# Online Learning in Pediatrics During COVID-19 Pandemic: Medical Students' Experiences, Perceived Benefits and Barriers*

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## ABSTRACT

**Objective**: To determine the experiences, perceived benefits and barriers of online learning in Pediatrics of the medical students during the COVID-19 pandemic
**Design**: Cross-sectional descriptive study
**Setting**: Far Eastern University- Dr. Nicanor Reyes Medical Foundation School of Medicine
**Participants**: Second year to fourth year medical students
**Main outcome measures**: Experiences, perceived benefits and barriers of online learning during the COVID-19 pandemic
**Results**: Two hundred fifty seven medical students were included with a response rate of 68%. Their mean age was 24.8 years. 71.2% were female, 47.9% were third year, 46.3% were second year, and 5.8% were fourth year medical students. 98.5% came from the National Capital Region. 79.8% used mobile data. 77.8% of the students (n= 200) did not find online learning useful for their assessment preparation in clinical skills. For asynchronous activities, students considered asynchronous activities such as video links (n= 181, 70.4%) useful for their learning. Synchronous activities such the use of power point slides (n= 228, 88.7%), small group discussion for history taking, physical examination, diagnosis, and management (n= 237, 92.2%), and scientific conferences (n= 217, 84.4%) were most useful in learning. 70% found online learning to be interactive. The cost of gadget and internet subscription were not extra burden for most students during the pandemic (n = 198, 77%). Although they found synchronous lectures lengthy (n=153, 59.5%) and online learning lacking in student feedback (n=168, 65.4%), they gave them more time to study (n= 175, 68.1%) and to engage in other activities or hobbies (n=183, 71.2%) from time saved from travel. Students were divided as to whether online learning developed or improved their resilience during a crisis like COVID-19 pandemic or not (n= 133, 51.8% vs n=124, 48.2%, respectively). 95.7 % of students (n= 246) did not find online learning superior to traditional method and 85.6 % of the students (n =220) did not have high over-all satisfaction on online learning. The perceived benefits included provision of recorded lectures, which made it easy for them to go back and go through the lecture at their preferred time (92.2%), learning at their own pace (85.2%), and flexibility without place limitations (76.7%). The perceived barriers were distractions at home (94.2%), poor, interrupted, or slow internet connectivity (n=144, 56%) and time-constraint both on topics covered and requirements (80.5% and 79.4%, respectively).
**Conclusion**: Online learning in pediatrics develops the medical students' discipline for self-directed learning, but is not considered superior to traditional method. Video links are the most useful among the asynchronous activities while it is the small group discussion for synchronous one. It lacks student feedback. Students are divided as to whether online learning developed or improved their resilience during a crisis like COVID-19 pandemic or not. Students do not have a high over-all satisfaction in online learning. The perceived benefits include provision of recorded lectures, which make it easy for them to go back and go through the lecture at their preferred time, flexibility in learning at their own pace without place limitations, and engagement in other activities. Barriers include internet connectivity concerns, distractions at home and time-constraints on topics and requirements.


**Key words**: COVID-19 pandemic, online learning

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The COVID-19 pandemic had caused school closure resulting to over 1.2 billion students being out of the classroom all across the world. The delivery of medical education, which has relied mainly on face-to-face encounters, has changed dramatically that teaching and learning have to be undertaken remotely using different digital platforms. In pediatrics, both didactic education for the undergraduate students and clinical exposure in hospital settings for year level IV students were discontinued. Implementation of national lockdown measures to prevent further spread of COVID-19 disease led to sudden transition from traditional to online method of learning. Online medical education during COVID-19 pandemic is coupled with social distancing and the uncertainty of the course and outcome of COVID-19 pandemic. Online teaching has played a key role in medical education over the years as part of blended learning. But during this pandemic, exclusive online learning replaced the traditional methods of teaching pediatrics. These include face to face didactic lectures, small group discussions, bedside teaching, history taking and in-person teaching of physical examination. Skills and patient care are equally important aspects that need to be addressed in online learning in pediatrics.

Students have reported varying experiences in online medical education during COVID-19 pandemic. Some had high over-all satisfaction and believed that it is superior to face to face instruction.[1,2] while others believed it was comparable to other traditional forms of teaching.[3] Students have different backgrounds in the use of different platforms of online learning. In a study by Muflih, et al, 241 (19.9%) of students were prepared for online learning.[2] Several studies that reported different students' perceived barriers consistently included IT constraints.[1,4,5,6] With 792 (65.5%) students experiencing inaccessibility to internet.[2] Other identified IT barriers were "too challenging eLearning materials" in 738 (61.1%) and limited technology experience in 909 (75.1%) in a study by Muflih, et al. of undergraduate medical and other courses' students.[2] Other key barriers, which affect online learning in medical education, include time constraints, and negative attitudes of students like lack of motivation in 694 students (57.4%).[2] Despite these barriers, benefits had been recognized by students like flexibility in time and place[1,5] and promotion of self-discipline and responsibility.[1] It also encouraged student-centeredness during this lockdown situation. The student had become self-directed learners and they learnt asynchronously at any time in a day.[7] Students also reported being comfortable to actively communicate with classmates and instructors online (n-757, 62.6%).[2]

Still, online learning must achieve the same goals as traditional learning to help students acquire knowledge, skills and attitude. How such a shift would impact the medical education need to be closely observed and monitored especially in its effectiveness on student learning. Online learning demonstrated several benefits in enhancing student's overall learning in medical education, but studies are scarce on students' perceived benefits in a specific area, like pediatrics. The same is true for perceived barriers and experiences on online learning in pediatrics. Insights of the students' experiences and perceived benefits and barriers must be explored to its full potential to benefit both the teacher and the student. These could guide the faculties in improving the recently introduced online curriculum in pediatrics course. Hence, this survey aims to determine the experiences, perceived barriers and benefits of medical students after one semester of online learning in pediatrics during COVID-19 pandemic.

## MATERIALS AND METHODS

The research is a descriptive cross-sectional study. An online survey was conducted using a self-administered, pilot-tested questionnaire. Simple random sampling of undergraduate medical students in Pediatrics III-A, III-B, and Year IV medical students/clinical clerks enrolled at FEU-NRMF School of Medicine in Academic Year 2020-2021 was done. Those with consent but with incomplete responses were withdrawn from the study.

### Sample Size

With a prevalence of 56.5% of medical students reporting use of technology tools as a barrier to online education by Rajab, et al. 2020, with a margin of error of 0.05 at 95% Confidence Interval, using estimation of population proportion and allowing for a response rate of 88.5% based on the study by Gormley (2009), sample size required was 422.

### Recruitment of Participants

The FEU-NRMF Medical Student Council was notified of the research study to announce to the

student body. General announcement was posted in the Medical Student Council Online Bulletin and HELPLINE/TELEGRAM of students per year level (Year level II to IV) as well as an email blast regarding the research study through the Chief Information Officer. A research assistant invited them to participate in the research by sending the information sheet, informed consent and questionnaire via email. The students answered the survey after completion of the requirements for the second semester for the second year and third year students.

Anonymity of the participants' data and responses was maintained by use of a code assignment. On the page prior to the questionnaire, the students provided consent through a required selection box. Demographic data gathered were age, sex, year level, internet use for profiling purposes only. The investigators developed a self-administered questionnaire to gather information on the medical students' demographic profile, experiences and perceived barriers and benefits of online medical education in pediatrics after review of related literature. The authors reviewed the questionnaire for face validity. Ten students eligible for the study participated in the pilot-testing of the questionnaire. Participants' responses were either Yes or No. The survey was created using Google Forms ® (Google LLC, Mountain View, CA), an online survey form. The survey took about 15 minutes. This was accessible for a two-week period. There was one follow-up e-mail reminder to the participants one week after. Those with consent, but with incomplete responses, were withdrawn from the study. No compensation was provided for their participation in the study.

### Data Management and Analysis

Data were entered in Microsoft ® Excel for Mac Ver 16.62. Baseline characteristics of the participants were presented as frequency and percentage for categorical variables (sex and year level, internet use) and mean and SD for continuous variable (age). Responses of participants were analyzed using frequency and percentage.

### Ethical Consideration

The study was conducted in compliance with the ethical guidelines in the Declaration of Helsinki (2013) and National Ethical Guidelines for Health and Health-Related Research V.2 (2013). FEU-IERC approved the protocol (No. 2021-0047). A research assistant recruited participants since they were vulnerable population in this study, being students of the investigators of this research in the following courses or programs: Basic Pediatrics, Pediatrics 3A and/or Pediatrics 3B or Clinical Clerkship.

### Risks

The risks in participating in the study was a possible breach in confidentiality of data and inconvenience in participating in the survey. These were mitigated by the use of unique respondent IDs, which provided anonymity of data. Data will be kept for 5 years from publication for the sole purposes stated in this study, then will be destroyed by the research assistant. The research assistant kept all coded data in a password-protected file.

*Conflict of Interest*: The authors are professors of the students who participated in the study. The authors did not have a role in participant recruitment. A third party research assistant provided the anonymized data to the investigators for analysis..

*Benefits*: There will be knowledge gained by the participants on the over-all perceived experiences, benefits, barriers to online medical education in Pediatrics.

*Community Considerations*: Results of the study will be published to inform others of the experiences, perceived benefits and barriers to online learning in medical education.

FEU-NRMF Research Center for Development will have publication rights for this study.

## RESULTS

Of the 257 respondents, majority were female, third year medical students. They had a mean age of 24.8 years. Most of them were in the National Capital Region (NCR) and Luzon areas during online education. The majority of the students used mobile data (Table 1).

### Experiences with Online Learning

Majority of students did not find online learning useful for their assessment preparation in clinical skills and considered video links for asynchronous activity useful in learning.

**Table 1**. Baseline characteristics of medical students in Pediatrics at FEU-Dr. Nicanor Reyes Medical Foundation during the School Year 2020- 2021 (N = 257)

| Characteristic | n (%) |
|---|---|
| Mean age in years | 24.8 |
| Sex | |
| Male | 74 (28.8) |
| Female | 183 (71.2) |
| Year level | |
| 2nd | 119 (46.3) |
| 3rd | 123 (47.9) |
| 4th | 15 (5.8) |
| Area of living | |
| NCR | 142 (55.3) |
| Luzon | 111 (43.2) |
| Visayas | 2 (0.8) |
| Mindanao | 2 (0.8) |
| Sources of internet Access | |
| I. Fixed-Line Internet | |
| IA. Wired | |
| DSL | 61 (23.7) |
| Fiber Optic | 90 (35.0) |
| Cable | 21 (8.2) |
| IB. Wireless Internet | |
| Broadband | 110 (42.8) |
| II. Portable Internet | |
| Device / stick | 3 (1.2) |
| Pocket Wi-Fi | 55 (21.4) |
| Internet SIM | 13 (5.1) |
| Mobile data | 205 (79.8) |

For synchronous activities, the use of power point slides, small group discussion for history taking, physical examination, diagnosis, and management, and scientific conferences were considered most useful in learning. Most of the students found online learning to be interactive. The costs of gadget and internet subscription were not extra burdens for most students during the pandemic. Although majority found synchronous lectures lengthy and online learning lacking in student feedback, the reduced and saved time from travel gave the students more time to study and to engage in other activities or hobbies. Students were divided as to whether online learning developed or improved their resilience during a crisis, like COVID-19 pandemic or not. Most students did not find online learning superior to traditional method with majority of them not having high over-all satisfaction on online learning (Table 2).

## Perceived Benefits of Online Learning

Majority of students perceived most of the benefits of online learning agreeing that recorded lectures made it easy for them to go back and go through the lecture at their preferred time. Furthermore, they learned at their own pace and considered online learning to provide flexibility without place limitations (Table 3).

**Table 2.** Experiences with Online Learning in Pediatrics of medical students at FEU-Dr. Nicanor Reyes Medical Foundation during the School Year 2020- 2021

| Statements on Experiences with Online Learning | Yes % (#) | No % (#) |
|---|---|---|
| 1. I find online learning useful for my assessment preparation in clinical skills. | 22.2% (57) | 77.8% (200) |
| 2. I find video links for asynchronous activity useful in my learning. | 70.4% (181) | 29.6% (76) |
| 3. I find synchronous lecture with use of power point slides useful in my learning. | 88.7% (228) | 11.3% (29) |
| 4. I find synchronous small group discussions for history taking, physical examination, diagnosis and management useful in my learning. | 92.2% (237) | 7.8% (20) |
| 5. I find participation in scientific conferences (bi-weekly case management/ perinatology/mortality) useful in my learning. | 84.4% (217) | 15.6% (40) |
| 6. Online teaching is interactive via chat box/small group discussions. | 70.0% (180) | 30.0% (77) |
| 7. Cost of gadget and internet subscription/mobile data fees are extra burden for me during this pandemic. | 77.0% (198) | 23.0% (59) |
| 8. There is lack of student feedback. | 65.4% (168) | 34.6% (89) |
| 9. The synchronous lectures are lengthy. | 59.5% (153) | 40.5% (104) |
| 10. Time saved from travel and preparation to go to school during face-to-face learning gives me more time to study. | 68.1% (175) | 31.9% (82) |
| 11. Time saved to go to school during face-to-face learning gives me more time to engage in other activities/hobbies. | 71.2% (183) | 28.8% (74) |
| 12. Online learning develops/improves my resilience during a crisis or difficult time (e.g., Covid-19 Pandemic). | 51.8% (133) | 48.2% (124) |
| 13. Online learning is superior to traditional method | 4.3% (11) | 95.7% (246) |
| 14. My over-all satisfaction on online learning is high. | 14.4% (37) | 85.6% (220) |

### Perceived Barriers of Online Learning

Majority of medical students were confident in using online learning platforms or media in general. Although the majority of students had satisfactory access to a computer, laptop, iPad, or similar gadget for use in online learning, most students encountered distractions at home. Majority of students perceived poor, interrupted, or slow internet connectivity as a barrier and a also perceived time-constraint on topics covered and requirements as barriers (Table 4).

## DISCUSSION

### Experiences with Online Learning

The COVID-19 pandemic caused a sudden shift in undergraduate medical education delivery from the traditional classroom-based learning to online method. The FEU- Dr. Nicanor Reyes Medical Foundation School of Medicine transitioned to blended learning during the School Year 2019 to 2020 then adapted purely online learning during the School Year 2020 to 2021. Online learning in pediatrics for medical students includes synchronous and asynchronous activities. Synchronous activities include lectures, small group discussions for history taking, physical examination, diagnosis and management, question and answer sessions, project presentations and discussion, and post-examination discussion. Asynchronous activities include recorded lectures, video links, group projects, assigned readings, individual manual for case diagnosis and management, and personal reflections.

Current study shows that the majority of medical students did not find online learning useful for their assessment preparation in clinical skills. This is consistent with the study by Dost, et al., where most medical students felt they cannot learn practical clinical skills through online learning.[5] With this perception, online learning cannot replace bedside teaching, which is a fundamental component of clinical training and an essential tool in medical education. Students perceived bedside teaching as the most effective way of learning clinical skills.[8] Prior to COVID-19 pandemic, medical students in pediatrics had exposure to bedside teaching and ward work. This experience exposed students to real patients and provided them direct experiences and patient encounters in learning under the supervision of faculty clinicians.

**Table 3.** Perceived benefits of Online learning in Pediatrics of medical students at FEU-Dr. Nicanor Reyes Medical Foundation during the School Year 2020- 2021.

| Statements on Perceived Benefits of Online Learning | Yes % (#) | No % (#) |
|---|---|---|
| 1. I learn at my own pace. | 85.2% (219) | 14.8% (38) |
| 2. Online learning encourages student engagement. | 31.9% (82) | 68.1% (175) |
| 3. Online learning provides flexibility without place limitations. | 76.7% (197) | 23.3% (60) |
| 4. Online learning provides flexibility without time limitations. | 61.9% (159) | 38.1% (98) |
| 5. Online teaching develops in me discipline and responsibility for self-directed learning. | 66.5% (171) | 33.5% (86) |
| 6. Recorded lectures make it easy for us to go back and go through the lecture at our preferred time. | 92.2% (237) | 7.8% (20) |
| 7. There is a quick response of faculty/mentor/trainer to questions or clarifications. | 71.6% (184) | 28.4% (73) |

**Table 4.** Perceived barriers of Online Learning in Pediatrics of medical students at FEU-Dr. Nicanor Reyes Medical Foundation during the School Year 2020- 2021.

| Statements on Perceived Barriers of Online Learning | Yes % (#) | No % (#) |
|---|---|---|
| 1. I am confident in using online learning platforms/media in general. | 58.0% (149) | 42.0% (108) |
| 2. I have satisfactory access to a computer/laptop/iPad or similar gadget for use. | 91.4% (235) | 8.6% (22) |
| 3. I have poor/interrupted/slow internet connectivity/access. | 56.0% (144) | 44.0% (113) |
| 4. I encounter home distractions. | 94.2% (242) | 5.8% (15) |
| 5. There is time-constraint on topics covered. | 80.5% (207) | 19.5% (50) |
| 6. There is time constraint on requirements. | 79.4% (204) | 20.6% (53) |

Students considered video links for asynchronous activity useful in learning. Substantial and quality videos are central and critical to the student online learning experience. These can be viewed repeatedly at their preferred time.[13,14] In the context of medical education, watching videos was found to be beneficial for gaining skills, changing attitudes, encouraging cognitive learning, and retaining knowledge.[15] It has also been shown in a systematic review that video-based learning saw improvements in teaching methods and learning outcomes.[16]

For synchronous activities, the use of power point slides, small group discussion for history taking, physical examination, diagnosis and management, and scientific conferences were considered most useful in learning. In the current study, medical students found online learning to be interactive, consistent with the study by Dost, et al. The costs of gadget and internet subscription were not extra burdens for most students during the pandemic. This can be attributed to FEU-NRMF being a private, non-profit institution.

Although they found synchronous lectures lengthy and online learning lacking in student feedback, the reduced and saved time from travel gave the students more time to study, and to engage in other activities or hobbies. The lack of student feedback reported by students can be attributed to limited implementation of certain teaching-learning methods like polls, question and answer sessions, and small group discussions in breakout rooms.

Students were divided as to whether online learning developed or improved their resilience during a crisis like COVID-19 pandemic or not. The study was conducted when online learning was introduced abruptly following the declaration of COVID-19 pandemic. There are other factors that could have affected their resilience, but these were not included in this study.

Studies showed varying perception of students on the superiority of online learning over traditional learning. This current study shows medical students, similar to the students in the United Kingdom, felt that online teaching had not successfully replaced the clinical teaching they received via direct patient contact. In contrast, Rajab, et al. reported that medical students found online instruction as superior to face-to-face instruction.[1] Moreover, in another study by Gormley et al, students believed online learning was comparable with other traditional forms of teaching.[3]

Current study is consistent with several studies by Al-balas, et al. and Sindiani et al in the findings that most students did not have high over-all satisfaction in online learning.[9,10]

**Perceived Benefits of Online Learning**

Majority of students perceived most of the benefits of online learning and agreed that recorded lectures made it easy for them to go back and go through the lecture at their preferred time. Moreover, they learned at their own pace and considered online learning to provide flexibility without place limitations. These findings are similar to the studies by Rajab, et al. and Dost, et al. of medical students who reported flexibility as the greatest perceived benefits of online teaching platforms.[1,5] Furthermore, the study by Mukhtar, et al. also reported that students had become self-directed learners and learnt asynchronously at any time in a day.[7] These benefits may not apply to acquiring clinical skills, which medical students experience during classroom-based learning.

On the other hand, medical students disagreed with the statement "Online learning encourages student engagement" (Table 3), which is similar to the study by Dost, et al, where medical students from the United Kingdom did not find online teaching to be engaging, with limited opportunities to ask questions.[5] Online learning activities must be designed to enable student participation. Students must be encouraged to have an active role in learning.

**Perceived Barriers of Online Learning**

Medical students were either confident in using online learning platforms or media in general or not. Although the majority of the students had satisfactory access to a computer, laptop, iPad, or similar gadget for use in online learning, most students encountered distractions at homes. These barriers could be attributed to living conditions, like large families and lack of own room.

The students perceived poor, interrupted or slow internet connectivity as a barrier (Table 4). This finding is also consistently reported in several studies.[1,2,4,5,6] Internet disruptions can be caused by natural calamities or being in places with limited internet access. These are important perceived barriers, which may be experienced during examination.

Medical students also perceived time-constraint on topics covered and requirements as barriers similar to some studies.[11,17] On the contrary majority of

students in the study by Al-Balas, et al. did not report this as a barrier.

This is the first local study that explored the experiences and perceptions of medical students in online learning in Pediatrics during COVID-19 pandemic strengthened by a good response rate. The survey provides hypotheses on possible factors that bridge the gap in achieving learning outcomes.

Responses may have been limited to the evaluation of online teaching. This study did not address different teaching modalities that may apply to certain specific topics. Learning experiences and perceptions of online learning of the fourth year medical students came from limited participants. The survey was conducted on the first school year after the sudden, full implementation of online learning brought about by COVID-19 pandemic with technical difficulties and limited training of the faculty on online learning modalities. Furthermore, the responses of the medical students may have been based on and influenced by their most recent experiences, rather than the over-all experiences in online learning in Pediatrics.

The study informs educators of the positive and negative attributes of online learning in medical education, specifically in Pediatrics. The findings of this study will be integrated in delivering effective and efficient online learning methods for students, while considering the benefits of classroom-based learning for clinical skills' acquisition.

Studies on the impact of the different attributes of online learning on acquired clinical skills and other competencies among students from different medical schools are recommended. Studies should also focus on experiences and perceptions on online learning compared with blended learning as we transition from pandemic to endemic status.

In conclusion, online learning in pediatrics develops the medical students' discipline for self-directed learning, but is not considered superior to traditional method. Video links are the most useful among asynchronous activities while it is the small group discussion for synchronous activities. It lacks student feedback. Students are divided as to whether online learning developed or improved their resilience during a crisis like COVID-19 pandemic or not. Students do not have a high over-all satisfaction in online learning. The perceived benefits include provision of recorded lectures, which make it easy for them to go back and go through the lecture at their preferred time, flexibility in learning at their own pace without place limitations, and engagement in other activities. Barriers include internet connectivity concerns, distractions at home and time-constraints on topics and requirements.

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