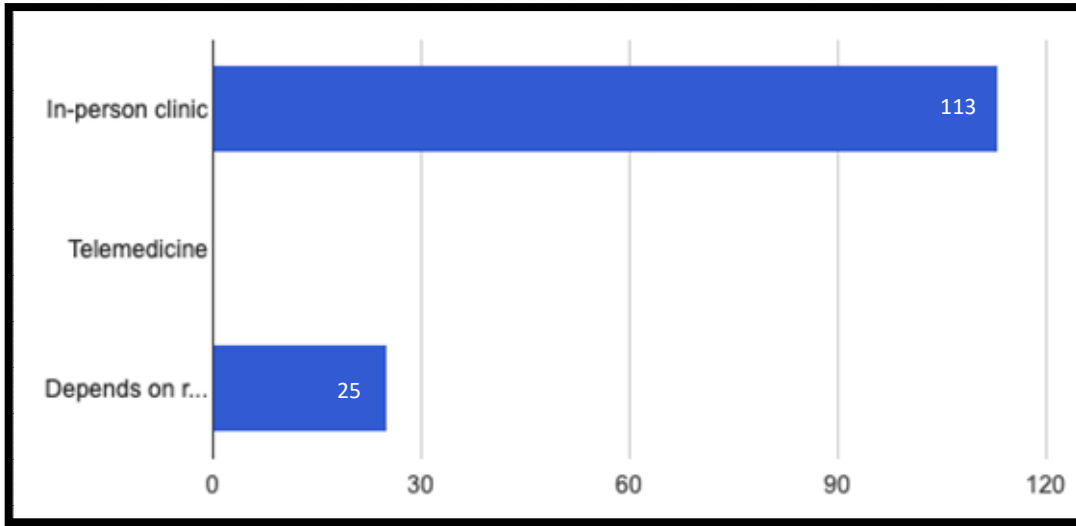


When comparing with in-person/traditional classroom and bedside learning, 93 (66.4 %) medical students reported the online virtual education to be less engaging.

# Did you experience any obstacles in your virtual medical education experience?

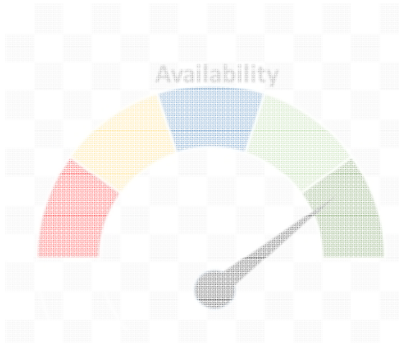
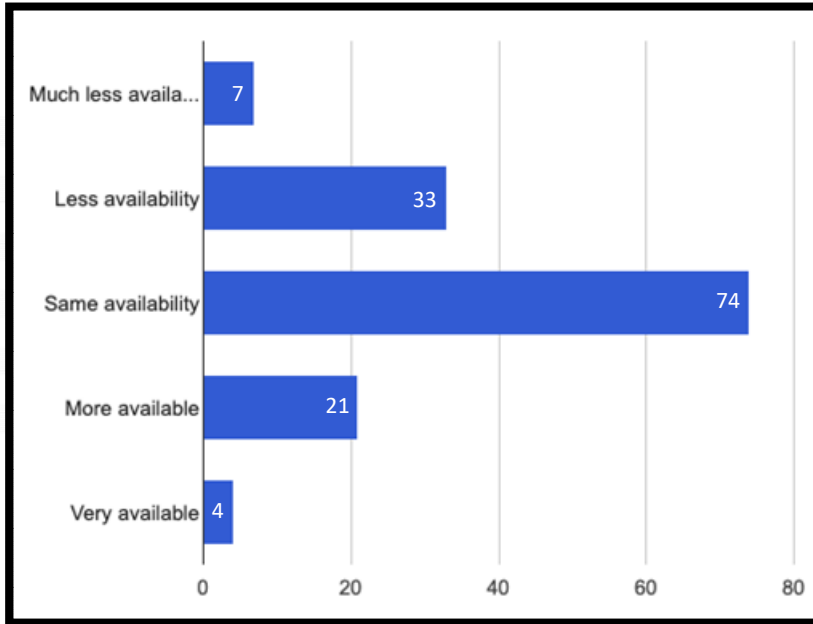


# Which patient visit setting do you feel most comfortable in?

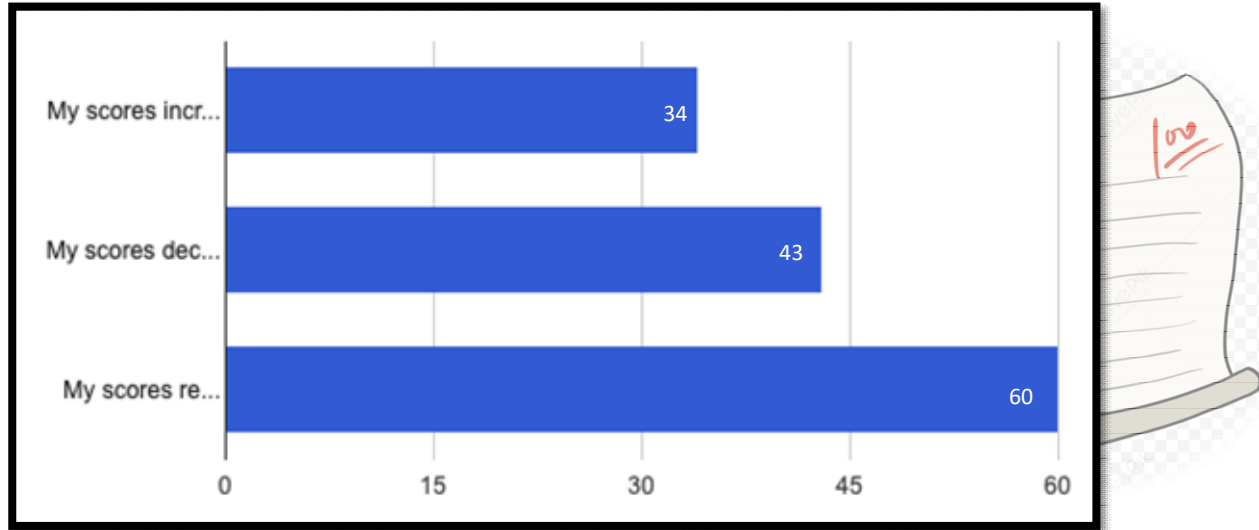


For comfortable learning settings, 0/141 students selected telehealth encounter and 113 (81.9%) students selected in-person clinic visits

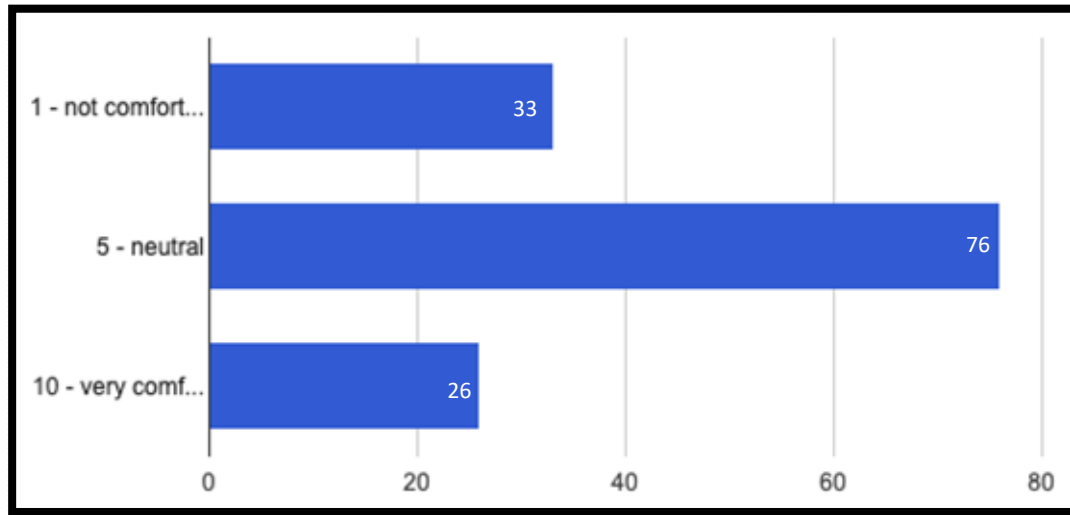
When comparing your online education versus when your education was in person, how was the availability of the faculty and staff to answer questions to help you understand concepts?



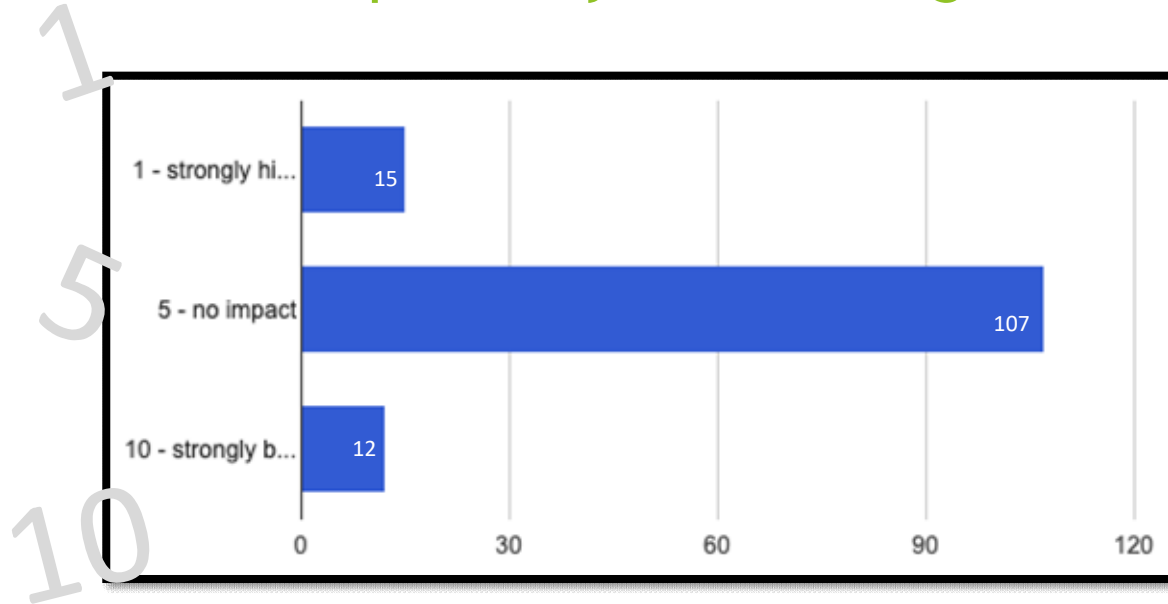
Depending on your level of education when the COVID-19 pandemic caused education activities to be solely virtual, on average, was there a difference in your class testing and shelf grade performance?



On a scale of 1 to 10, how comfortable are you with performing Telehealth visits?

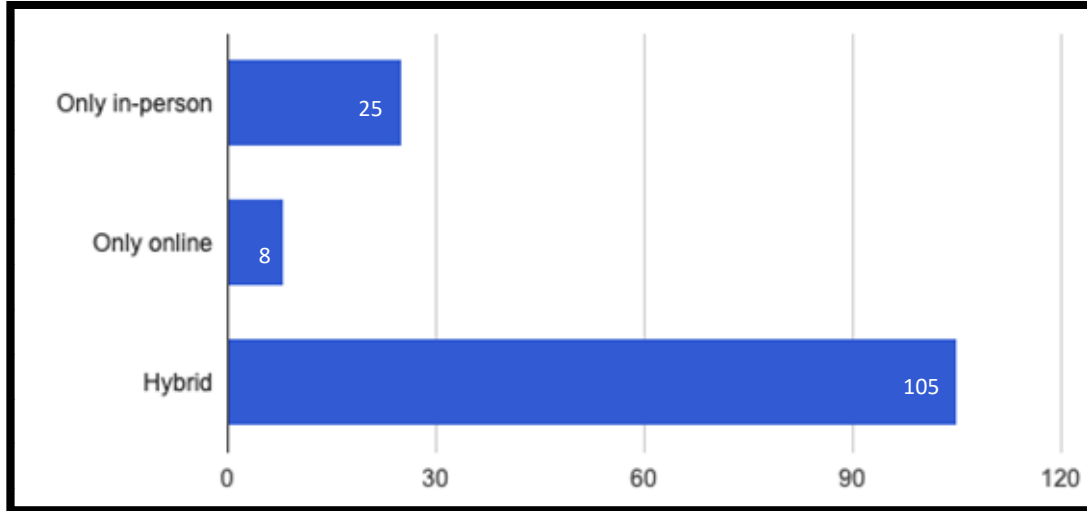


On a scale of 1 to 10, how has Telemedicine impacted your learning?



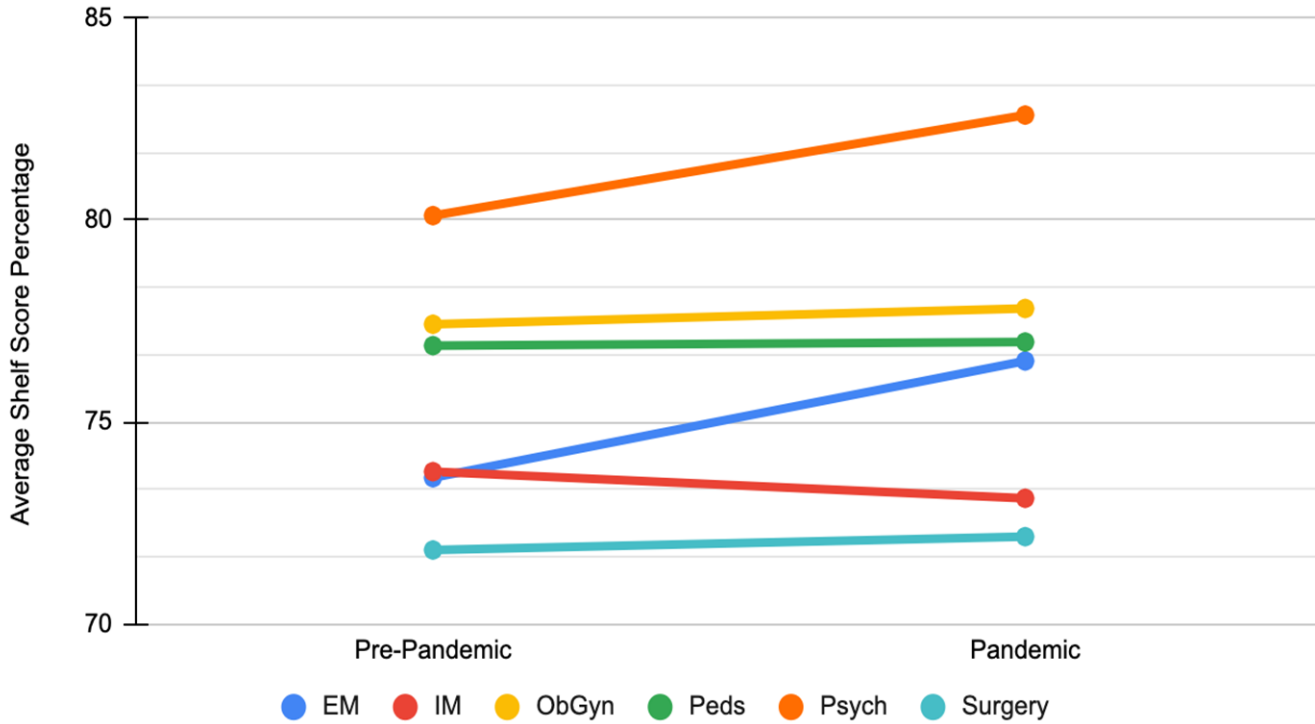


## In the future, what type of medical education would you prefer?



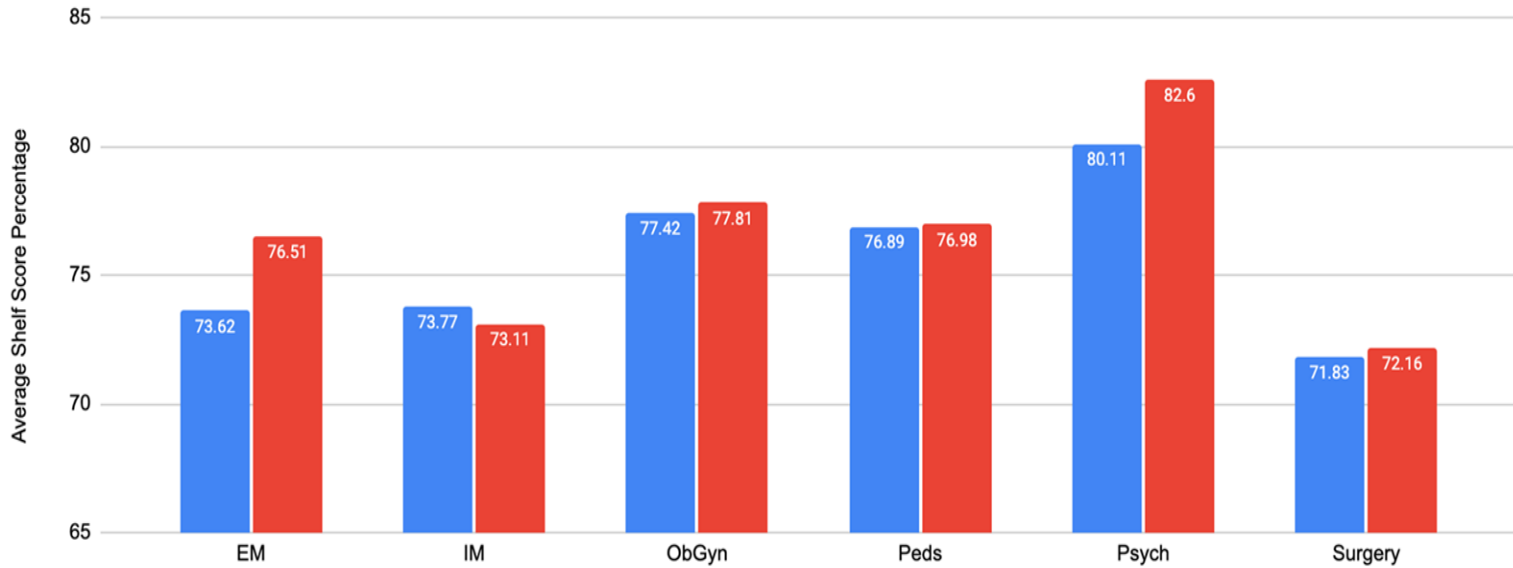
For future model of medical education, 105 (76.1%) medical students preferred hybrid model of learning, 25 (18.1%) preferred in-person, while 8 (5.8%) preferred virtual only model of learning for medical education

## Average Student Shelf Score Percentage Before and During the COVID-19 Pandemic



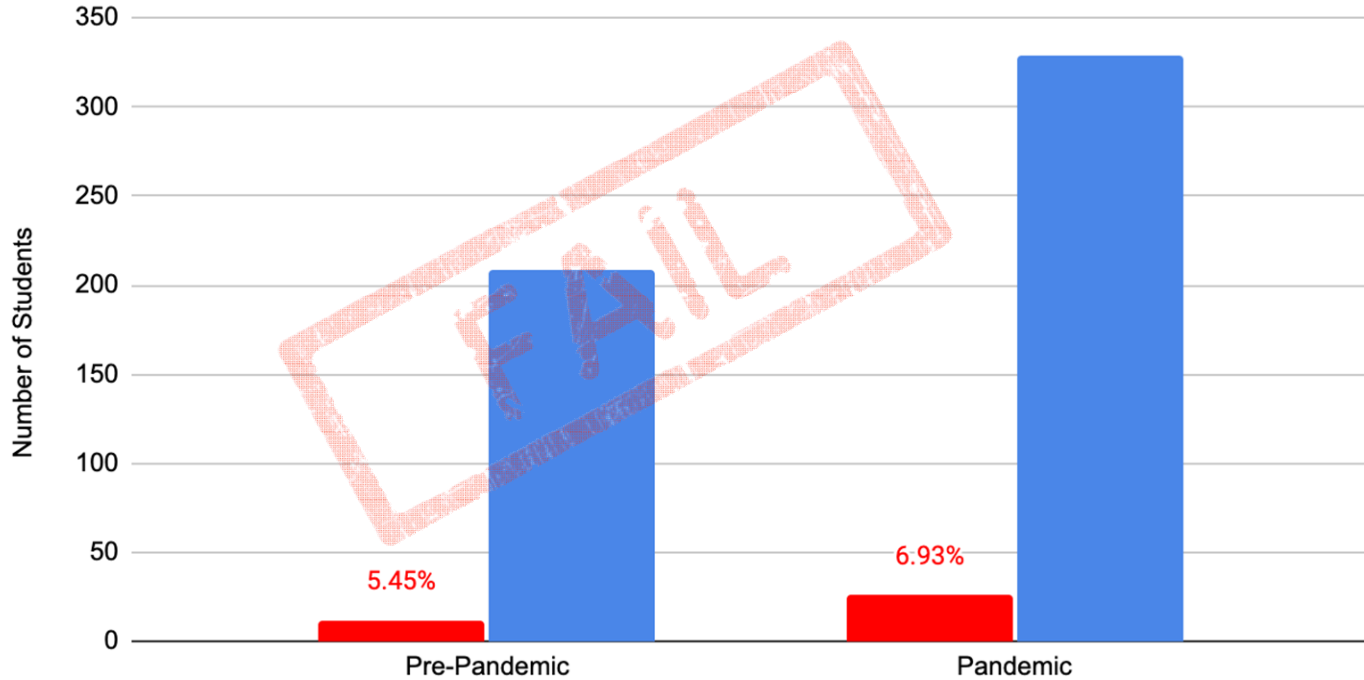
### Average Student Shelf Score Percentage Before and During the COVID-19 Pandemic

Pre-Pandemic Pandemic

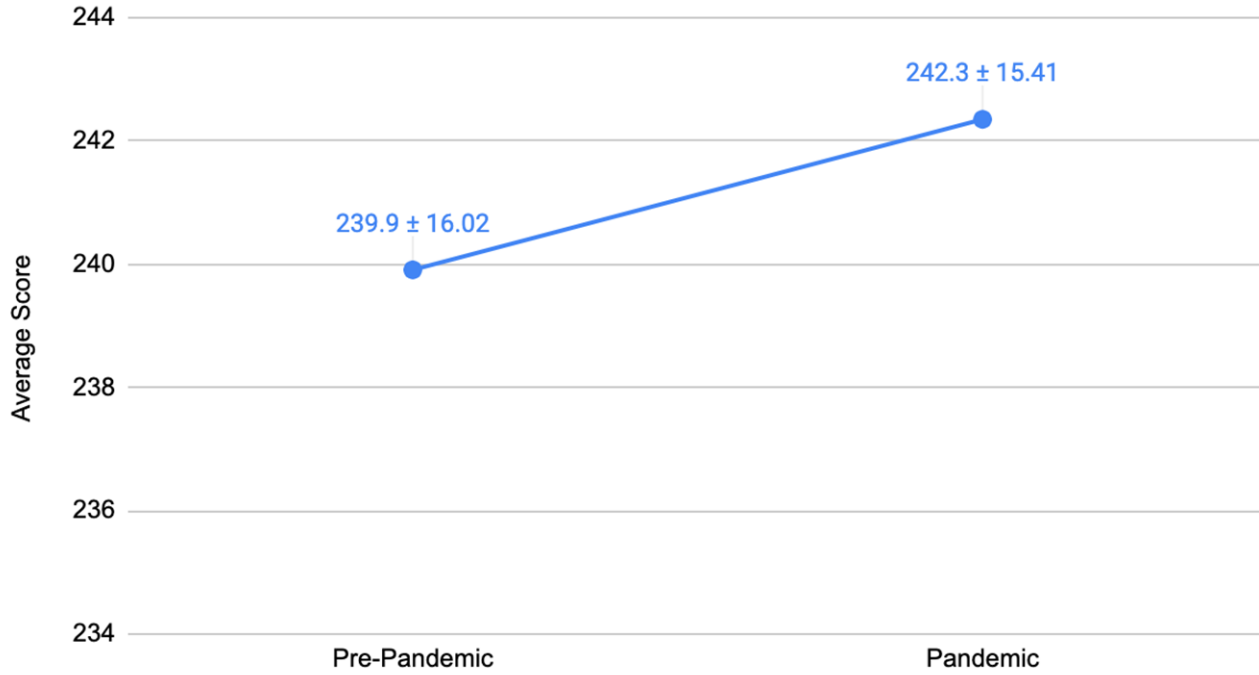


### STEP 1 Fail Rate Prior and During the COVID-19 Pandemic

Fail Pass



## Average STEP 2 Score Prior and During the COVID-19 Pandemic



<b>Table 1a: Student Questionnaire Results</b>			
	<b>Online</b>	<b>In-person</b>	<b>Hybrid</b>
<b>Satisfaction with the Level of Education Received</b>	6.12	7.01	7.08
<b>Student Bedside Skills</b>	5.02	7.90	7.04
<b>Future Class Preference Percentage</b>	5.8%	18.1%	76.1%

<b>Table 1b: Student Class Engagement</b>		
<b>Less Engaging</b>	<b>Same Level of Engagement</b>	<b>More Engaging</b>
66.4%	28.6%	5.0%

<b>Table 1c: Obstacles Encountered by Students</b>	
<b>Disruption of Internet</b>	87.7%
<b>Low speed and quality of audio/video</b>	78.1%
<b>Internet outage</b>	42.1%
<b>High Cost of Internet</b>	4.4%
<b>Lack of Internet and computer or laptop for all users</b>	4.4%

<b>Table 1d: Teacher's Availability</b>				
<b>Much less available</b>	<b>Less availability</b>	<b>Same availability</b>	<b>More availability</b>	<b>Very available</b>
5.0%	23.7%	53.2%	15.1%	2.9%

<b>Table 1e: Impacts of Online Learning</b>			
	<b>Decreased</b>	<b>Remained the Same</b>	<b>Increased</b>
<b>Test Scores</b>	31.4%	43.8%	24.8%
<b>Telemedicine Experiences</b>	11.2%	79.9%	9.0%

<b>Table 1f: Most Comfortable Patient Setting</b>	
<b>In-person Clinic</b>	81.9%
<b>Telemedicine</b>	0%
<b>Depends on the reason for visit</b>	18.1%

<b>Table 1g: Comfort Level Performing Telehealth Appointment</b>		
<b>Not Comfortable</b>	<b>Neutral</b>	<b>Very Comfortable</b>
24.4%	56.3%	19.3%

# Resident Results

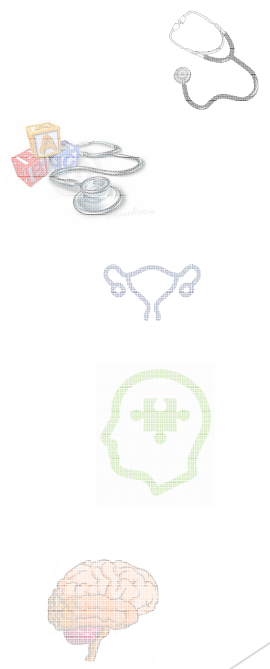
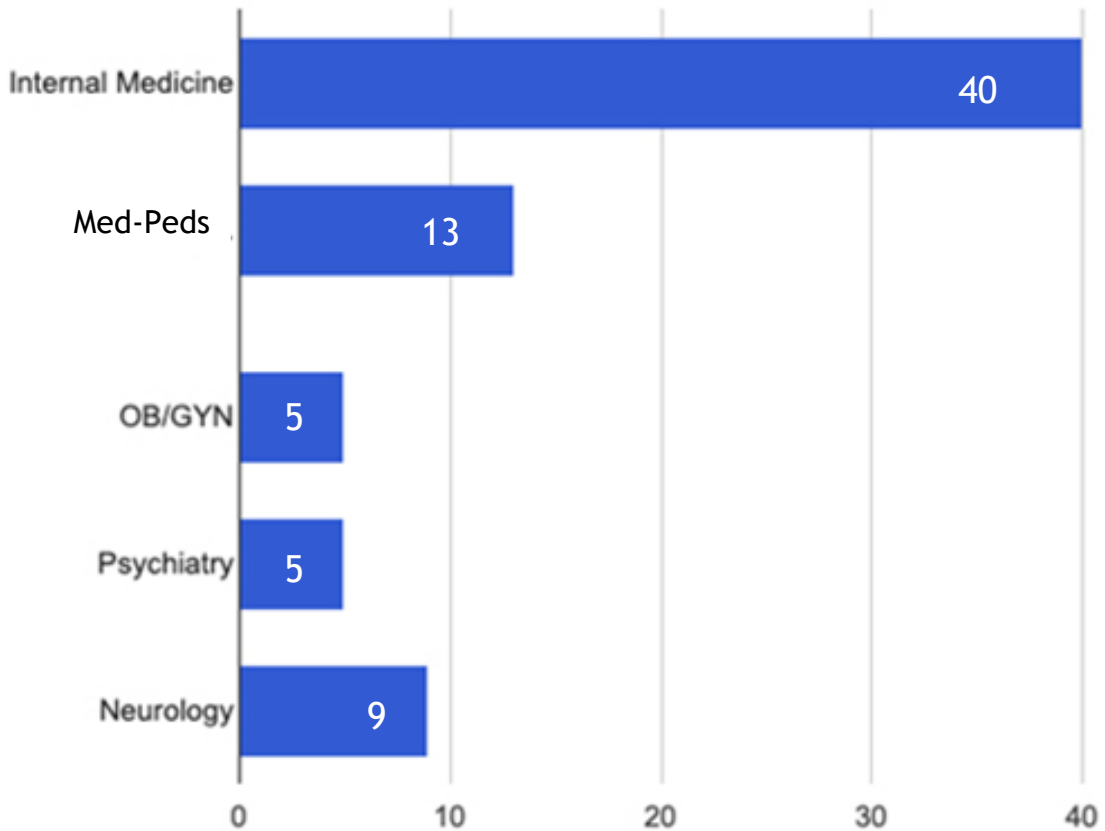


# Results

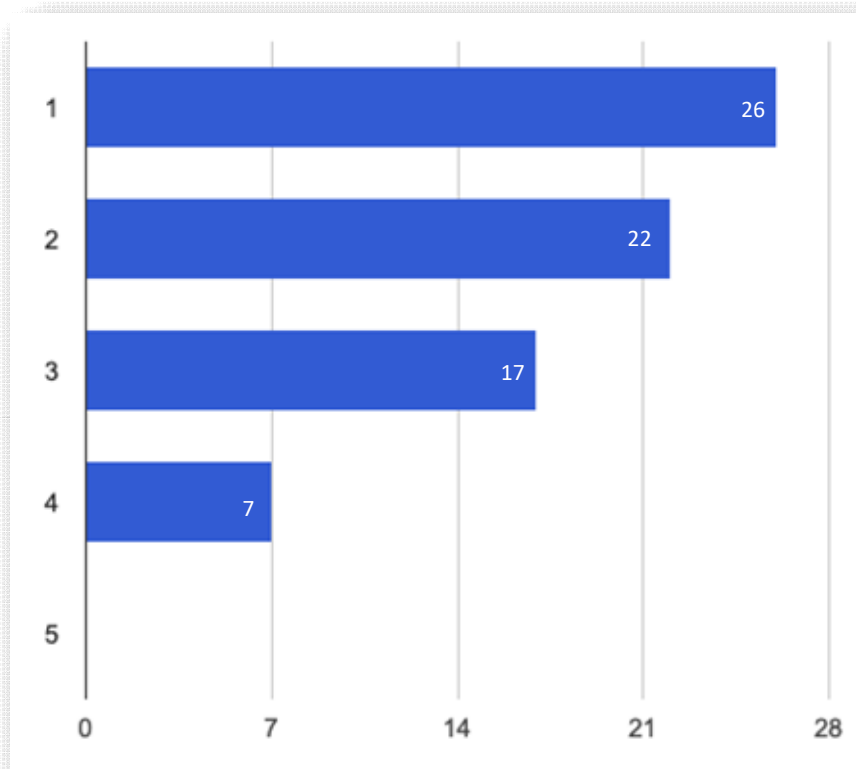
- 30 (41.7%) resident physicians preferred hybrid model of learning, 28 (38.9%) preferred in-person, 9 (12.5%) preferred virtual, while 5 (6.9%) had no preference.
- Regarding attention span during virtual education, 4 (5.7%) reported increased attention, 51 (72.9%) reported decreased attention, while 15 (21.4%) reported same attention span. Mean distraction ranking was 7 (on a scale of 1 to 10) for the virtual learning model.
- Regarding attendance during virtual education, 34 (49.3%) reported increased attendance, 18 (26.1%) reported decreased attendance, while 17 (24.6%) participants reported that their attendance remained the same.
- 44 (61.1%) resident physicians reported higher motivation for in-person learning, 8 (11.1%) reported higher motivation for virtual learning, while 20 (27.8 %) reported their motivation remains the same.
- The mean satisfaction with the quality of education (on a scale of 1 to 10, for online virtual, in-person, and hybrid models were 6.7, 7.0, and 6.8 respectively. Mode was 6, 8, and 8 respectively.
- The mean satisfaction for the ability to interact with educators (on a scale of 1 to 10, 10 being the highest) for online virtual vs in-person, hybrid was 6.01, 7.38, and 6.7 respectively. Mode was 6, 8, and 8 respectively
- 31 (44.3%) resident physicians reported occasional internet connectivity issues leading to missed lessons during virtual learning..

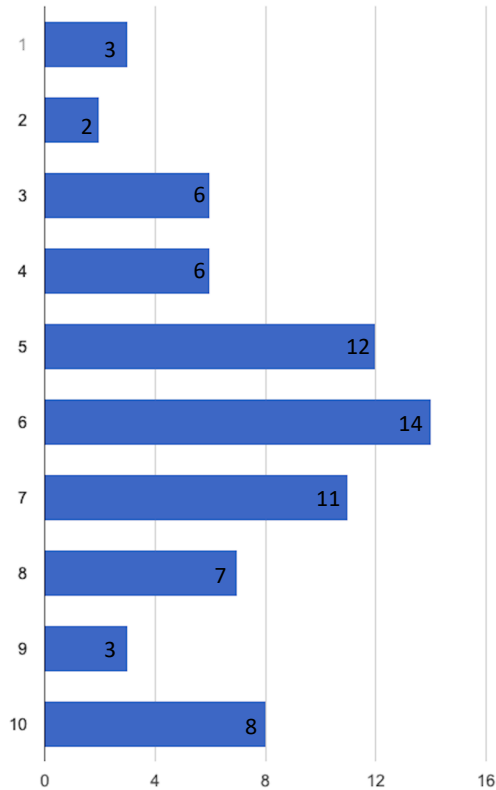


# What medical specialty program are you currently in?



# What is your PGY year?



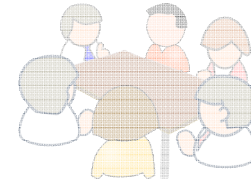
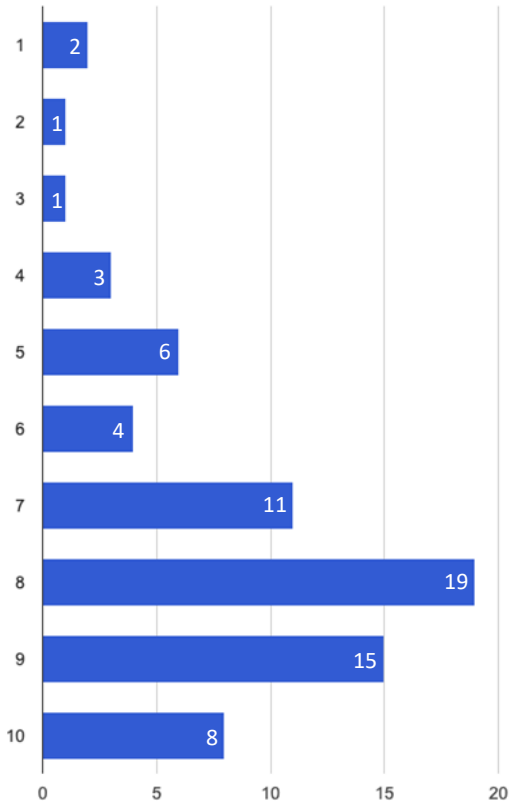


On a scale of 1 to 10 (1 being the lowest and 10 being the highest), rank your satisfaction with the educational quality of virtual education (such as noon conference, resident report, didactics).

The mean satisfaction with the quality of education (on a scale of 1 to 10, for online virtual, in-person, and hybrid models were 6.7, 7.0, and 6.8 respectively.

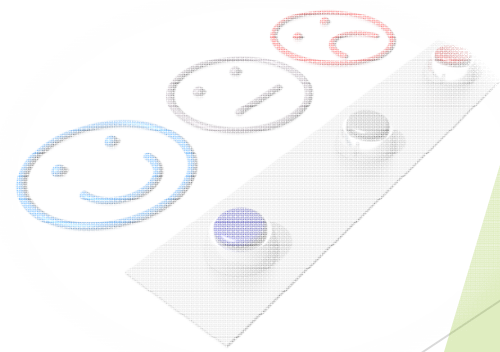
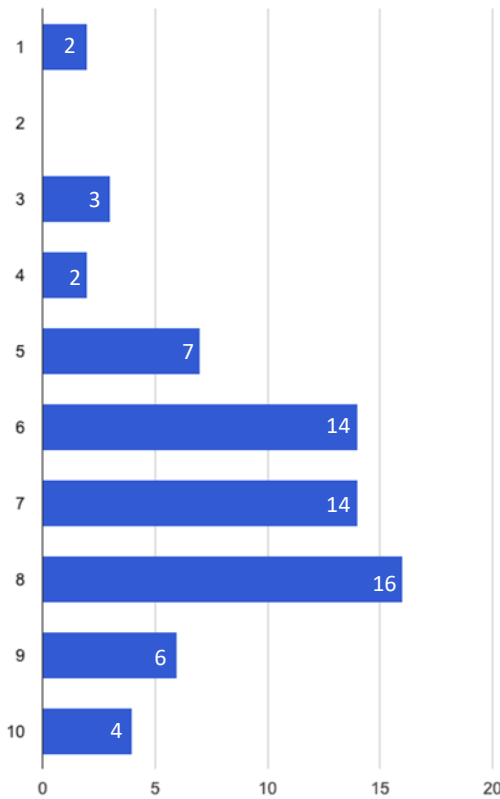
Mode 6

If you experienced in-person education (such as noon conference, resident report, didactics), rank your satisfaction with the educational quality of in-person education on a scale of 1 to 10 .



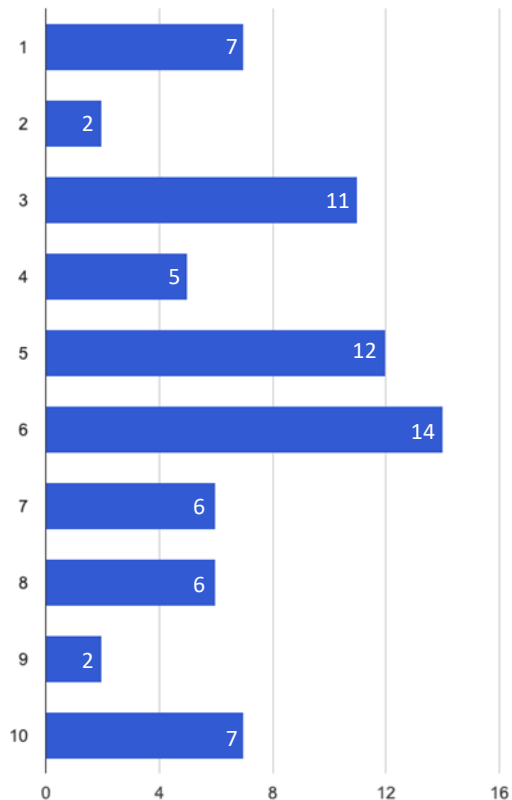
The mean satisfaction with the quality of education (on a scale of 1 to 10, for online virtual, in-person, and hybrid models were 6.7, 7.0, and 6.8 respectively.  
**Mode 8**

If you experienced hybrid education (i.e. combination of in-person and virtual), rank your satisfaction with the educational quality of hybrid education on a scale of 1 to 10.



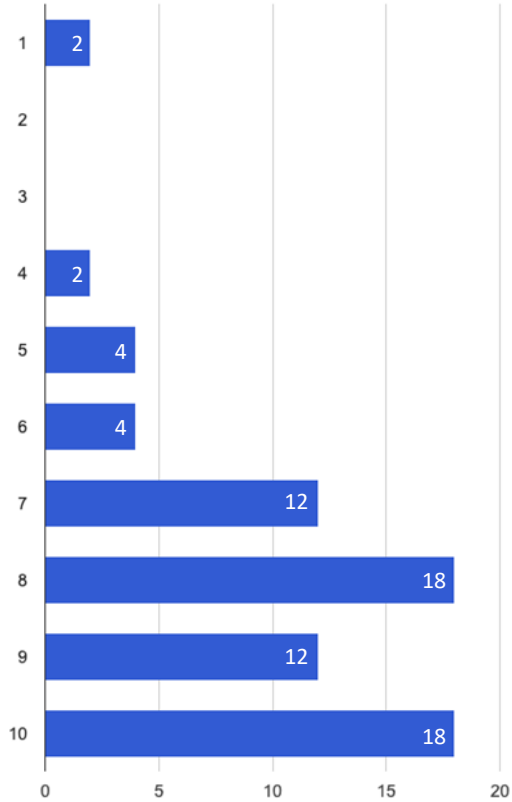
The mean satisfaction with the quality of education (on a scale of 1 to 10, for online virtual, in-person, and hybrid models were 6.7, 7.0, and 6.8 respectively.  
Mode 8

On a scale of 1 to 10 (1 being the lowest and 10 being the highest), rank your satisfaction with your ability to interact with the educator during virtual education.



The mean satisfaction for the ability to interact with educators (on a scale of 1 to 10, 10 being the highest) for online virtual vs in-person, hybrid was 6.01, 7.38, and 6.7 respectively.

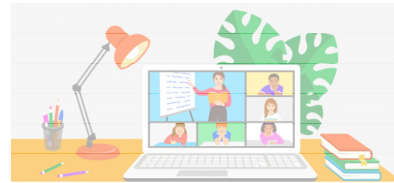
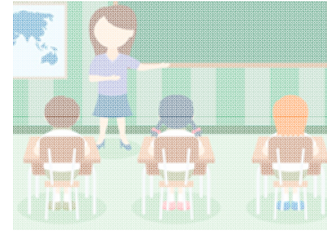
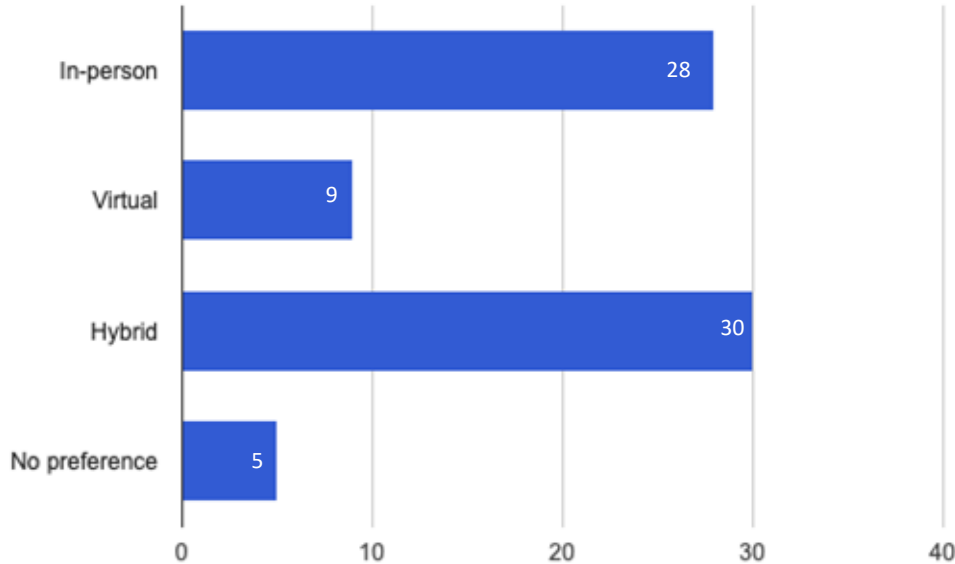
If you experienced in-person learning, rank your satisfaction on a scale of 1 to 10 (1 being the lowest and 10 being the highest) with your ability to interact with the educator during in-person learning.



The mean satisfaction for the ability to interact with educators (on a scale of 1 to 10, 10 being the highest) for online virtual vs in-person, hybrid was 6.01, 7.38, and 6.7 respectively.

Mode 8

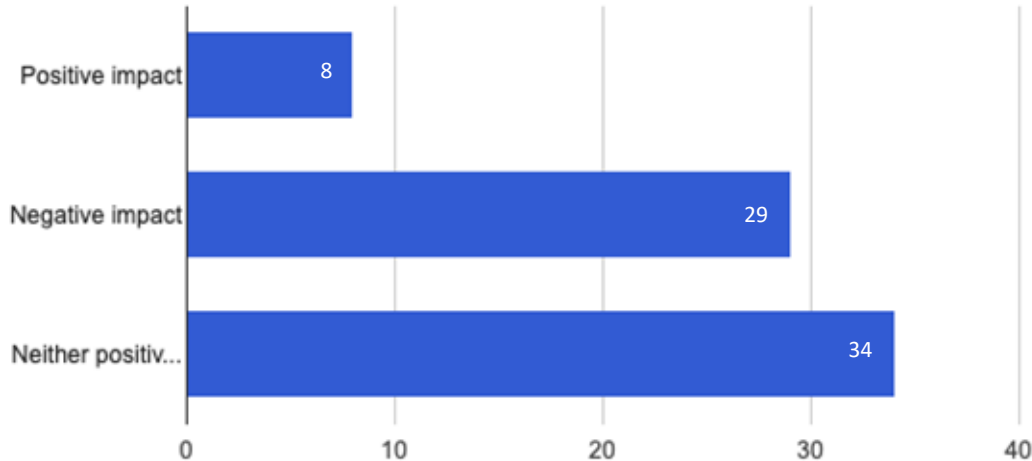
# If you experienced both in-person and virtual education, what is your preference?



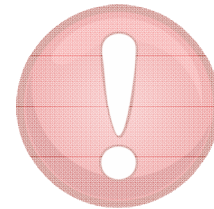
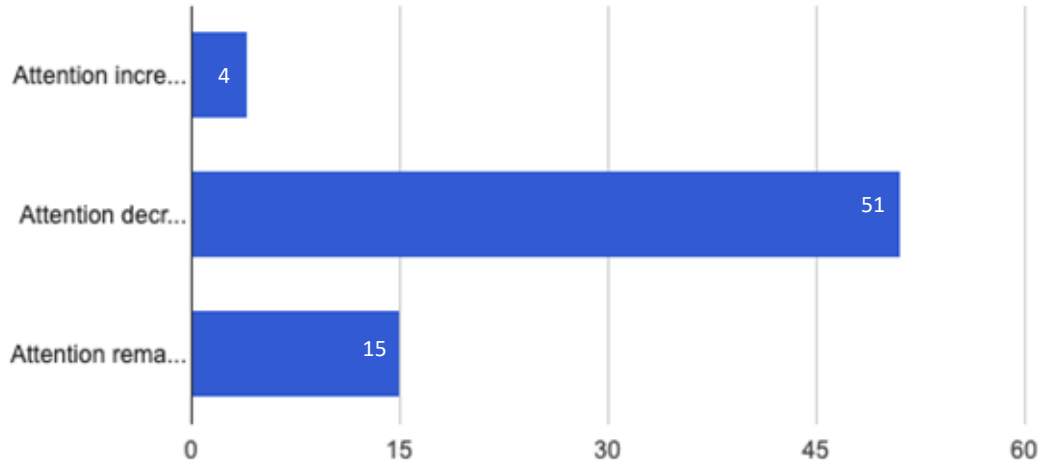
30 (41.7%) resident physicians preferred hybrid model of learning, 28 (38.9%) preferred in-person, 9 (12.5%) preferred virtual, while 5 (6.9%) had no preference.



If you experienced both in-person and virtual education, did shifting to primarily virtual education during the COVID-19 pandemic impact your learning?

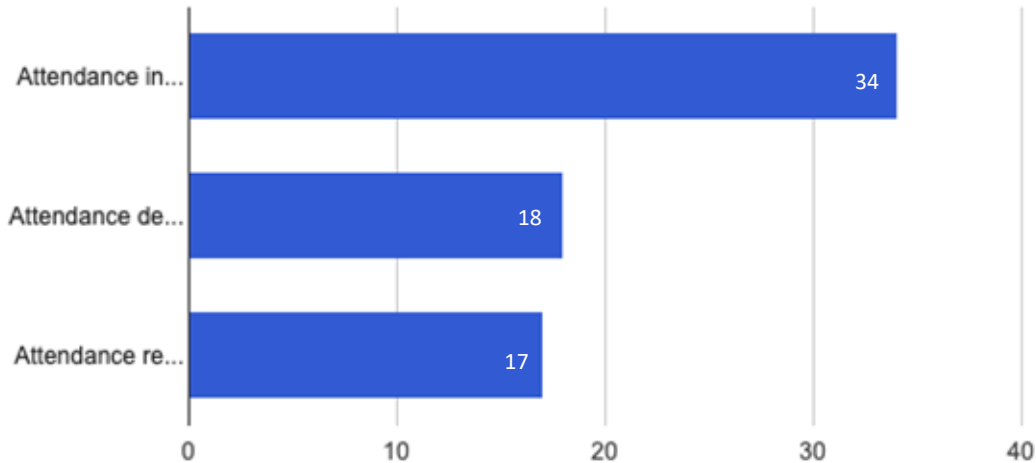


If you experienced both in-person and virtual education, how did shifting to primarily virtual education during the COVID-19 pandemic affect your ability to maintain attention during the length of the educational session?



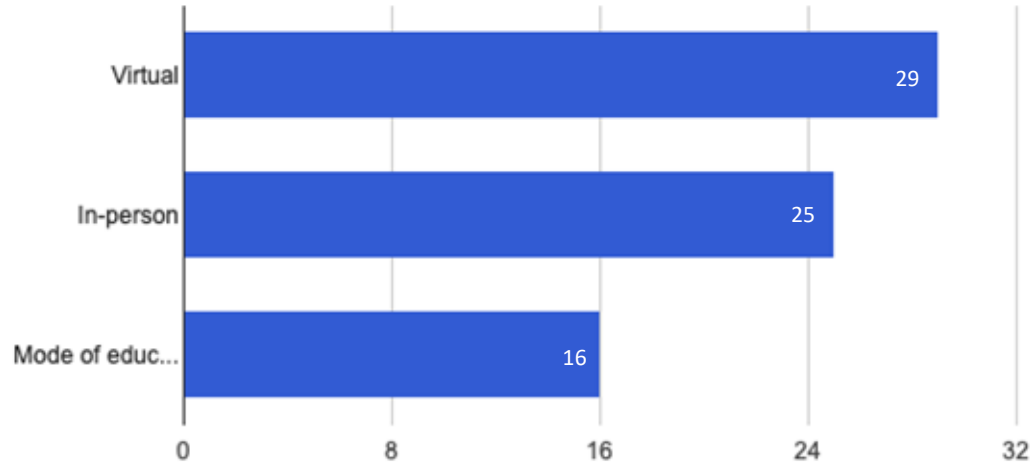
Regarding attention span during virtual education, 4 (5.7%) reported increased attention, 51 (72.9%) reported decreased attention, while 15 (21.4%) reported same attention span. Mean distraction ranking was 7 (on a scale of 1 to 10) for the virtual learning model.

# If you experienced both in-person and virtual education, how did shifting to primarily virtual education during the COVID-19 pandemic affect your attendance?

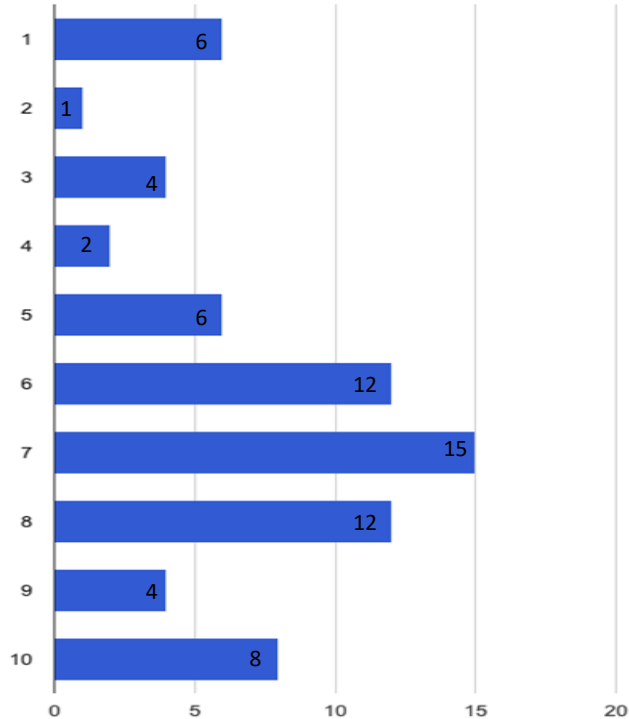


Regarding attendance during virtual education, 34 (49.3%) reported increased attendance, 18 (26.1%) reported decreased attendance, while 17 (24.6%) participants reported that their attendance remained the same.

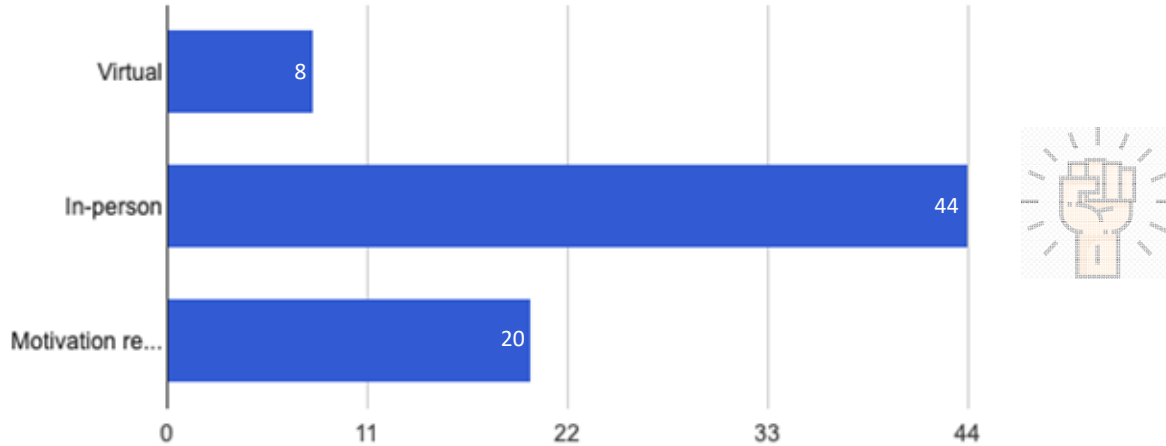
# In your opinion, which method has increased your efficiency?



# On a scale of 1 to 10 (1 being the lowest and 10 being the highest), how distracted do you feel during a virtual education session?

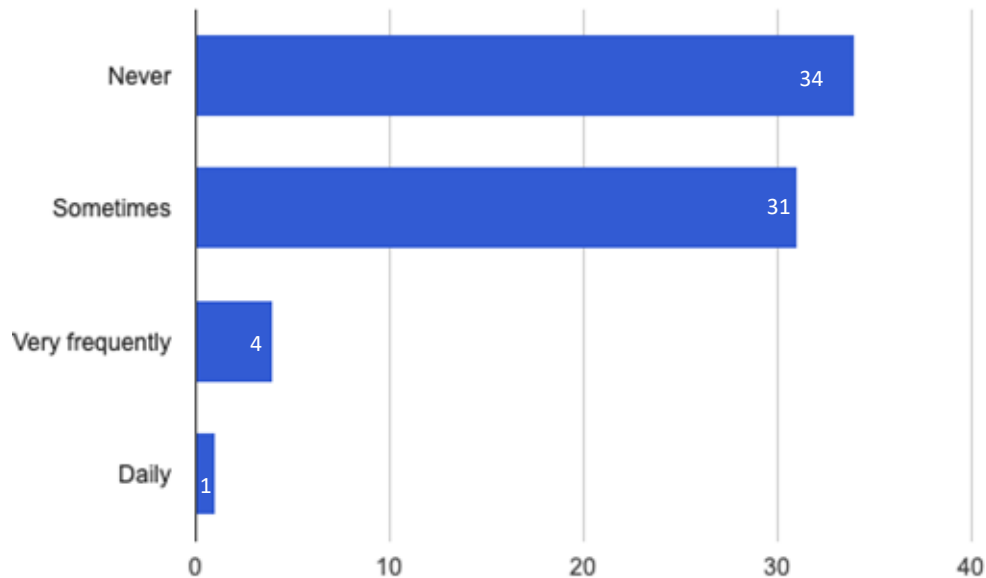


# Which method gives you more motivation?



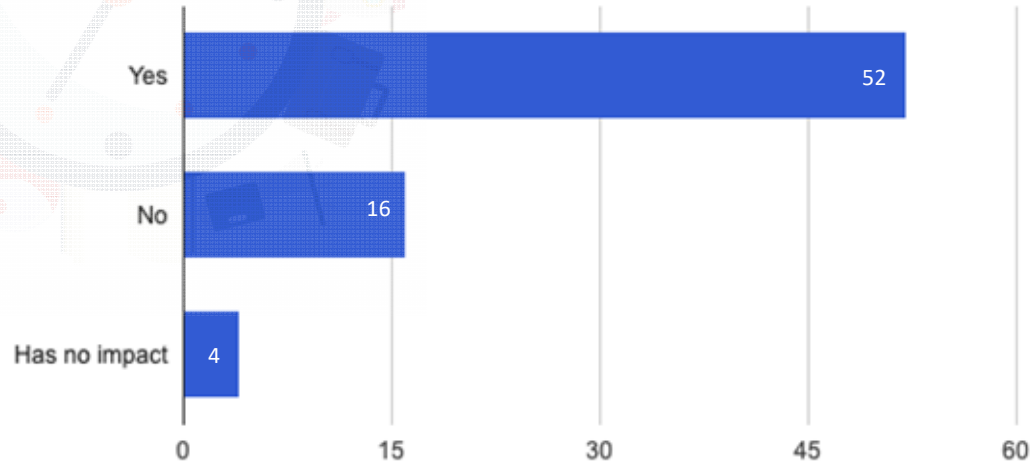
44 (61.1%) resident physicians reported higher motivation for in-person learning, 8 (11.1%) reported higher motivation for virtual learning, while 20 (27.8 %) reported their motivation remains the same.

# How often have you experienced internet connection problems resulting in missed lessons?



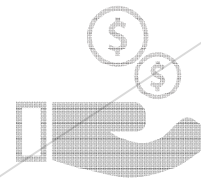
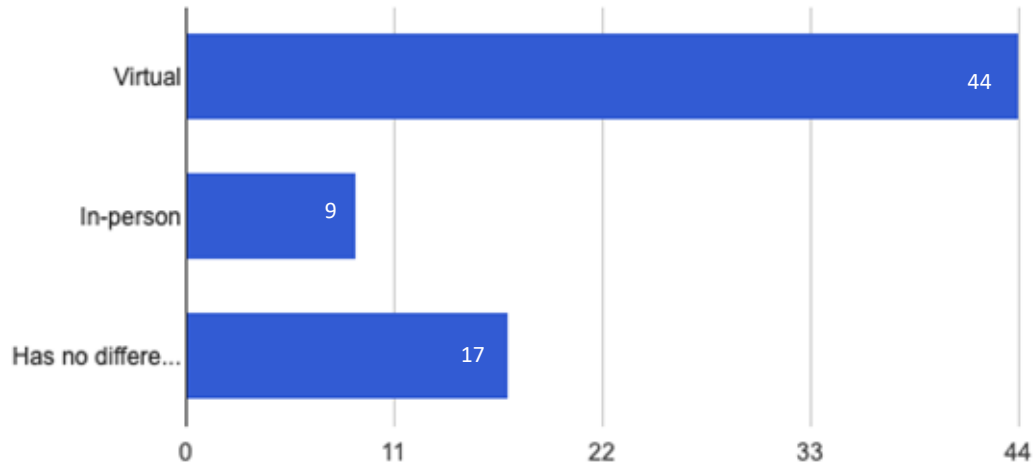
31 (44.3%) resident physicians reported occasional internet connectivity issues leading to missed lessons during virtual learning..

# Do you think virtual learning is associated with better time management?

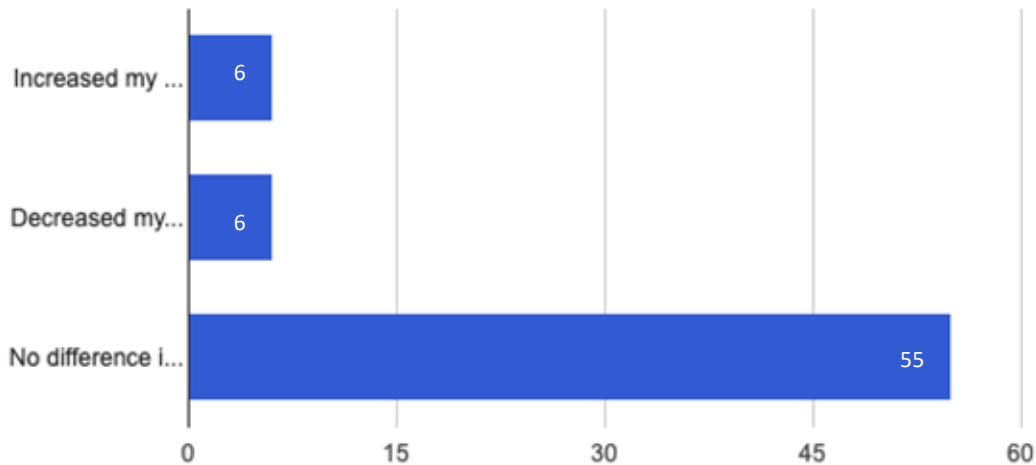




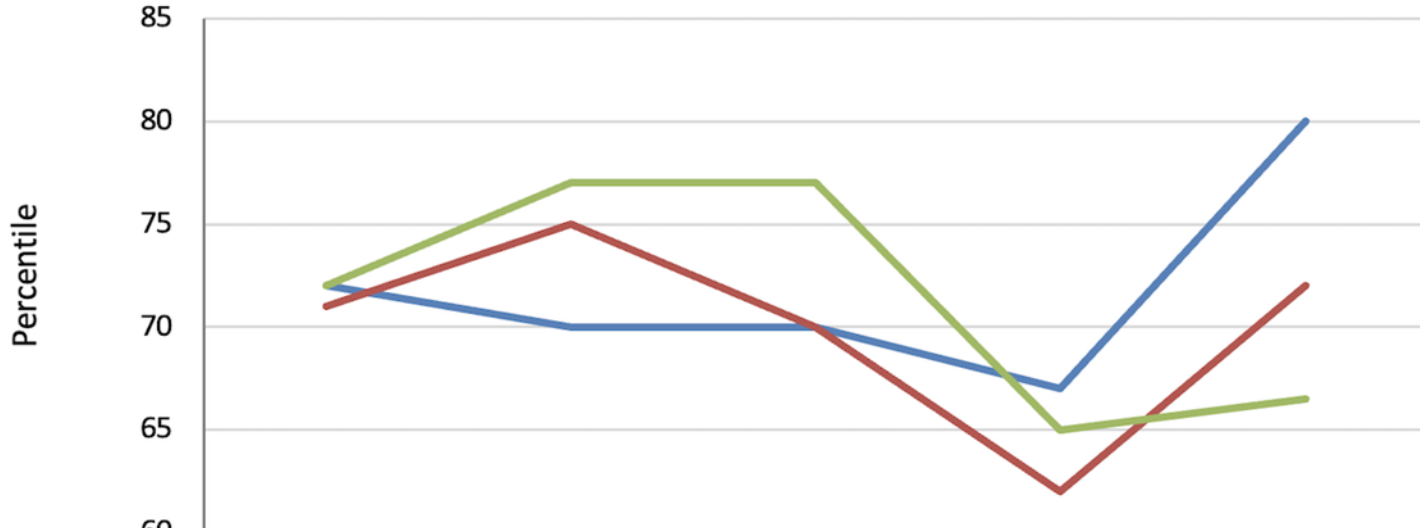
# In your opinion, which method is more cost effective?



# How did virtual teaching affect your ITE scores?

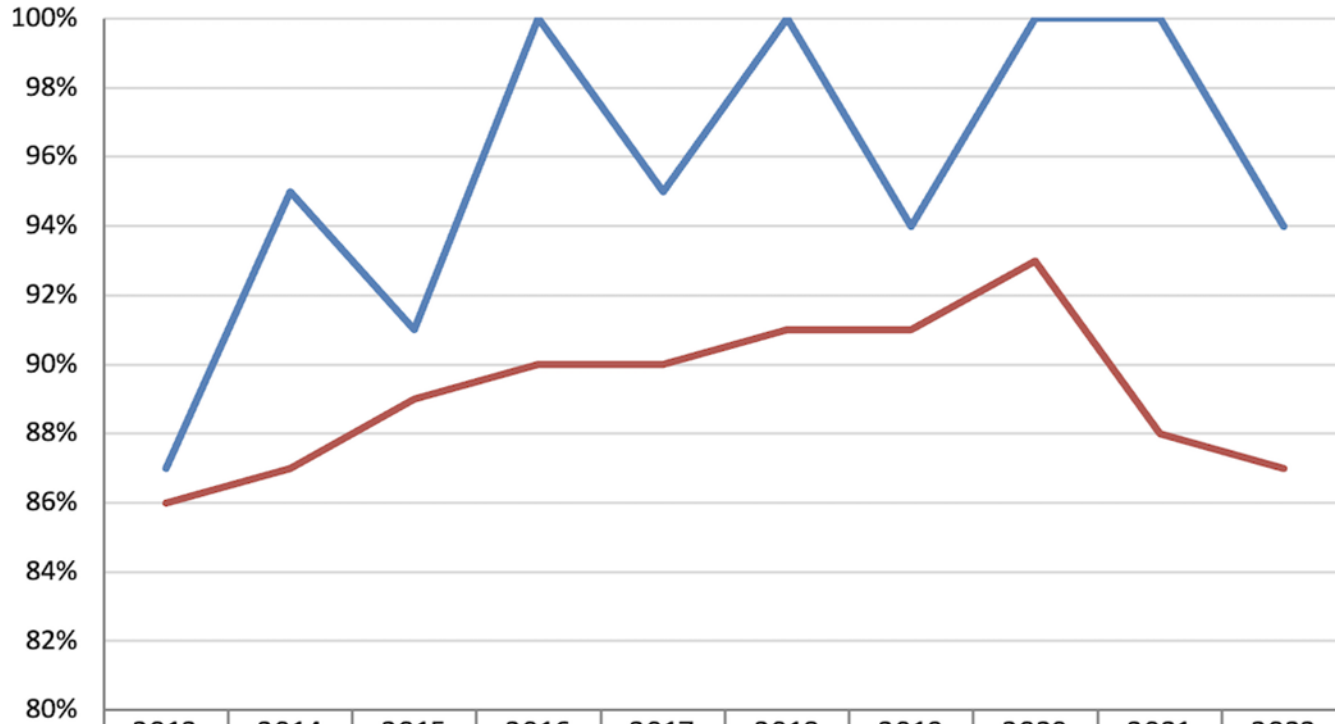


## Average ITE Score (percentile) of UMKC IM Trainees, 2018-2022



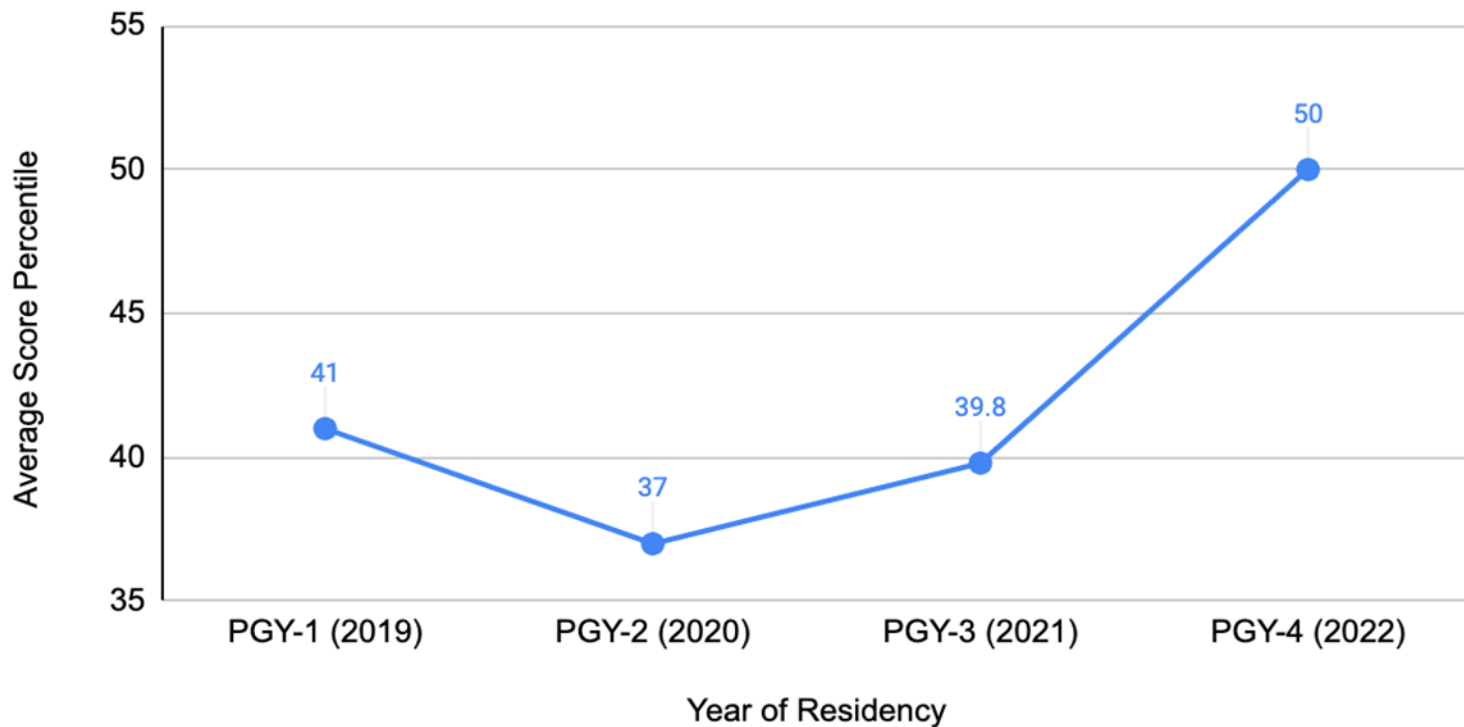
	2018	2019	2020	2021	2022
PGY-1	72	70	70	67	80
PGY-2	71	75	70	62	72
PGY-3	72	77	77	65	66.5

### IM board pass rate

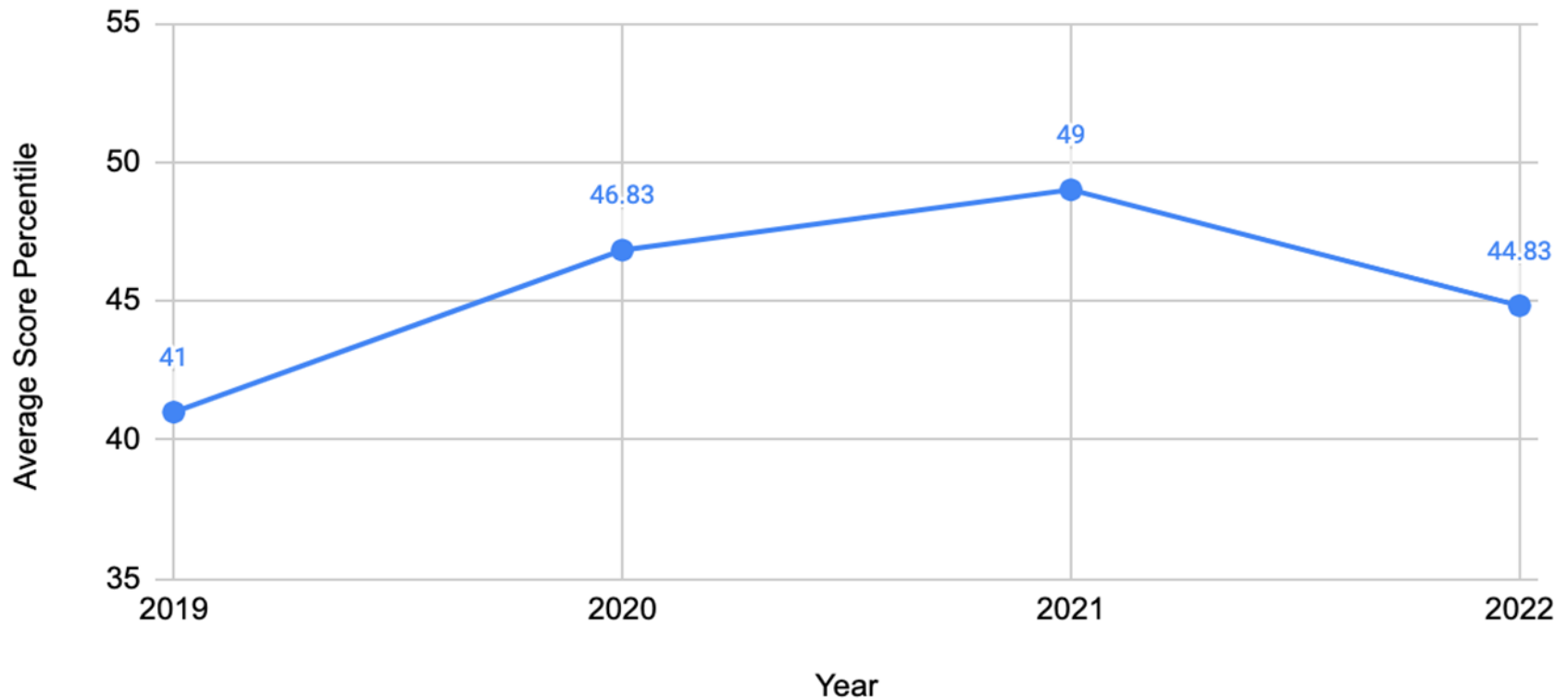


	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
— UMKC	87%	95%	91%	100%	95%	100%	94%	100%	100%	94%
— National	86%	87%	89%	90%	90%	91%	91%	93%	88%	87%

# Average ITE Score Percentile of Med-Peds 2022 Resident Physician Class



# Average ITE Score Percentile of the Med-Peds Intern Class





# Discussion and Literature Review



# Literature Review highlights (Medical Students)

- Kala et al. revealed that 65.5% of medical students preferred hybrid teaching moving forward.
- Johansen et al. emphasize the importance of in-person elements for fostering social interaction and clinical exposure while virtual education allows students more independent study time and thus a more efficient learning process.
- Dost et al. found the majority of medical students felt less engaged with virtual learning.
- Tabatabaiechehr et al. demonstrated that less than half of medical students were satisfied with completely virtual learning.
- In Jhajj et al., 74% of students reported a decrease in the quality of their medical education. This study attributes these results to a reported worsening mental health of their students during the COVID-19 pandemic, and the lack of preparedness for schools to transition to virtual learning as quickly as they did.
- Arain et al., only 35% of medical students reported satisfaction with professor availability.
- Rajab et al., 41.8% of medical students had no experience with online learning prior to the pandemic.
- Gheshlagh et al., 18% of medical students reported having a lack of motivation when it came to virtual learning.
- Mutalib et al., internet issues (19%) and low interaction between learners and instructors (19%) were the most frequently reported concerns with online learning by medical students.
- Hanson et al. revealed that students who completed their pediatric clerkship during the COVID-19 pandemic were 3.77 times more likely to fail the NBME shelf exam.
- Kronenfeld et al. report that there was no difference in medical students' performance on the surgery NBME shelf exam prior vs during the COVID-19 pandemic.
- Unger et al. states that on the family medicine clerkship, student's score did not vary whether they received virtual or in-person teaching.
- To our knowledge, there have been no studies done so far on the effects virtual learning and COVID-19 on STEP 1 pass rates and STEP 2 scores.



# Literature Review Highlights (Resident Physicians)

- ➔ In Tsyurulnik et al., 75% reported that they missed social interactions with their colleagues and would prefer for < 20% of their didactics to be virtual.
- Tsyurulnik et al., a significant percentage of resident physicians were able to pay more undivided attention when didactics were online.
- Nozari et al. state that 72% of resident physicians were less engaged during virtual didactics when compared to in-person teaching.
- Tsyurulnik et al. and Nozari et al. where more than half of residents stated they were more likely to attend virtual didactics.
- Tsyurulnik explains that this unexpected increase might be attributed to the flexibility afforded by virtual learning, enabling participants to engage regardless of geographical constraints which led to more resident physicians (77%) reporting that they would attend virtual didactics even when on vacation or elective blocks.
- Smith et al. report that resident physicians had strong concerns with the loss of hands-on experience with clinical skills that came with virtual learning.
- Rao et al. state that a drop in ITE scores did occur for pediatric residents who entered residency during the COVID-19 pandemic, regardless of the change in clinical encounters.
- Ngo et al. state that when comparing 14 pediatric subspecialties, 3 of them saw statistically significant decreases in subspecialty in-training examination scores (SITE), 2 sub-specialties showed increases in SITE scores, and 2 showed decreases in SITE passing rates.

# Conclusion

The COVID-19 pandemic led to significant and necessary modifications of medical education in both patient care and non-patient care settings. Our study suggests that the hybrid model of education is the preferable model for medical students and resident physician. Our study further highlights the need for additional curriculum modifications to increase learners comfort level for learning in telehealth encounters and virtual education settings.

Interactive Virtual/hybrid learning for example incorporating polleverywhere, audience response activities, and simulation-based learning may further enhance hybrid model of learning as reported by park et al.

One of the limitations of this study was that it is based on one University center. Multicenter studies will further highlight the impact of COVID-19 and virtual education on medical education.

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## References

The background features abstract, overlapping geometric shapes in various shades of green, ranging from light lime to dark forest green. These shapes are primarily located on the left and right sides of the frame, leaving a large white central area. The shapes are layered, creating a sense of depth and movement.

Thank You!