Evaluation of the California Institute of Technology (Caltech)
Global Relay of Observatories Watching Transients Happen (GROWTH)
Partnership for International Research and Education (PIRE)
2020 Astronomy School

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Response statistics

- 81 out of 82 participants completed the survey for a 99% response rate.
- All open-ended questions were required and have 81 responses each except for one question which was optional and is noted in the report.

Respondents' perceptions of the GROWTH Astronomy School's influence on skills and abilities

	Strongly disagree		Disagree		Neither disagree/agree		Agree		Strongly agree		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
The Astronomy School increased my overall knowledge of multiwavelength follow-up observations of transient events.	0	%	0	%	0	%	26	32%	55	68%	81
The Astronomy School increased my ability to use practical tools for multiwavelength follow-up observations to transient events.	0	%	0	%	1	1%	30	37%	50	62%	81
The Astronomy School expanded my knowledge in my research area.	0	%	2	2%	7	9%	39	48%	33	41%	81
The Astronomy School increased my knowledge of new tools that will enable me to achieve my research goals.	0	%	1	1%	6	7%	23	28%	51	63%	81
The Astronomy School increased my interest in a new area of observational astronomy.	0	%	0	%	18	22%	27	33%	36	44%	81

Note: Darker shades of blue indicate higher counts of respondents who selected that rating. This note applies to all similar tables in the report.

Goal for attending GROWTH Astronomy School

Response
I am working on a project to identify transients in VLASS and FIRST, so attending the GROWTH school helped learn more about the different techniques.
I was aim to attend the GROWTH Astronomy School was to learn data analysis tool and techniques and explore new field of research, the Multi-Messenger Astronomy. Thanks GROWTH TEAM for the wonderful lectures and hosting a great virtual school.
To acquire hands-on practical experience of data analysis in multiwavelength follow-up observations.
Learning how to use new tools for data reduction
Learning about multi-wavelength follow-up techniques for observing transients.
To develop my skills for transient astronomy
Learning new skills relevent to my research
To learn more about transients and how to carry out transient astronomy research.
I wanted to expand my knowledge in time domain astronomy and pythonic tools. Apart from this, I wanted to know more about spectroscopy and imaging since I have not worked much on them.
I wanted to learn about astronomy of transient events across the electromagnetic spectrum, and to learn the practical techniques involved in the process of analyzing data.
Learn more about multi-wavelength tracking observations of transient events.
My main goal in attending the GROWTH Astronomy School was to get to know about the multi-wavelength study and analysis of transients.
I have been doing astronomy for quite a time and needed some upfront interaction with experts to interact and work accordingly. As I am still an undergraduate I got to work with senior students, graduates, post-docs, and even professors. I have gained a set of new skills in just 5 days and I am looking forward to discover more new things.
My main goal was to learn how to reduce and deal with raw data, which the astronomy school have helped me greatly.
My goal for attending the school is to learn from a group of amazing astronomers from all over the world and gain new techniques that will become useful for research in the future, especially Python packages that are becoming widely used.
I expected to gain more tools to apply in my time-series research and more confidence in using them.
To learn about tools used in time domain astronomy and how to apply them to real data with the purpose of finding new transients.
To learn useful tools for my research
To learn more about time-domain observational astronomy and processing methods.
Broadening my horizons in astronomy research areas and learning about time domain astronomy.
To learn about the many disciplines that work together for transient identificaiton in transient astronomy
To improve my data analyses on time-domain astronomy

Goal for attending GROWTH Astronomy School (Cont.)

Response
I am working in variability using near IR data so my main goal was to learn about other wavelengths to improve my science.
To prepare me for my upcoming PhD studies which will explore SMC extended sources, such as Planetary nebulae and supernova remnants, with MeerKAT data. The supernova remnants are our current interest - situated around Be/X-ray binaries in the SMC, thus this multiwavelength approach to the school was really great. I got to interact with other early career researchers in similar fields - where I'm from we are very few!
To develop a better understanding of the tools available to me to undertake time domain astronomy
Getting a general sense of how multi-wavelength transients are detected and analysed
I wanted to learn new methods in multi messenger astronomy
To learn more details about the transient astronomy that I work in.
learning state-of-the-art techniques in a new research area.
acquire knowledge of multi wavelength get used to various python modules
I wanted to learn more about data reduction techniques used in time-domain astronomy, to better achieve my research goals.
Learn about multiwavelength astronomy - in particular techniques outside my main domain of study.
To learn about various techniques to grab, analyze and understand the transient science. As someone who is more into theoretical astrophysics, this was really helpful and full of information.
To learn new skills to help in observational and data analysis techniques for my work in multi-wavelength astronomy.
I wanted to expand my knowledge of data reduction techniques in transient astronomy.
To develop skills to apply in my astronomy career.
Reinforce the techniques I learned as an undergrad and learn about how professional research is conducted.
To gain more knowledge and practical skills in Multi_wavelength Astronomy
Just to see what goes on with transients
Get to know tools used by experienced people so that I could improve my toolset for my researches
I wanted to learn more data analysis techniques for all wavelengths.
I wanted to learn the tools used by astronomers for data analysis. I wanted to interact with researchers who work on different types of data. I wanted to learn astropy and other modules extensively used in astronomy
I wanted to learn new skills and new ways of tackling my research problems
Since I will be identifying transients via alert broker anomaly filters for follow-up, I wanted to learn additional techniques on many different observational skills.
To obtain new tools that could help me during mi thesis project, and my career. Also, to learn more about the physics of transients.

Goal for attending GROWTH Astronomy School (Cont.)

Response
Multiwavelength analysis
To learn about more methods used in astronomy for data analysis
To get a flavor of multi-wavelength astronomy and learn new techniques (python tools).
My main goal in attending the GROWTH Astronomy School was to obtain knowledge of practical processing techniques and inference into the steps required to process raw telescope data and produce science data. I also hoped to see 'best practice' methods for implementing these techniques. I am pleased to say that my goals were met!
Learn new techniques in my field of research and get in touch with subjects I didn't have the chance to learn before.
Get a general idea of how data analysis works in other wavelengths other than X-ray, which is my main field
To learn Python tools to analyze multiwavelength data for my research.
Increasing my knowledge in observation of transient events
I wanted to learn multi-wavelength observations of transient events.
My main goal was to learn more about X-ray and radio time-domain) astronomy, as I am less familiar with those wavelength regimes.
I wanted to learn more about time-domain astronomy because I am still a junior undergrad. I also really wanted to work with data from different telescopes and get to see how some of the telescopes operate.
To get a good introduction into the field of transients
To understand multi wavelength analysis methods and techniques.
To develop my understanding of transient astronomy and also to develop my skills of using observational data analysis tecniques.
To get familiar with all fields of Astronomy and tools used for data analysis
Learning new techniques, especially those relevant to gamma ray burst related studies.
My main goal was to understand the multivalent data reduction and analysis for different instruments as well as develop my computational skills.
Learning up-to-date ways of data reduction (this includes new Python packages that I didn't know they existed)
Providing a broader experience of time domain astronomy. Both for career prospects and for personal development.
Since my research is in the physics of compact object mergers, I wanted to understand more about the observational side, i.e. data acquisition and what kinds of limitations there are in the data because later, I will have to look at the data and understand what can and cannot be said about a particular event.
Learn how to analyse multiwavelength data for transient astronomy, especially x-ray and radio data.
Learning about multi wavelength data analysis techniques and Python coding
To gain expertise in multi-wavelength astronomy, interact with my peers and finally to get hands-on experience with data analysis.

Goal for attending GROWTH Astronomy School (Cont.)

Response
To expand my knowledge on the multi-wavelength aspect of transients
Improving the computational skills I gained as an undergrad in Python and using Astropy
To learn the newer techniques and also to get an overall idea of the methods employed in multiwavelength data analysis.
To learn multiwavelength data analysis of transient and their physics.
To learn new observational techniques on astronomy, such as photometry, spectrocopy, image subtraction, etc. in order to apply it in different moments of my career.
to get new skills to use for my research
To learn about data handling in multi-wavelength astronomy using python.
To learn tools that would help me have a better understanding of multi-wavelength observations of transient events
My major motivation to attend the GROWTH school was to fill gaps in my knowledge about observational astronomy. I have a particle physics background and hence having didactic lectures in observations is very helpful for me since I hope to work in the field of transients.
To learn more about achieving my science goals using coding. Learning more about observational astronomy.
I wanted to learn about the tools used to do EM-follow ups on GWs.
I am working in the field of gamma ray bursts which is a multi-wavelength phenomenon. So. my main goal was to learn multi-wavelength data analysis.
My main goal with the GROWTH school was to participate in an inspiring place for me to develop skills and acquire knowledge in data analysis, mainly across gravitational waves. I was hoping that it would improve my observational techniques and it will train me for time-domain science in a way I otherwise would not be able to do.

Most beneficial concepts, topics, or techniques learned at the GROWTH Astronomy School

Response
I believe was to deal with raw optical data and reduce it.
MCMC technique in radio astronomy
I really enjoyed Image Data Reduction. Flat Fielding also has lot of uses in Photography as well and the techniques learnt can be employed in a variety of fields.
spectroscopy
Observing run preparation; X-ray data analysis; Radio data analysis
Although all the topics were very interesting and well taught, (to me personally) spectroscopy, imaging, and data reduction techniques were the most beneficial. I had very little working knowledge in those topics before I attended the school and now I am confident enough to build upon the skills I got from the school in these topics.
Using Python to do transient astronomy analysis.
I never know about how image reduction procession runs, and how to subtract the background contribution from the target aperture etc. All lectures were amazing.
The GROWTH Astronomy School helped me in understanding the various techniques used to find transients, at multiple wavelengths. I also learned a lot of tips and tricks for using python effeciently.
Spectroscopy and light curve analysis were really important to learn. But I learnt so much about image reduction, subtraction and observing run preparation in the school.
MCMC module on radio lightcurve analysis
I think the most beneficial topic I've learned are X-ray and radio data analyses since I've not done researching in those ranges on the E&M spectrum. It's really cool how we can analyze the light curves and extract information about transients in all wavelengths.
For me, the observational preparation was a new and very amazing thing I learned here. Now I can remotely take data from a list of observatories with mutual consent and after practicing the modules of the school I can safely say that I can be a pro in it. XD
How to prepare an observation is probably something that I would not see in any other course. But also the spectroscopy lecture was extremely helpful
Spectroscopy
spectroscopy, light curve analysis were the most beneficial for me as they were easier to understand
The hands-on sessions were great and the ability to ask questions any time. The most beneficial for me was to learn how to program so many algorithms in python
How useful radio measurements are in order to break degeneracies and get a better value for H0.
Image reduction and subtraction techniques
Light curve analysis
Light curve analysis, and how to think about the peaks of the periodogram.
Image subtraction between reference image and science image, PSF photometry, calibration of spectra.

Most beneficial concepts, topics, or techniques learned at the GROWTH Astronomy School (Cont.)

Response
skills to perform python analysis on multi waveband data
Got an idea about all optical,X-ray and radio data analysis
Seeing a complete spectroscopic reduction all in python was very useful for me.
the hands on data reduction tutorials. In particular I found the radio astronomy session really helpful
All the optical wavelength - photometry, image subtraction, planning observation - was very useful as I have not seen the details of those before, and it is good to know where the unprocessed data / science results I often use in my analysis comes from.
The X-ray data analysis and image photometry/subtraction modules.
The pre-recorded lectures really helped to go through them before the sessions and come up with engaging questions. All the tutors were absolutely brilliant with the presentation and the hands-on sessions. The highlight of the school for me was the live observing session and then the data challenge that followed. Having learnt the skills and to put them into use right away helped me retain a lot of the knowledge I gained at this amazing school!
I really liked the sessions about image reduction and I absolutely loved the live observing session
The Lomb-Scargle algorithm as an alternative to the Fourier Transform when data points are uneven
Photometry and light curve analysis
I think finding the redshift from spectroscopy and using the emcee package more efficiently.
I think that now I have an idea abur all the wavelength and this is the key to improve our science in general. Specifically the way we learned how to work with the data in the python sessions was the key to apply what we learned in the lectures.
The spectroscopy module was extremely helpful, as I had never handled astronomical spectra before.
I learned a lot at the GROWTH Astronomy School! Some of the most useful techniques I learned was the Lomb-Scargle method and Markov Chain Monte Carlo.
Learning about analysis methods that aren't related to what I do. I loved learning X-ray/radio data analysis, even though I don't do them because now I feel like I can connect with researchers in other areas.
I was least familiar with X-ray astronomy so it was a good introduction and overview of the field with some great hands-on exercises.
Some of the python was useful, particularly astropy
I learned a lot from a lot of the sessions. The photometry and data reduction sessions were particularly beneficial.
The "observing run" module was the most helpful. I learned about many of the subtleties in observation planning.
Lightcurve analysis and image subtraction
Image analyses. Because I did not have experience with it previous to the school. Also learn a lot in how to use python-based tools for data analyses
Light curve analysis, which is the topic of my scientific initiation

Most beneficial concepts, topics, or techniques learned at the GROWTH Astronomy School (Cont.)

Response
Optical observations data analysis
I learned some basics of Xray astronomy, which I never knew before.
I very much enjoyed the Spectroscopy, Photometry and Image reducrtion/subtraction modules. I used to use other tools for image reduction/subtraction so learning about new ways definitely will help my PhD in future.
UV, Optical and IR Photometry
Light curve analysis and radio analysis.
Image subtraction and photometry.
Probably photometry
Light curve analysis, X-ray data analysis
Python based spectroscopic reduction and analysis
Across all topics, the python sessions and notebooks were extremely useful. I learned so many ways to improve my coding and how better to use python.
Virtual experience on Live Observing Run, was good to apply things we had learned to live data
1) LombScargle 2) Steps in image subtraction
The most beneficial concept was to be able to use data from all of these different types of telescopes. I enjoyed the observation run and that changed my life because for once I could see a transit happening in real time.
Lightcurve
The most beneficial technique was just the general use of Python.
I think python tools, and the fact that we can work through the jupyter notebooks during and after the school, were the most beneficial techniques for me
The most beneficial technique that I learnt was the practical steps in image reduction, which will be applicable across several wavelength ranges (each with their own quirks). This will allow me to reduce data and appreciate the limitations of catalog data.
Fitting the data and obtain the fitting parameters with its uncertainties using python programming, specifically MCMC
Data reduction can be done without Iraf
Mainly Spectroscopy and X-ray sessions. However, all of the python workshops were beneficial.
I think the module of observing run planning was most beneficial because it helps me understand why gathering data for a ToO event is so hard.

Most beneficial concepts, topics, or techniques learned at the GROWTH Astronomy School (Cont.)

Response
Light Curve Analysis
An overall introduction to different packages in Astropy was pretty useful
Honestly, all sessions were very well made and organized and I feel I have learned a lot from each one of them. I want to mainly mention the extra session with the observations with the telescopes. Also Chris Copperwheat, Dan Perley, Igor Andreoni, David Buckley and Robert Quimby sessions were very very amazing to watch and to learn with it.
I liked all the lectures and exercises a lot. Pertaining to my work and interests, I found the session on spectroscopy , photometry and Radio and Xray observations very helpful. I learned a lot of new things and new tools.
I think it was the photometry and spectroscopy modules, once I use it repeatedly on my research.
The observing prep session!
What x-ray data and x-ray data analysis is like.
Image reduction techniques and also Photometry and Spectroscopy
The optical reduction technique
The most beneficial topic for me was, regarding light curve analysis and also radio data analysis. Specially learning about the part in radio analysis where emcee is applied.
Image reduction and analysis using python.
Image reduction, subtraction and photometry.
About technicalities involved both in X-rays and optical observations
MCMC in the radio session with David Kaplan
Light curve analysis, Image reduction, Image subtraction and Photometry
optical photometry and spectroscopy data analysis.

How respondents will use their gained knowledge and experience in future research

Response
I work on exoplanets. Specifically transit method of detection which uses light curves. But I want to also use radial velocity method in the future which requires knowledge of spectroscopy. Thanks to the wide range of topics covered in the modules, I can use what I learnt from the spectroscopy module as a foundation when I start working on spectrum
I believe that know how to deal with data is essential for all astronomers, even those who decided to go for a more theoretical approach. Thus, I am sure that the knowledge I gained in the school will accompany me;
In my future research
I will certainly use what I have learnt in every single module fro the data reduction (in my specific case spectroscopy will be the one I will use the most)
With my interests in transients like SGRBs and FRBs, I will definitely be using what I've learned to study things like afterglow and counterparts which I have not done before.
I am sure what I learnt in this school would be very instructive during my research in Phd.
I am only a beginner in Astronomy so this was a huge learning curve for me. I couldn't comprehend some of the advanced approaches involved as I haven't learned the Maths behind the stuff yet. I hope to save the materials for later and do them again.
I have the basic skills and knowledge to use x-ray and radio data in analysis of transients.
It will be useful for my PhD research at University of Cape Town and South Africa Astronomy Observatory.
I will be able to analyse follow up observations for interesting transients I discover as part of my work
It's directly relevent for my PhD research
Currently I am looking for a PhD position in astrophysics, I did my masters degree and have done a dissertation work on Galactic Astronomy. All hand-on-sessions and lectures were new for me. I gained a lot of data analysis and reduction techniques and have to still dive in about these field. These techniques what I learning during wonderful school will be very beneficial in my future research if I would get an opportunity in the field of multi-messenger astrophysics.
As an undergraduate, I am still exploring stuff but surely skills learned are never wasted. Mostly my research would be oriented in Machine learning and Deep learning techniques in astronomy and some of the modules learned here can come in handy any time. Also, if I am supposed to teach things to someone I'll surely use these modules.
I study radio transients in my research and wish to expand the theme to multi-wavelength study of transients. This school has provided me a good amount of exposure to multi-wavelength transient astronomy.
It's hard to predict all the benefits of the GROWTH school in my future research. Much of what was covered during the school was new knowledge for me. Probably what I will use earlier among the things I learned will be the knowledge about photometry and spectroscopy, given that I'm working with data from a system of galaxies and will have to use these techniques to construct a numerical model of them. But all the python stuff and techniques like matching a catalogue with your data, extracting psf of an observation, to apply MCMC method, to perform an astrometric calibration, to apply the Lomb Scargle method and so on will surely be beneficial during my research on astrophysics.
It will be used here and there throughout the duration of my research, again particularly when I'm calculating many light curve features to identify anomalies

How respondents will use their gained knowledge and experience in future research (Cont.)

Response
Now I have a clearer idea about which wavelength help as a counterpart for the near IR data I have. Specifically, the spectroscopy part was specially interesting because I am working with microlensing events but juts using photometry, so if I start spectroscopy I can get mor information about the source and sometimes about the lenses, this can break the degeneracy and can help me to confirm some good candidates.
I am likely to use the techniques I have learned to further my ability to analyse light curves as part of my PhD research
I'm interested in researching transients, and it's helpful to have a broader understanding of observational features and methods in across all wavelengths
As someone who is currently working with active galaxies and involved in the upcoming LSST at the Vera Rubin Observatory, the skills I have learnt in the school are invaluable. And I also got to make some new acquaintances!
It allows me to better understand how to use flux measurements and be able to take/use/reduce data if needed at wavelengths previously unfamiliar to me - this will help a lot in my study of transients.
I can already see it benefiting me in my current analyses such as with the spectra reduction. This school is very beneficial for my future transient studies.
I am currently working on a project involving a new type of multi-object spectrograph. The skills I learned at GROWTH will definitely be useful for my research.
My future research will be across the EM spectrum from infrared to Gamma-rays, so I can definitely use all of the techniques learned.
I want to use these tools to interpret more signals than the ones that I currently use.
I am about to start my PhD in astronomical transients, so I suspect every part of this school will be useful at some point.
I hope to modify the python packages and modules presented in the workshop to reduce and analyze my own data.
I will have courses in these subjects and I think this school really helped for me deciding between observational astronomy and computational astronomy
In all data analysis
When I perform some analysis of not only my research area, but other wavelength area, my newly gained knowledge should be benefical.
this summer school made me certain that I will do my next project on observational transient astronomy. I am sure I will use some of the things I've learned directly in that project that I will start in a couple of months.
I've been introduced to many skills that I'll use in whichever research area I go into.
It will help me in my research work at my institute and also for my higher studies in the field.
I hope to work in multi-messenger physics and I think getting a hands-on experience with multi-wavelength data reduction and analysis will help me in my research work and also have a more rounded up approach to the problem at hand.
Probably in the near future, when large sky surveys will be online
In my next summer research project
they will be useful to work with gravitational wave data

How respondents will use their gained knowledge and experience in future research (Cont.)

Response
I can apply many of the computational methods I have learned that will come in handy with research
I will do a research project with ZTF data and this school has done a great job in providing a great introduction!
I will be using the statistical tools (MCMC) learned from Radio analysis module in my research field i.e., X-ray astronomy where it is not widely used, but fast gaining ground. I will also be using optical and radio techniques for multi-wavelength studies of XRBs and GRBs as future project.
they will be beneficial mostly in programming related stuff
I am a Gravitational Wave researcher. I will use this newly gained knowledge in studying EM counterparts of GW.
I hope to be able to use these techniques to work on gamma ray burst sightlines, which I have been interested in for quite a while.
Reducing and analyzing spectroscopic classification of AGN
I'm about to start my PhD on the observation of supernovae, so my new skills will greatly help in that.
I will apply image substraction to Meerlicht data, and try to use it for forced photometry. I also am looking forward to using th espectral index calculation from the radio module.
More educated guesses on possible observational conditions for transients
The new techniques I have learned will help me to analyse data more efficiently, which will help me increase my work output.
I can use the tools and techniques from this school to carry out multi-wavelength analysis of the sources of my interest.
I can start working on multiwavelength analysis for my research compared to just the radio I've been doing.
I definitely know that I love astronomy. Seeing the transit happening in real time and making observations made me realize why I want to do astronomy in the first place. Seeing the astronomers make the observations is exactly what I want to do.
I will be continuing my studies with a PhD, therefore I will be using some of the content that we have learnt during the school.
My newly gained knowledge will be of immediate benefit in my current research in the detection and classification of transient objects, as well as when I am collaborating with specialists on other wavelength ranges.
It will be very beneficial for Em counterpart study of GW events.
During my master thesis project, the new knowledge I gained will help me for a better understanding of the processes involved for getting photometric data. In the future, during my phd I will be able to work with confidence using photometric and spectroscopic data.
I don't know yet, but surely it will help me collaborate and communicate better with colleagues who do observation.
It will improve my data analyses skills.
Right now.

How respondents will use their gained knowledge and experience in future research (Cont.)

Response
I am in the process of gathering and processing x-ray data relevant to transients I am studying. So the x-ray skills and knowledge I learned at GROWTH will be useful straight away. A tutorial in MCMC is also useful and I will likely use this soon too, but not as soon as analysing x-ray data.
Multiwavelength analysis will help to understand the different aspects of gamma ray bursts in my future work.
Surely it will improve my skills in general knowledge within astronomy. Participating in this school was better than I expected. I have learned very much in very different fields that I was not so used to work with.
I feel like I will be more comfortable using python to address new facets of my research! Also I feel much more comfortable with preparing for an observing run.
I am still a master student and haven't completely decided on what topic I would want to work on for my PhD. I have a few options, but there are a few factors I will have to consider. This school helped me in gaining knowledge on various topics and no matter however briefly I worked on it, I now have a better idea on the topics that I really enjoy working on.
This workshop gave me a broad idea on the technical part of multi-wavelength follow-up which I can use to plan a rapid follow-up of interesting transient events in the future.
I currently work with GWs. I plan to explore multi-messenger astronomy in the future. So, the knowledge I have gained in this school will be very helpful then.
Since I plan on becoming an observational Astrophysicist interested in Cosmology, knowing about E.M. follow ups to transients like GWs will be something I need to probe distances in space
In my future internships and projects
I am X-ray astronomer working on Black hole binaries. I want to extend my current research to include radio, optical and UV data to get a holistic picture of the sources I am working on.
I learned the optical and X-ray data analysis. It will be useful for my research. I usually do the modeling of the afterglow of GRBs, Now, I am planning to include MCMC in my code.
For my upcoming PhD programme, now I have more clarity and knowledge about certain topics
Identifying new and interesting transients
I'm probably a bit better at coding now
I am incharge of ePESSTO data reduction pipeline, so this will definitely be beneficial in the near future when observatories open again.
My next observing proposal to observe supernova will benefit significantly from the methods I've learned.
I will apply methods of image analysis and light curves for my current exoplanets research. I hope to explore transient astronomy in the future with the rich tools I learnt at the school.
I will use all the coding skills and new tools at work right away

How respondents will use their gained knowledge and experience in future research (Cont.)

Response
Having a deeper understanding of the multi-wavebands and how to process them will give me better insight when applying for telescope time when following transients, and certain variables.
My research expertise is gamma-ray data analysis based on the space-based instruments. In the future, I may use the knowledge and skills related to the multiwavelength acquired during school to extend my research in broad energy ranges. After this, I may start to work on the data obtained from the ground-based detectors.
I will look for additional data in other wavelenght ranges. Additionally, I have a better understanding on what goes before I get my pretty light curves so I can better appreciate the work and understand where the uncertainties come. The notebooks are also quite useful to take as models of the type of analysis. In particular, finding the period of variable events was something it is probable I have to do in the future and now I have a good guide on how to do it.
This will greatly benefit me in my doctoral studies which I'm going to start in Dec 2020.
i want to do a phd in astronomy and i believe growth school has equipped me with the tools necessary in astronomy and given me enough exposure in the field so that i can use the knowledge for my masters thesis and during phd applications.

Respondents' perceptions about the GROWTH Astronomy School program structure

	Strongly disagree		Disagree		Neither disagree/agree		Agree		Strongly agree		Not applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
The sessions were organized well and in a logical manner.	1	1%	0	%	0	%	12	15%	68	84%	0	%	81
The format of pre-recorded lectures, followed by live discussions and interactive Python workshops were well-balanced.	1	1%	3	4%	0	%	24	30%	51	63%	2	2%	81
The lectures and live discussions were the appropriate length of time for the content.	1	1%	2	2%	5	6%	30	37%	43	53%	0	%	81
The live interactive Python workshops were the appropriate length of time for the content.	1	1%	11	14%	12	15%	30	37%	27	33%	0	%	81

Respondents' preference to follow up observational techniques in multiple wavelengths or a particular wavelength

Value	Percent	Count
I would have liked a more focused program	6%	5
I was content with the multiwavelength approach	19%	15
I really appreciated the multiwavelength approach	75%	61
Totals		81

Respondents' explanation of preference for follow up observational techniques

Response
I think that studying an object at multiple frequencies can reveal important features. Since we now have multiple high resolution telescopes at many wavelengths, it is only right to learn about the data coming from them.
Some of the Python modules were a bit lengthy and couldn't be completed in the allotted time
Maybe I would have preferred more focus on wavelengths that usually are considered "less important/useful" than optical (e.g. radio, X-rays, IR and gamma-rays), since it is very hard to find a course on them
It gives me more deeper knowledge to understand astrophysical sources in different wavelengths to get know more their physical property
It is important since the physical processes of the events can be better explained by analyzing them at various wavelengths.
This program format in this content is really appreciated. I rated all questionnaires without any biased. I really enjoyed all sessions, I strongly agreed with the provide question for rating.
I am always awed by how we can utilize the entire spectrum in time domain astronomy and I think knowing a little bit about each section of the spectrum is useful in future researches.
I do not think it was problematic having into account that the school could not be in person. But it is more difficult to follow-up python discussions online, even with the breakout session rooms. For this need of the school to be online, it was really good.
As this is a short summer school and not an intensive course, touching upon multiple wavelengths seems to be perfect and helps gather a bunch of diverse audiences, and let others know what interesting stuff goes on in other domains. Whereas, focusing on just one would make the school a bit monotonous in terms of practice and understanding.
Sessions: I strongly agree that the sessions were well organized. I expected some glitches since this was an online platform but there were rarely any if not none. Pre-recorded lectures: GREAT IDEA! I usually prefer being better prepared for any lecture. Due to pre-recorded lectures, I was able to rewind or pause whenever I needed to think about a concept that was explained in the lecture. Also kudos to all the tutors/lecturers for being available on slack whenever anyone had questions. Length: I think the length of the lectures, live discussions, and the python workshops were appropriate.
Transient studies in multiple wavelengths as provided in the Summer School with hands on computational supplements gave me a better opportunity to understand the methodologies in digesting raw data and analyzing it to obtain meaningful astronomical insight
The program covered many different areas, which I preferred as I could then think about what I wanted to learn more about
I feel like most of the emphasis was still on the optical wavelengths, and we only learned little about X-ray and radio. While this approach is fine with me, because I am mostly involved with optical astronomy, I would have liked to learn more about astronomy in wavelengths I am not that familiar with.
I'm currently studying SNe, and I would have liked to have at least one advanced lecture about the physics of these objects, e.g explanations of shock breakout, shock cooling etc.
In my thesis research I'll never really be doing radio or X-ray follow up, mostly in optical and NIR so those were of most use to me, and as such an even more focused program would be even better

Respondents' explanation of preference for follow up observational techniques (Cont.)

Response
My favorite part of the workshop was learning about astronomy at other wavelengths than what I'm used to.
Gave a good big picture overview
I really liked the multiwavelength approach because at least in my case (and other PhD students I know) we are very limited in our thesis to work with a specific wavelength and is much more useful if we know about the others because the science can be improved in a substancial way. Additionally, the methodology used was excellent, I could follow all the lectures and the python session were the key to practice what we learned.
I think learning particular wavelengths at great depth have other places for that, I really appreciate the exposure to observational techniques in multiple wavelengths, which is not so accessible sometimes.
I think it was really great. The only thing I think could have been a little bit more in depth, was a few more lectures/time on current developments in the field. Such as what is going on right now in transient astronomy.. what are the big open questions in observational transient astronomy today..
It was a perfect combination between lectures and python
I think there was a good balance of exposure and difficulty.
I applied this summer school to get knowledge of multiwavelength astronomy.
I thought the summer school was extremely well organized and comprehensive.
I believe that context can be far more valuable than focused learning if there is limited time to do so.
The program was extremely well run, given the constrains of the online format.
It was interesting to learn about techniques outside of my speciality and how they might be applicable to my research
Quoting the School's head (Prof. Kasliwal) - one needs to be agnostic to any bias of just looking at particular energy or part of the EM spectrum. These energies are linked and help understand the processes that go into these cosmological sources that we try to study. It is of utmost importance that we gather as much information covering the widest range of energies as possible. A great example is the detection of the first double neutron star merger!
I felt that there was a good balance between pre-recorded lectures, live discussions, and Python workshops. However, perhaps more time could be allocated for the Python workshops since some were difficult. The multiwavelength approach is very beneficial.
It is good to have an exposure to Multi-wavelength study for all astronomers
Organising an Online school with over 100 participants from around the world is not an easy task and I congratulate the organisers for their amazing work. Also, hand on sessions were so well organised with the jupyterhub which made things go smoothly. I have had experiences where the tutors spend most of the session time on downloading python dependencies and bringing everyone at the same ground. GROWTH had this already done! Tutors made the perfect notebooks and exercises. Also, the pre recorded lectures was a good idea in view of the participants joining from different time zones and its difficult to find a 6 hours long sessions at a stretch. Also, the areas covered during the school were well balanced and gave me a good view of observations multi-wavelength astrophysics.
I think it was important to compare different types of wavelengths

Respondents' explanation of preference for follow up observational techniques (Cont.)

Response
I will give A rating, as lecture were well organised in timely manner.
I think is useful for astronomers to have experience in multiwavelength analyses, since astrophysical sources are multiwavelength in nature
It is not practical to make oneself expert in one particular field within a week. So, with the current approach, I could get a flavor of all different fields and then, if I want to pursue further I would do so using the knowledge gained here as a first step.
The school helped me have a basic understanding of the techniques in different wavelengths in a short period of time.
It's appreciable not to be biased on a particular wavelength. It is beneficial for those who are at their early stage of research and got a taste on every areas of astronomy.
All lectures and python workshops were very balanced. Only suggestion would be separating two live observing session to two different days. This would probably increase the learning of students since it will be less tiring. Also would probably be helpful for staff as well.
I liked the multiple wavelength approach because I learned a good amount from each.
The format of recorded lectures, Q&A sessions and then the interactive Python workshops was itself wonderful. Everything was conducted in a smooth manner, particularly considering the challenges of doing it entirely virtually. However, I would have appreciated having more time for some of the coding exercises.
Everything organization and teaching wise was super great! Some jupyter notebook sessions were slightly longish, but that is fine, we can come back to them later!
I think some of the models were dense and difficult to complete in one session (I'm particularly thinking of the aperture photometry one and the radio). The multi-wavelength approach is why I chose to apply to this school, so I did appreciate it.
I was very impressed with the provided materials. I take detailed notes on lectures and to a lesser extent on the code, simply to ensure I understand the provided material in depth, and found that in spite of this the presented material was of the appropriate length.
I thought the school was really good overall. Some of the sessions were perhaps too short for the amount of content, but that is a strong factor of my skills in Python and the number of examples available allowing me to copy and paste code and adapt as appropriate. Some were very appropriate, some were too short.
This was the first time I got in touch with data in other wavelengths than optical, it was great to learn more about it.
It was very interesting to get new knowledge on different wavelength observations
This is not a crique but rather just the reality. I really enjoyed the Python workshops, but I almost never finished them. I am perfectly happy with that, because it will take time to absorb all the information. The solutions are going to provide a brilliant set of tools as I work through everything carefully.
I think the lectures and discussions were appropriate in level and length, but felt that the hands-on session required more time. It is great that we can still practice after the workshop, and ask questions for a while longer
I was aware of a data reduction techniques earlier across the wavelengths but not using python. This workshop helped me to learn many concepts beyond my expection. The program was very well organized and the idea of providing a workspace for the followup discussions are commendable.

Respondents' explanation of preference for follow up observational techniques (Cont.)

Response
Multiwavelength astronomy is the future of astrophysics. One has to have an expertise in more than one wavelengths to be able to get complete picture of the sources in the universe as they are always interacting with their surroundings and one another.
The workshop was very useful overall considering a broad purview!
The analysis in radio and X-ray band should have given more time to explore.
For me, as a beginner in astrophysics research, it was really nice to have this broad approach in different wavelengths as a way of getting to know all the different science that can be done, not to get stuck with only a narrow window of possibilities.
It was really interesting to learn more about observing in wavelengths beyond what my research has introduced me to.
I am really happy with the way the pre-recorded lectures and interactive sessions were planned. However, as a pre PhD student, since I am new to using Python coding, it would be better if there would be little more was taught about the basics. But I don't complain as I understand that majority of the participants are already familiar with that and it might not be possible in a Summer School and that too a virtual one!
I haven't yet decide which field to work and since I am interested in Astronomy this was really good exposure. I learnt a lot of new things
The multiwavelength approach was certainly useful and even if the material was very broad it probably gave the participants something to work upon in the oncoming weeks or months. Variety is good for everyone who needs to find what they're interested in the most.
Multiwavelength data analysis is very important to understand the emission mechanisms.
For me the main aim of attending this program was to have an exposure apart from that that was being provided by my university and also gain knowledge and be upto date with all the latest techniques that is employed in the data analysis of multiwavelength observation. This program enabled me to get just that.
Most of us have access to materials that explore a particular wavelength at depth, but learning relevant material for each wavelength is quite time consuming. GROWTH school taught us just the right amount of techniques to get started.
The only thing for me was that some Pythons workshops had a very dense content that, at least for me, required more time for us students to understand.
Most of the Python workshops were easy to follow along till the very end. However, the radio workshop I did not successfully follow till the end. Each breakout was not enough time. If the solution (code) for sections was shared after each breakout before moving on, this would help.
I loved everything about the summer school, but I do wish that the workshops and live discussions were longer and more interactive. Since the first day, a few people in my breakout room did not put their camera on, and by the end of the summer school, almost no one had their camera on and it sucked. I don't know how this issue can be solved, but it would've been nice if I could've worked with other students too and maybe that would've felt like the length of time was sufficient. The material was great and I loved the approach, but it all felt a bit rushed and thats the only thing that I did not like about the summer school. The observation run was the only experience that felt open to many possibilities and it felt the most exciting and interactive. I wish that was the case for all the other days.
It is great we could work on three frequency ranges: optical, X-rays and radio. However, we spent too many days for the optical band and only one day for radio and X.

Respondents' explanation of preference for follow up observational techniques (Cont.)

Response
I strongly agree with the data analysis related to the data obtained from different instruments and the lectures before the computing sessions.
NA
Honestly, I really hate online teaching, lectures, seminars, everything. I feel absolutely drained after this week, exhausted in a way that in-person lectures never do to me. That being said, I really do think the organizers came up with the best possible format given the "online" limitation. The breakout groups with the same people was really helpful, since a 100 person zoom meeting is overwhelming. The lectures being prerecorded so that I could watch it whenever I wanted was really helpful. 3 hours of zoom each day is already too much for me, so it helped that I could at least watch the lectures on my own time, with pauses and whatnot.
I think it's a school to broaden your vision, not narrow it, and it was very well done.
Some times there were too few time to do the python-based activities
I am already incredibly familiar with optical/IR/radio astronomy. This approach means that one stands to gain something from the school without worrying when applying.
I work with optical and near infrared, so I would have liked to have deeper understanding in those wavelengths. However, I do appreciate the lectures on xrays and radio as I didn't know much. I understand that this school teaches all wavelengths (we didn't hear about gamma rays though)
The wide breadth of topics was covered well within the time given
I enjoyed a broad survey of the EM spectrum. A module on GW observations might be interesting as well.
The organising was really good. I have absolutely no issues with the timings or regularity.
I think that the workshop sessions were quite fast and that I would have benefited from some more time. It felt a bit rushed.
Learning by the multi-wavelength approach taught me the connections as well as challenges involved in astronomy data acquisition and analysis.
I enjoeyed the breadth of knowledge that the school provided, and found the lectures particularly useful.
You cannot provide a decent amount of info for the whole EM spectrum in 5 days.
I actually thought there was too much of a focus on optical wavelengths, and would have enjoyed learning more about other wavelengths - gamma-rays and infrared for example.
I though the school format was good. I wishe the break was larger and that the data challenges had been phased out given that all of them started when it was night at my locations and I would have liked to compete on them. I enjoyed the multiwavelength approach because I can now see what I can use from other wavelengths in my reasearch.
Since i am an undergraduate student who wants to explore the field , i am glad that they gave me exposure from different fields so that I can decide what field i would like to choose during my future research

Respondents' perceptions of the level of content presented

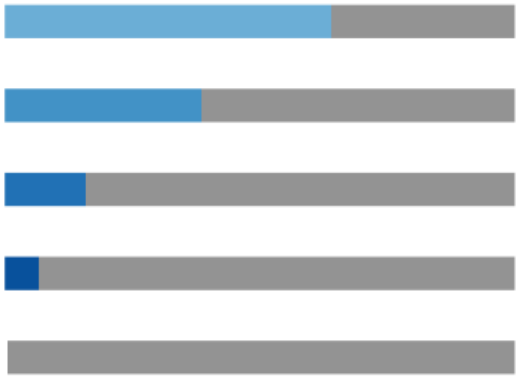
Value	Percent	Count
Too difficult	4%	3
Just right	90%	73
Too easy	6%	5
Totals		81

Respondents' perceptions of the remote observations with the Liverpool Telescope

Value	Percent	Count
Not at all important	1%	1
Slightly important	7%	6
Somewhat important	35%	28
Very important	42%	34
Extremely important	15%	12
Totals		81

Respondents’ overall rating of their experience participating in the Astronomy School via an online format

Value	Percent	Count
Very good	57%	46
Good	32%	26
Acceptable	10%	8
Poor	1%	1
Very poor	0%	0
Totals		81



Respondents' experience of the Astronomy School via an online format

Response
I think it was well organised especially for being a remote course. The lectures and lectureres were excellent, I learnt a lot.
It seemed great to me, because it allows you to study the lectures quietly since they are sent a day before and also having the facility to communicate and learn without having to travel is a good opportunity
The school presented a lot of new information and teach me the path to reduce and analyze data from several wavelengths. Certainly, it will be helpful on my future career.
I had a really fun time at the school. Great experience, learnt a lot and still more to be learnt!
It gave me the opportunity to learn transients astronomy in a multi-wavelength approach.
Missed out a lot on in-person interaction, specially outside the classroom environment
I did not find any difference between online and in-person attendance. The school was very well planned (extremely well, in my opinion) Before the school, I expected there to be some problems. But I found none. The only issue with the online format is not being able to meet all the wonderful people in-person.
If I had the choice of attending the astronomy in person, I definitely would. But give the circumstances, the team did a really great job in putting the workshops together!
I feel that it is really difficult to get people to participate in the breakout rooms. Although online is certainly better than nothing, in-person will always be better for networking and interactions.
The in-person school is quite far better than online one because we can attention and focus on the subject matter and lectures and we can interact with experts during coffee and luck break. Nevertheless, during this situation, it is the only best option to choose.
The online school was easier to attend than an in person school, but I did feel like I missed out on networking opportunities because of the format
As I am not from the US, it was nearly impossible for me to attend the summer school due to expenses. I'm not sure if GROWTH provides some aid, but this is the foremost reason.
I have been busy with another research work that was simultaneous alongside with the time period of the school.
I loved every minute of the school, especially the remote observations.
The online format allowed time to learn at your own pace. I was able to watch the lectures at varying playback speeds as I needed. However, while the lectures were great in the online format, the breakout rooms were not as good as in-person interactions would have been.
In some ways, I think the school ran better online than in person. I think for the live sessions, it was easy for everyone to see what was being shared by the instructor, and we could all easily share our plots etc in the breakout room. The only place where it was perhaps slightly lacking was in terms of socialising and networking, but that is difficult to avoid in an online format. I realise that the cartoon competition was partly about encouraging us to work together as a group, but my group didn't really do much together for it.
This is the first online school I am attending and it was good.

Note: n=60. Responses to this open-ended question were optional.

Respondents' experience of the Astronomy School via an online format (Cont.)

Response
It was fun and done well over an online platform
I sometimes had trouble over zoom in the workshop sessions due to my attention deficit disorder. I tend to prefer a quiet environment for working and going through the notebooks myself.
The workshops were intense sometimes and the breaks were a bit short. But everything was really well organised and the content was engaging.
So there are pros and cons of this online school. The good part is that we could follow the lectures at the moment we were fresh and ready to learn. Also we could stop and go back and listen again to the explanations. The bad part is that to be in front of a screen is always difficult, even more now that we are doing everything throw a screen! but in general I would say was a really good experience
It was very well managed. The organisers were around all the time for help. The lecturers also would reply to promptly to all queries.
Given the need for remote learning right now, the GROWTH summer school did an excellent job of adapting to an online format.
The school has been conducted extremely efficiently given the limitations of the online format.
Nice teachers, TAs, lectures, modules and a wonderful experience overall.
It felt well organised and structured. It allowed me to work in a more comfortable environment and ensured that I was able to get the most out of it.
The online format was good, although I did run into some technical issues with Zoom. Maybe in the future if the school will be run online, there could be more social activities.
I really enjoyed connecting to other likeminded individuals and learning about professional multi-wavelength astronomy.
it was really useful
It was very well run, and set of easily to follow lectures/workshops as the teaching team was amazing. Of course, in-person allows for forming better connections with other students, tutors and lecturers - but I guess this is the best we can do in this situation - thanks!
Zoom was not ideal, but it was the best option given that we couldn't meet in person.
It was a phenomenal experience one that I will remember. If given a chance, I'd like to do this all again. :)
It is a very good alternative for the normal setting and it was one of the reasons I was able to join this session
I'm autistic and would not have attended if it was in person
Again, the organization was phenomenal given the online limitation but I'm so tired. Spending so much time on zoom, especially because my internet constantly cuts out so often, is exhausting and aggravating. Having to sit in one place for so long and worrying that, if I get up to go to the bathroom, I'll miss something important, it's really not great. I can't sleep properly after this much time spent in the day looking at the screen. But this is all me personally, I think the organizers were absolutely phenomenal. And next week, I'm on holiday so I'll recover :)
I very much enjoyed all of the modules and python workshops. I definitely gathered new skills and my understanding also improved. Thank you.

Note: n=60. Responses to this open-ended question were optional.

Respondents' experience of the Astronomy School via an online format (Cont.)

Response
It was really managed online school with the utilisation of all available social platforms zoom, slack, GitHub, jupyteHub. It also managed well the time differences among the countries.
A great opportunity to learn new things and acquire new skills
The online format was as good as the in-person school. It was well planned and properly executed.
I wish i could interact with everyone normally, online interaction do put some restrictions like poor internet conection. also i wish i could have actually visited the observatory to see how data is taken
The lecture were really good and the follow up workshop was also really helpful
Despite the entire situation with the pandemic stuff, the online format was very well organized and the breakout rooms were a very good idea.
It was convenient to access everything I needed.
It allows for more international participation, especially if there is not enough funding to send many graduate student on oversea trips
Despite what I think could've been done better, I still firmly believe that this was a wonderful opportunity and I am grateful that I could be a part of it. There was a lot of effort put into everything we did during our sessions and I feel like it was one of the best experiences I have had in a long time.
Everything was beautifully organised!!! I am extremely impressed and I was able to learn everything as well as in person.
I really enjoyed participating in GROWTH 2020. The online format was well thought out to ensure that all concepts were covered up to significant depth. The live Q&A sessions and slack discussions was an added advantage. All the tutors were more than willing to help at any time.
I always enjoy traveling to places, and getting to know people face to face. However, I enjoyed a lot that communication was in Slack so there is always a written record to go back to. Also one can rewatch the lectures, which would not happen if they were live.
It was very engaging.
Way less interaction with peers and lecturers. Additionally, there were no opportunities to socialize and develop connections/network. I say "aceptable" because the lectures were good and in that sense, it worked.
I have participated in other schools during these pandemic times, and this was far the best. It was organized, material was appropriate and well prepared, especially given that we all have different backgrounds. And also, the daily duration was fine, considering that we have to spend all day in front of a screen
The organisation of the school was so good and smooth that it made a lot of difference. The exercise sessions always kept the interest going. The pre recorded lectures gave the freedom to follow the lectures at our own pace and time. There were ample opportunities to ask questions and all the tutors and lecturers were very kind to answer everything. It is one of the best schools I have attended,
The school was highly accessible in its online format. The slack channel was a good place to ask questions and document the answers, and to put up other resources to follow. One would not be able to remember so much information at once if it were held in person. Everyone behaved professionally and the tutors were lovely. The experts were brilliant with their well-curated lectures.

Note: n=60. Responses to this open-ended question were optional.

Respondents' experience of the Astronomy School via an online format (Cont.)

Response
Learning gets usually monotonous with online workshops/conference. But GROWTH organizers found a nice balance between tutorials and lectures. And that's what made it more interactive, which is a good way to learn things
An online version has its benefits, like not requiring you to get out from your home sweet home, having zero costs to the participants and also no greenhouse gas emissions, but being in person is surely a greater experience. I felt a bit of difficulty talking with people from my own breakout room and tutors, and also to make questions during the Q&A sessions, and I'm usually not so shy in an in-person meeting. Not to say that the experience of being personally on a place with all the other participants and lecturers is much more conducive to make new friends and to learn with them. By the way, as we had no other choice this year, for me the GROWTH online version was very well organized and I still appreciated it and learned a lot!
For me the main points that I would be looking for is the interactions with the tutors and lecturers. Inspite of this being an online school I can almost certainly say that it felt no less than what would have been if it was ofline. The prompt responses, the breakout rooms, immediate solutions to all our queries, everything was just gteat. I really liked this experience. I also learnt how different tools available can be put to efficient use as per the needs.
I think this is a fairer system for people who cannot travel/afford to travel. There was less opportunity to network both with academics and my peers, but given the circumstances the school was handled well.
Networking is very hard online, plus discussion is also limited.
the format of interactive python rooms and lectures makes sense
The school was very well organized, I liked the fact that I could watch the lectures at my own pace beforehand and I found that some (unforunately not all) of the python tutorial sessions were very well explained.

Note: n=60. Responses to this open-ended question were optional.

Respondents’ previous GROWTH Astronomy School participation (in 2018 or 2019)

Value	Percent	Count
Yes	1%	1
No	99%	80
Totals		81

Respondents' preference of school format

Value	Percent	Count
The online format	17%	14
The in-person format	54%	44
I have no preference	28%	23
Totals		81

Respondents' perceptions of how successful the Astronomy school was in the following areas

	Not at all		Slightly		Somewhat		Very		Extremely		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Communication of content during the school	0	%	1	1%	2	2%	31	38%	47	58%	81
Promoting participation	0	%	2	2%	9	11%	27	33%	43	53%	81
Promoting interaction	1	1%	1	1%	17	21%	30	37%	32	40%	81
Meeting individual learning needs	1	1%	4	5%	23	28%	27	33%	26	32%	81

Benefits experienced as a result of the online format

Response
I was at the comfort of my home and could attend the recorded lectures at my own pace.
They include online slack and zoom conversation. Using Jupyter hub to practice the hands-on python scripts.
-To be able to access school without having to travel. -The ease of being able to choose the time to analyze the lectures. -The excellent level of the exhibitors -The patience of the instructors
Personally, I preferred the online format. The main reasons are 1. Pre-recorded lectures 2. Travel issues: From what I know about the 2019 GROWTH school, registration fees, accommodation, and food were covered by GROWTH. But since some of us need visas and have to cover travel costs, it would have been slightly difficult to attend the school in person.
I like how we can watch the lectures on our own pace ahead of time.
The online format allowed people from different places to attend even with the pandemic. Nonetheless, even without the pandemic I do believe that the online sessions allows for people from more diversified countries to attend.
Since lectures were pre-recorded, I could watch them at my own pace or re-watch them if needed
I was able to manage the time better and I the lectures were not condensated in just 3 days which I think would have been too much
The online format was very relaxed and you could take the sessions while having a cup of coffee etc. The online format doesn't put a lot of stress on the students and minimises peer pressure.
It was nice to see the faces of many names I've seen on papers! I enjoyed being able to watch the lectures in my own time.
I liked this experience just in case I have no the ability to travel or lack travel funding.
More flexible and enabled me to get work done in the mornings before the school, also easier to engage with and less tiring than an in person one
As mentioned earlier, I got to attend the school because it's in an online format. The time zone barrier is real but the prerecorded lectures make it easier. Also, it's fun to lie on your couch and still do astronomy!
I am very lucky in this sense, the school format went on virtual format. If it were gone to in-person school format I had to face many problems, funding, visa etc if I would select in. Nevertheless, I have got an opportunity to interact with experts.
I am quite shy in person. I was able to open up and talk to people a lot faster than if it were in person. I was also able to watch the lectures in my own time, this was helpful as I struggle to pay attention for more than 30 minutes. I could do the lectures in chunks.
It reduces travel costs and other expenses
It was easier to approach the instructors and tutors
I am not sure I could have attended if in person
Time to watch the lectures and do exercises later

Benefits experienced as a result of the online format (Cont.)

Response
Time saving.
I could watch the lectures on my own schedule, and do the school while continuing my usual work.
I was able to work through modules at my own pace.
I was able to work in a learning environment that I was in control of and take things at my own pace.
Adapting to a new way of learning and collaborating online.
Able to work from the ease of my house
I was able to watch the lectures on my own time, which worked better. In addition, I probably would not have been able to make it in-person, even without COVID-19, since the costs of travelling abroad were high.
not need any money and time for journey
It was nice to be able to watch lecture videos at our leisure during the previous day. The screen sharing was nice because everyone could easily see the screen and there was no squinting!
No need to travel / move anywhere, can watch lectures at own pace which makes everything much easier to understand
I was able to follow the school which would not have been an option otherwise
I have a very good computer setup, so I found the online format helped me to complete the work quickly.
easier to ask questions to lectures.
I did not require any funding to attend the school in a different country.
The pre-recorded lectures gave more time to us to go through them. And the queries/info/comments were promptly handled on Slack.
So again, the benefit was mainly in the lectures. The fact that we could listen to them in the moment we wanted and we could stop whenever we wanted makes it easier to follow all the concepts.
The wide use of slack makes it easy to see a lot of the questions that are being asked by other participants.
the prerecorded lectures the night before were a nice way to get introduced to the topic, combined with the next day activity was helpful.
It was completely free and comfortable
Not having to interact with people unless it was needed and going at my own pace for some of it
Being able to watch the lectures at my own pace was useful. The JupyterHub was a great way to make sure that everyone was on the same page.
Multi-cultural aspect was great, but it isn't something that would lack in-person.
I had more time to absorb the material, becaue I experienced less pressure to perform.
Large number of participants from all over the world.

Benefits experienced as a result of the online format (Cont.)

Response
Learning from home
Everything was recorded and the sound was good.
I was able to attend in spite of COVID-19 restrictions, and did not need provide funding for travel expenses from Australia.
I have not joined the in-person format, so I can not compare it to online version. However, I think online version was well prepared in terms of time allocation and it did not caused any difficulties for me.
NA
I am from India and could NOT have attended it if it were not Online!!
It is also one of the good format.
The greatest benefit is to be able to learn all the contents while at home, not having to deal with travelling, money issues etc.
personal commitments
No travelling
It was comfortable being at home and having time to think about questions without being under pressure.
I could watch the lectures at my own pace and rewatch them before the interactive sessions.
As mentioned above - easier to clearly share results within the breakout, and see instructors screen. Also good to have extra participants. Also, the talks were designed to be recorded, so they will be easier to watch online for the participants, and other people who weren't selected/ able to attend.
I guess in online format is easier to deal with programming, because you can share your screen and work with people simultaneously
I have been able to attend the school and gain from such an international experience without having to travel or apply for travel grants, which may have otherwise dictated the possibility of participation.
The most important is that I couldn't have attended due to funding issues. Although there is no match to an in-person format, that is always best, for some who can't attend due to funding or other issues, a hybrid format including the both should be considered for future schools.
Time flexibility, low cost
I think online schools are much more relaxed and while you can see the lectures at your preferred time, it also gives you time to think about them and ask questions, which can sometimes be very hard to do at an in-person school.
I personally would have been able to travel to Liverpool, but I think there are many students who were able to participate because they did not have to secure funding for the school; I see this as a major benefit, really.
I had more time to take a rest, and I had more time to be relaxed after the sessions. Also I had time to do different things than the school in the afternoon.

Benefits experienced as a result of the online format (Cont.)

Response
I got to use a large monitor instead of my laptop that I would have brought to the school (I assume we bring our own laptops). I could watch the video at 2x speed and pause as needed. Answers to some questions that were posted in slack remain there for me to look at later. All sessions and Q&A are recorded (I assume this is not the case in person)
it was good and I think it was not possible to do much more in this covid crisis
Probably having material I can keep learning from in the months to come
The availability of online lectures. We can easily go back and forth and repeat if we missed something out in the first go
The timing and the format of the online school helped me to balance my other engagaments and work without disturbing my schedule and any postponements.
The lectures were uploaded well before the session. It allowed us to watch the lectures at our convinence .
I was able to go through the lectures beforehand and also have time to process the new information so that while working on modules it made more sense to me.
It help me to continue my work with school.
It saved a lot of time
We could still have this school even with COVID! That is a huge benefit.
If it was an in-person school I would have difficulty with the travel costs, so the online format made it much easier for me.
I might not have been able to attend the school without travel funding. So, this was the only upside to the online school.
I learnt a lot of tools that would be useful in learning Astronomy
The breakout rooms and the youtube videos that facilitated to stop the videos whenever we could not undestand something.
Even during the pandemic where travelling overseas is impossible, the online format made it possible and so I got an amazing opportunity to attend this school, learn a lot and all from the safety of my home.
apart from the benefit of attending the school from the comfort of our homes, I think one of the biggest advantage is the public resources one can save if one were to travel to the US for the school. Also many times, students cant travel because of lack of funds, visa issues, medical issues and so on, Online school gives an opportunity to everyone to attend the school.
The online format first allowed it to be accessible to so many students, reduced carbon emissions due to travel and allowed many backgrounds to participate. The Jupyterhub helped run programs without worrying about installation and we did not have to carry the laptops during travel. Also the slack channels were brilliant and I do hope they are used even if next editions are done in person. It is a great place to document everything. I missed an astronomy school in the past since I could not travel, so attending this school from comforts of my home in itself is amazing. I believe women, minorities and socio-economically disadvantaged will continue to benefit from online events or even hybrid events.
I could watch the lecture at my own pace when I was most focused and rewind parts I did not understand fully. This allowed me to aprehend better.

Drawbacks experienced as a result of the online format

Response
Already discussed how much I hate zoom, but in addition to that, it's impossible to recreate those important summer school and conference moments where a casual run-in with someone leads to a new contact, collaborator, or friend. It is impossible to recreate this in an online format. So this is also really sad. The informal learning and sharing aspects are simply not there.
Certainly, the experience is diminished compared to a live session. It is easy to ask questions in the in-person format. For instance, I have social anxiety. So, for me, it is really hard to expose myself on a breakout room with other 10 people or on a Q&A event. Live, I would have the chance to ask personally me questions. I think that I am not the only person on the event that would suffer from this kind or others psychiatric diagnosis that hampers the social interaction. Apart from that, If the school was in-person we would certainly have the chance to meet the other attendees more deeply, during the school time or after it. Nonetheless, I think that the overall experience was positive.
1. Not being able to meet the people in person 2. Some of the challenges and cartoon game arranged by GROWTH would have been a lot more fun if we were all in person Apart from these minor drawbacks general to all online workshops/seminars/schools, I found nothing in particular to GROWTH school
Some drawbacks as a result of the online format of the school are, 1) less focus on lectures 2) hard to synchronize time-zone format 3) wast of time the coffee break sessions.
I think it's not a super convenient time for me due to the time zone but it is manageable.
In-person interaction
There were no drawbacks as such but still some times I lost track of what's going on in the modules. It is just because of the online mode of working and not some thing from the school.
Poor network at my end slowed my participation.
Interaction with other participants very limited
Less opportunity for networking and one-on-one discussions, also lots of time in front of a screen particularly for the observing session day
Since the internet is not very good at my place, I experienced occasional lagging in live videos. It was a little difficult to have a one to one interaction with teachers and tutors.
I gained really good experience to hands on research in data analysis in time domain astronomy for multiwavelengths observation.
The only drawback I found was that since I am very inexperienced in this field I often lagged behind my peers and being in an offline school with tutors would have helped me.
Lack of social interaction and networking with participants.
none. Maybe I did not get to meet my fellow participants in person, but that would be the case anyways! I will stay in touch with them electronically.
Less interaction with people, and the interactions we had were very work-related and not very social
I think networking was the biggest issue. I would have liked to hear about job opportunities in the area.
Everything was fine!
I had some problems with my connection, and the communication with the rest of the students was not of "high quality"
Wasn't able to attend some live sessions, interrnet failed

Note: 6 respondents indicated N/A or no response.

Drawbacks experienced as a result of the online format (Cont.)

Response
I think we only didnt really meet the other students so much. We barely had time to get to know each other. I think it would have been fun to maybe do a "coffee mixture" where all participants are randomly put in a zoom room with 2-3 other participants, and get a couple of minutes to meet each other. You can also use other programs to have a more "socializing part" to the program
Less communication because of my communication skill...You promoted the interaction well!
Sometimes, I guess the time for the interactive sessions was a little low. So I couldn't follow the speed.
There were obviously technical glitches here and there but that's to be expected with the online format.
None. Except an outing with the participants and the tutors :D
It felt awkward to talk during the breakout sessions, so I think people chatted less.
The online format isn't the best way to have people engaged. It's great for reachout purposes, but I can't actually distinguish it from video-classes. I could have just watched last year lectures on youtube . It might had been even better, despite the lack of certificate.
No one on one time with the tutors for questions we have.
The breakout rooms are not as personal and it is difficult to feel comfortable asking questions.
The interaction between people was a bit hard sometimes
Limited opportunity to socialise with the other attendees/staff
Less interaction with other students/instructors.
It seemed a bit rushed - not enough breaks between content and sessions.
There were some technical issues with Zoom, and there were less interactions with other participants.
Lots of people, hard to interact personally
It would have been nice to meet people in person
Less interactive
The connection wasn't always very good and my Jupyter notebooks became very slow on Friday
It's always easier to collaborate in real-time in person, no matter how good the online format is
Very unfavourable timezone, difficult to connect with other students (but still much better than a lot of other online events / meetings I've been to)
The breakout sessions were not very interactive. While I learned a lot, it was difficult to engage and form connections with the participants and lecturers.
Internet connection issues.
It would be nice to meet people we interacted with online also in person.

Note: 6 respondents indicated N/A or no response.

Drawbacks experienced as a result of the online format (Cont.)

Response
I am in a place with bad internet so this would break sometimes. Additionally, no networking and it was harder to stay focused on the python tutorials since there was not much interation. We could not talk with other participants in an organic way for the tutorials too.
I wish that I could interact more with the presentors and students. I wanted to communicate more with them and talk to them directly because I am a naturally shy person and it doesnt get better when I am online.
It was harder to connect with other students.
Directly meeting people
One for me is the time-zone issue. The live sessions continue till late night and coincide with dinner and other timings. But, there is no way out of it, I guess.
Internet connectivity problems, but nothing severe.
Due to my inconvenient timezone, the live sessions were from 00:00 to 03:00. This somewhat effected my concentration.
It is hard to focus 100% of the time with online meetings
My main issues were related to internet connection and problems with my laptop. Also, meeting the tutors in person would be great to talk more about their areas of research.
Less interaction amongst participants which is often fun and a good place to start collaboration and interact.
headaches mostly
It is more draining than an in-person format, though this is not a particular issue with this school particularly and has more to do with the nature of virtual environments in general.
Connectivity issues... Sometimes I was alloted to wrong breakout room....
couldn't interact with the participants. could only talk to participants in my breakout room
I would interact with team members easier if the format was in person. I guess online version kept us a bit distant and only made us to focus on the school (I guess that's also good).
It's relatively minor, but it did mean that I didn't really get to know the other participants / tutors etc, as there was less chance for the informal discussions you would participate in during a live school.
Forming collaborations would probably be better in person.

Note: 6 respondents indicated N/A or no response.

Drawbacks experienced as a result of the online format (Cont.)

Response
Interaction between participants was less since itwas online
It gets monotonous. In addition, we don't really get to interact with the broader audience or network which is a huge disadvantage. It's not the same as a real in-person workshop/conference
I felt difficulty to interact with other participants and to make questions to tutors and lecturers, once the virtual contact is much poorer than the in-person one. It would be amazing to be in person in the same place with all the other participants.
Duration of hands on can be extended more.
The only drawback was not able to meet people
I personally believe that in-person is more interactive in general
I think one and probably the only drawback is that it gets a bit difficult to talk to new people which is slightly more easy when one is in person.
my time zone was not the best to attend the school since I had to attend in the middle of the night
The only thing would have been I didn't get to meet everyone personally. Apart from that I like the online format.
Even with the breakout rooms, I felt a little isolated from the other participants. I am not sure how to improve that though since it might just be an effect of the online format in general.
I am in a place with bad internet so this would break sometimes. Additionally, no networking and it was harder to stay focused on the python tutorials since there was not much interation. We could not talk with other participants in an organic way for the tutorials too.
Communicating to the lecturers and discussion regarding various aspects in-person was not possible.
It made the interaction a bit more difficult, also the in person format allows to interact with teachers during the lectures, not just the live sessions
I didn't get interact to with my peers much.
Less networking and interaction with others outside your breakout rooms
It is hard to focus on a screen Timezones Less getting to know other participants and instructors

Note: 6 respondents indicated N/A or no response.

Perceptions of the school's instructors

	Strongly disagree		Disagree		Neither agree or disagree		Agree		Strongly agree		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
The instructors created an inclusive environment.	0	%	0	%	2	2%	25	31%	54	67%	81
The instructors created an interactive environment.	0	%	1	1%	3	4%	35	43%	42	52%	81
The instructors used the technology available to communicate effectively.	0	%	0	%	1	1%	21	26%	59	73%	81
The instructors responded promptly to student questions.	0	%	0	%	0	%	12	15%	69	85%	81

Perceptions of the school's tutors

	Strongly disagree		Disagree		Neither agree or diagree		Agree		Strongly agree		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
The tutors created an inclusive environment.	0	%	1	1%	5	6%	25	31%	50	62%	81
The tutors created an interactive environment.	0	%	2	2%	10	12%	29	36%	40	49%	81
The tutors used the technology available to communicate effectively.	0	%	0	%	7	9%	28	35%	46	57%	81
The tutors responded promptly to student questions.	0	%	0	%	4	5%	15	19%	62	77%	81

Perceptions about the technology used for the school

	Strongly disagree		Disagree		Neither agree or disagree		Agree		Strongly agree		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
The technology used was appropriate for the school.	0	%	0	%	2	2%	18	22%	61	75%	81
The technology used was effective overall.	0	%	0	%	1	1%	19	23%	61	75%	81
The technology used was difficult to navigate.	35	43%	29	36%	5	6%	2	2%	10	12%	81
I would have preferred different technology was used to allow for more effective communication.	25	31%	33	41%	20	25%	0	%	3	4%	81

Type of technology preferred for more effective communication during the school

Response
none
I loved using Jupyter Hubs and the video lectures on YouTube. I would have loved if the lectures were slighlty shorter and the instructors had used animations or links to other YouTube videos as well.
The JupyterHub environment provided to us really amazing It's functions were pretty cool

Note: The three respondents who answered Agree or Strongly Agree to the previous item “I would have preferred different technology was used to allow for more effective communication” were shown this question.

Respondents’ level of experience with e-learning

Value	Percent	Count
I have not participated in any e-learning before this school	20%	16
I have had some experience with e-learning (e.g., taken an online class)	41%	33
I have a lot of experience with e-learning (e.g., taken several online classes, workshops, etc.)	40%	32
Totals		81

Satisfaction with the Astronomy School's logistics

	Very dissatisfied		Dissatisfied		Neither dissatisfied/ satisfied		Satisfied		Very satisfied		Not applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Registration process (pre-workshop information)	1	1%	0	%	1	1%	17	21%	61	75%	1	1%	81
Communication about the school from program leaders before the school began	1	1%	0	%	4	5%	17	21%	57	70%	2	2%	81
Technology (platform used for delivering the school)	1	1%	0	%	0	%	15	19%	63	78%	2	2%	81
Atmosphere (friendly, supportive, promoted collaboration)	1	1%	0	%	3	4%	21	26%	55	68%	1	1%	81
School agenda (clear purpose, balanced, useful)	1	1%	0	%	2	2%	17	21%	61	75%	0	%	81
Timing of the event (days held, times held)	1	1%	3	4%	14	17%	19	23%	44	54%	0	%	81
Length of the event (not too long or too short)	1	1%	3	4%	5	6%	28	35%	44	54%	0	%	81
Format of the sessions (recorded lectures, live discussions, and live interactive workshops)	1	1%	1	1%	0	%	17	21%	62	77%	0	%	81
Results (productive, time well spent, beneficial)	1	1%	0	%	1	1%	25	31%	54	67%	0	%	81

What respondents liked **most** about the GROWTH Astronomy School

Response
Well organised and planned.
Three things I liked mostly; Friendly GROWTH TEAM, Lectures and hand-on-section as well as the interactive platform, Slack.
The hands-on workshops
Lecture notes and videos recorded
The lecturers, the tutors and the slack discussions. The content was brilliant. The python modules were brilliant and detailed.
I enjoyed the focus on practical aspects - how to reduce/gather data for your science needs.
The hands-on practical session.
I liked that the all the teachers and tutors were very encouraging and helpful at all times. There was always someone to discuss your doubts with.
I learned a lot and a lot of beneficial things too!
I like the content of the classes and python workshops. I could learn a lot from them.
The pre-recorded lectures were of an excellent quality. The python notebooks were instructive and easy to follow, and will be good to refer back to in future.
I like how we are able to work out the modules on our own through Jupyter notebook and save our progress and look at the solutions at a later time.
How engaged were the instructors with us.
Personally, I found the atmosphere on slack very supportive and engaging. I liked just reading what people were writing on the slack channel.
The very didactic instructors and the good attention to the doubts of the organizers.
1. Pre-recorded lectures 2. Live observation session
The hands on sessions
Learning things about transients
The instructors seemed highly skilled at what they are doing and were quite effective at communicating their thoughts.
The limited amount of participants and personal attention in the breakout rooms.
I liked watching the prerecorded lectures. It gave me more time to absorb it.
the instructors and tutors were very friendly and approachable, the lectures and jupyter notebooks are very informative and helpful
The interactive workshops
The opportunity to not only learn about different time wavelengths in a coordinated way but also to have tutorails to learn how to do the things we had learned in the lectures
the python notebooks and exercises were great, and I expect to refer back to them when doing research
The variety of topics, and the timing

What respondents liked **most** about the GROWTH Astronomy School (Cont.)

Response
the interactive python sessions. And the great lectures & Q&A
topics, content, engagement
The interactive or live coding aspect was very informative.
That I was able to learn about a wide array of topics over a short period of time and also have an opportunity to use this knowledge.
I really like python, so using it for every module provided me with tools which I'll probably use throughout my career.
Being able to play with real data - making what we hear in the lectures real.
It gave a great overview of everything.
The lectures, hands-on sessions. But most importantly the live observing session.
balance between youtube lecture and python workshop
I like the diversity, meeting and hearing from other students, and the very interactive format. It was nice to learn by doing.
The observing sessions were very interesting!
I liked learning new techniques in time domain astronomy.
I liked many things about the school. First of all, the environment was very friendly in all levels (professors, tutors and participants) even though we don't know each other in person I feel like a met a lot of nice people during the school. Apart from this, I really think that the topics included were extremely interesting and useful. From short chats with other students I realized that this summer school was directly applicable to all our research projects (generally the PhD thesis).Finally, the way the summer school was organized was extremely useful to be able to follow the topics without getting lost and to maximize the contents we could learn. This was one of the best summer school I have ever attended.
From my Institution
The format of lectures and then Q/A and then live modules
The friendly environment.
The observing session
Organization and well-prgramed schedules.
Interactive hands on session with tutors
The hands-on acitivies and examples.
Hearing people's doubts and answers from experts. This is something we don't have everyday in college and was specially interesting during this quarentine.
The pre-recorded lectures and those tutorials, where the lecturers explained in detail and very well what a certain piece of code will do and how to apply it to data.
The chance to work on the jupyter notebooks

What respondents liked **most** about the GROWTH Astronomy School (Cont.)

Response
Using each online platform effectively.
The amazing lectures, very useful and interesting
Well-balanced and we spent just enough time on each wavelength to get a taste.
NA
I enjoyed the practical knowledge provided by the interactive notebooks.
that it was meant for us to learn the basics, they did a good job in communicating what is essential, and did not expect us to have prior knowledge (as many schools do...)
I liked how the tutors made the most of the tools available.
The variety of topics.
I learned a lot about techniques that I will use.
The observation run was amazing. It blew my mind and it was exactly what I was hoping we would do. To see the binary eclipse happen in real time and make the observations made me feel like I was a young astronomer in the making. Thank you for the observation run. It changed my life.
I enjoyed the multiwavelength approach. I have not much experience with transients since my interest is galaxies. However, I have enjoyed learning in general. My favourite was spectroscopy because I like it.
1) lectures (very informative) 2) hands on notebooks (nicely made)
It gave me the opportunity to learn many new techniques across the electromagnetic spectrum.
Different areas of Astronomy was discussed
Learn a lot of things in a short time!
The best session was the live observing (both with the SAAO and the LT). I didn't have time to take part in the Data Challenge, but I wish I had, because it was a cool idea!I liked the range of topics covered, and the use of Jupyter notebooks hosted on github so we didn't have to install all the right programs and make sure all the dependencies were sorted out - we could just get on with the exercises. I also appreciate that the material will be available online after the school, not only for the participants, but for anyone who wants to access it.

What respondents liked **most** about the GROWTH Astronomy School (Cont.)

Response
I was pretty impressed by the code of conduct that the school had. Very necessary and I am sure that it helped to create a diverse and equal environment for all races, gender, etc. Love it!
The content and how approachable the lecturers were.
The python tutorials were almost all extremely well thought out and had good exercises for us to do (during breakout rooms)
The material made available to students from the last year of undergraduate degree to postdocs
It covered all the wave-bands.
Lectures
I really learned a lot from it. There was a lot of information but I feel like it was approached well and at a good pace. I liked using Jupiter notebooks and being guided through them with time to work in our breakout rooms.
Wide array of topics. Excellent tutorials.
Learnt a lot from experts and had the opportunity in interacting with them
The fact that it covered data analysis techniques in multi-wavelength band which has the potential to reveal a lot of information about a certain object.
I liked how efficient the modules were. Also the lectures were point on which helped me learn a lot.
Tutorials
What I most liked was the python workshops. I learned a really lot of new stuff with them!
interesting to study transients from different points of view
Live Q&A sessions and Breakout rooms
I would say the organisation, starting from registartion, jupyterhub setup, pre recoded lectures and slack channels. Also the breakout rooms were good.

What respondents liked **least** about the GROWTH Astronomy School

Response
the times chosen. I would have preferred three hours earlier to start and finish. Too tough to attend after midnight.
I could only wish that it was offline.
Sometimes the lectures became boring and as mentioned previously I would have loved to see more illustrations and animations.
There was one or two tutorial sessions, where we more or less just got the notebook and we were supposed to solve everything alone. I think in such limited amount of time for one session, this is counter-productive. I preferred the tutorials, where the lectureres first explained what we are doing and what a piece of code did to our data, and then let us apply this to our problem.
I did not like the time disposal. I understand that, with different time zones, people suffered from different problems. In Brazil, the school was from 10 am to 2 pm. It would be better if the break in the middle was more than just 10 minutes. Every day, I have lost the first 5 minutes of the Q&A after the break because t was lunchtime and I had to eat for medical reasons, and even eating faster, I couldn't end it on time. It would have been better a break of 15 or 20 minutes instead of 10. It would allow people to eat something. 10 minutes, is only enough to go to the bathroom and grab water. Nonetheless, I understand that it would be really hard to find the perfect time for everyone.
maybe the distance
The timezone barrier for me
Honestly, I did not find it.
That it ended in just 5 days!
Missed out on in person interaction due to online format
The time per day might have been better more hours per day.
In general I didn't dislike anything, but I do have suggestions: see below.
It being online, although that's out of our control
For me the timing was a bit bad because I attended the school in AEST time zone and it was form midnight to 3 am for me which made very tired. but i understand that its difficult to find a spot which is good for all.
Time difference
sometimes due to time constraints the teachers would rush over the python notebooks and it was slightly difficult to follow
Short itme for the hands-on acitivies.
Being online.
Nothing really, it was all very good
Not having a chance to network. I liked the style of some tutors more than others. If we could discuss in team before the tutor helped would be better.
It is probably just a result of the online format but I don't really feel like I got to know my peers very well, even just in my breakout room. It was generally very quiet and only a few people tended to speak up.

Note: 16 respondents indicated N/A or no response.

What respondents liked **least** about the GROWTH Astronomy School (Cont.)

Response
It would have been nice to do it in person, but I accept that that was impossible this year.
It was hard to meet and get to know many of the participants due to the online format.
I would have liked a bit more interaction.
The online format, though good for the constraints we are in, was not ideal.
The fact that it was online but these are extraordinary situations.
How quick everything went!
The python workshops were not all of the same quality. The vast majority were very good and clear as to what was needed; however one or two were badly paced and effectively required you to produce code identical to that written by the author to be able to progress. The radio workshop was the most notable example of this.
Maybe data challenge could have been open for more than one day (happens that during that day, there was no time to work on it) - and seemed like it would have been fun
It was unfortunate that the program had to be remote but the GROWTH team did a great job adapting to the current situation.
I understand its not your responsibility, but I'd have liked to take part in this school offline
I think the most difficult thing is to be in front of a screen everyday. The schools in general are intense so I got tired easily. I guess that this is a consequence of the pandemic so I imagine that for the next summer schools is not going to be the case.
A lot of the content is the basics, the first few days weren't applicable to me. However, I understand the range of capability going in is huge; potentially having parallel sessions on the same topic. One for advanced students and one for beginners.
large volume of participants
Knowledge seeking in MV range
A bit longer break would have been nice like 15min or something
that there was not much of a platform/time to get to know your tutors & teachers and/or fellow students. Also, it would have been fun to learn a bit more about different careers in transient astronomy.. E.g., how did the lecturers get into this field? What do they like most about their research/work
Online prevents interaction. It was also very difficult to gauge the progress students were making while in breakout rooms.
The online format.
Jupyter
The lack of interactions with other participants.
Lectures Tutors assistance The way the code of computation presented
I didn't get to have fun conversations.
That it was online, but there was no other option available right now, so that's okay

Note: 16 respondents indicated N/A or no response.

What respondents liked **least** about the GROWTH Astronomy School (Cont.)

Response
Some breakout sessons required more time and the time allotted were not sufficient.. As a result couldn't be utilized properly.
It was inconvenient to switch back and forth between watching the notebook presented and filling in on my own notebook, so I missed some information during the interactive sessions, but I like that the information was posted later.
i wish it was of longer duration
I couldnt join the SAAO observing session due to timing. I would prefer one of the sessions to be on other day. This was the part I least liked.
Radio data analysis was just a glimpse and was fast.
I did not had the opportunity to interact in person with other people
Not being able to complete some of the coding exercises during the allotted session.
That I couldn't follow some of the python sessions.
I really liked everything. It was such a great school, I am sad that this was my first GROWTH school.
The time of the sessions, though this is a result of my time zone, not the school.
Some of the Live sessions were too difficult for me, just on the basic level, as there wasn't enough example code to scaffold my answers. Again, I understand this will be a personal thing. But the solutions were all provided, so the exercises are still very useful, and I'm sure I'll get more out of them when I work through the solutions.
Less interaction due to virtual format
I had a bit of difficulties to complete some exercises during the workshops and felt disappointed with myself. But I accept that I'm going to have to review the notebooks calmly. I learned a lot anyway.
I honestly have no complaints about it. Despite the situations that we are all in, I believe that the school made the most of it. Only add that the amount of time that they gave us in the end of the school to answer this question was insanely short! That's a lot of questions in here to be answered in only 10/15min.
People not putting on their cameras and not talking or communicating in our break out rooms. We had the same break out rooms every day. It was nice working with some in my group but more than half of our group never really said anything and that made me even more shy to say anything.
Nothing about the school itself, just that I spent too much time looking at my laptop screen
perhaps the lectures should also be focused on the coding rather than just the theory.
less time for data analysis
It was online.
Lack of spending time in person with participants and instructors/tutors
The fact that the support provided to the B. Sc. or M.Sc. students by the tutors could be a little more in terms of the hands-on -sessions. Most of the pre-PhD students do not have the expertise to code in Python and so a little bit more help from their side would help us to learn a lot more and enjoy the sessions better.

Note: 16 respondents indicated N/A or no response.

Respondents’ likeliness to recommend the GROWTH Astronomy School

Value	Percent	Count
Not at all likely	0%	0
Slightly likely	0%	0
Somewhat likely	4%	3
Very likely	23%	19
Extremely likely	73%	59
Totals		81

Respondents' suggestions to improve the GROWTH Astronomy School

Response
Increase the number of hours per day
In general, the school was perfectly tailored. Two things: (1) slightly higher break (5-10 minutes more); (2) it would be great if it was possible to see the lectures a few days prior not only the day before (for instance, during the previous weekend). Specially during the data challenge day, at some point, I had to stop my coding to watch the lecture. It would also allow us the chance to watch more than one time some classes and research more about the subject field before the Q&A. (3) I would love if the school have given us daily python exercises with answers for us to have more material to train. It would not be necessary to be corrected live or anything. Just extra material for us to train before going to the real world data.
I just have a suggestion (it could be out of the scope of the school) We learn a lot of things during school. I believe that it could be very useful if there could be some projects for the attendees For example, there could be one project each for lightcurves, photometry, spectroscopy, x-ray, etc. And the attendees could be divided into groups with each group picking one project. Then we can work on the project during school. In the end, maybe a small report on the project. I understand this could be difficult to handle.
My suggestions are: 1) To give a short project for the participants. 2) to increase the days of school (at least 2 weeks)
In the future, I am hoping that we can visit the observatories in person (of course, that is not possible this year) and maybe have some talks about a specific research that the speaker is working on.
Maybe increase the length of the school (1.5~2 weeks)
The school should also introduce some modules that help us reproduce recent research work and thus letting us know how things have been transforming and what is the community upto.
Have a networking session on `YouTribe`
Maybe make every hands on module last more
Maybe allowing slightly longer sessions since a few of the breakout activities felt rushed
Please keep the breaks a little bit longer.
By Increasing the required time to solve exercises.
I really liked the whole jupyter hub setup for the tutorials. It was very effective and efficient and I think they should continue doing that for the future in-person workshops as well
School was more focused towards optical, day of school be extended more to cover more about other wavelength.
It's hard to say how it can be improved. You guys made a very good work.
Increasing the focus on the computational side
spend more days for X-rays and radio. So, there is a good balance with optical.

Note: 25 respondents indicated N/A or no response.

Respondents' suggestions to improve the GROWTH Astronomy School (Cont.)

Response
Maybe more details on radio data - even in the lectures if not suitable for the python workshop.
Also, it would have been fun to learn a bit more about different careers in transient astronomy.. E.g., how did the lecturers get into this field? What do they like most about their research/work It would have been fun if there were some "coffee chats" students could sign up for or are randomly assigned to.
Since online is so exhausting, if it must be online as well next year, perhaps a suggestion would be to have it be the same number of sessions but over a longer period of time (10 days instead of 5), with only one workshop each day (half the time) or simply every other day to provide students with rest from e-learning.
The modules can be held a bit longer.
As already said, future schools should be hybrid, i.e., allowing both in-person and online candidates. Another idea that can be explored is to allow students to work on serious (real) problems that can be pursued further and result in publications. Depending on the expertise of the lecturers and interest of students, many groups can be divided where apart from the regular school activity each group can discuss to work on a real project. Of course, not very much can be achieved within a week, but the groups can stay in touch with each other and then continue to work after the school until completion. This platform can give a head start for such project under the guidance of the lecturer. This activity need not be a part of the formal school schedule. For example, such a thing happens in LPI summer internship and COSPAR capacity building programmes.
Maybe to do it a little bit longer can be good because is too much information.
Make the module sessions a little longer
more interactive activities for breakout groups
Zoom might not be the best option
No, the online format was done very well.
Keep it up!
more time to hands-on acitivies. An more #datachalenges
It would be great to have it online, only.
Allow for a bit more time to do things as well as breaks. I do not personally have childcare duties but I do have other duties that could not be overlooked even though I was attending a school this week! I think it would be good to also include subtitles and/or some form of voice to text for the live sessions...
Maybe post the data challenge earlier in the week. Participants have more time to work on it, and even try out the skills from their modules on the data as soon as the modules finish.
You can give some more time to X-ray and radio-bands
I liked the breakout competition and the data challenge, perhaps doing a couple more optional group challenges would be fun!
Just to include more details about the physics of some transients during some lectures,
The python sessions were hard to finish in the given time. Maybe something can be done about that.

Note: 25 respondents indicated N/A or no response.

Respondents' suggestions to improve the GROWTH Astronomy School (Cont.)

Response
Social time between people in the same breakout room scheduled?
make some sessions shorter so they finish in time without rushing through
Thank you for the time that you all put in :) Everything was overall very well organised, assuming this was not quite easy during the COVID situation. Many Thanks
If time allotted for the school could be increased may be some more time could have been given for tutorials
Some more detail about the coding in the notebooks would have been nice, especially when it comes to writing code from scratch rather than filling in the missing lines.
Make sure all of the Jupyter notebooks have at least some example code you can copy and paste to complete the exercises. One or two were a bit too freeform for me (but this possibly wasn't a problem for most other people).
The coding exercises could be designed to be more time-appropriate or there could be more time allotted for the set exercises.
Yes, It can be divided into summer and winter online sessions with more details of X-ray and radio analysis.
Decrease the level slighlty so more undergraduates like me can participate. The school was predominantly dominated by post graduates and Phds.
Strong emphasis: I feel that there could have been much more emphasis on scientific results - i.e. how the various techniques were employed by the GROWTH collaboration in their scientific publications. I would have appreciated more information on the science output of the GROWTH team - what are the 'big questions' they are focussing on solving - and where they believe future work lies.
We can have some sessions where we talk about the latest research and about connections across the tools we learnt. We can have those on the penultimate day. More thematics.
Make it a bit longer so some topics can be covered more in depth
I am actually not sure how to make it better, probably allowing more time for the hands-on sessions so they actually fit in their time slot
Ask students to commit to putting on their cameras. Lets do more observation runs!! Show more about the telescopes and what YOU do as an astronomer because we want to know. We want to have some insight into the lives of astronomers. Thats why I applied.
I have no suggestions. I found everything good
Sometime the live Q&A session was a bit longer than on schedule, then the whole session shifted. For some people, the school was in the evening, so this was not appreciated. Maybe a suggestion could be that the time for Q&A would really be limited to 15 minutes and that the questions were asked on slack only. Then the participants could vote and only the questions with the maximum votes would be answered (then you also make sure, that the participants read all the questions). Other questions could still be answered on slack later.
Kindly help the pre-PhD students a bit more with the Python coding
Could have been longer
I am very happy the way things were planned and conducted.
if the duration can be increased so that people will have more time to interact and grasp the knowledge provided

Note: 25 respondents indicated N/A or no response.

Monday, August 17 – Day 1 sessions: (recorded lecture): Overview of Time Domain Astronomy (Mansi Kasliwal)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	2%	2
Somewhat useful	22%	18
Very useful	28%	23
Extremely useful	47%	38
Did not attend	0%	0
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	10%	8
High quality	90%	73
Did not attend	0%	0
Totals		81

Monday, August 17 – Day 1 sessions: (live discussion): Overview of Time Domain Astronomy (Mansi Kasliwal)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	2%	2
Somewhat useful	17%	14
Very useful	31%	25
Extremely useful	49%	40
Did not attend	0%	0
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	9%	7
High quality	91%	74
Did not attend	0%	0
Totals		81

Monday, August 17 – Day 1 sessions: (Python workshop) Python Basics and Setting Up (Q&A) (Igor Andreoni)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	5%	4
Not very useful	10%	8
Somewhat useful	21%	17
Very useful	27%	22
Extremely useful	37%	30
Did not attend	0%	0
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	14%	11
High quality	85%	69
Did not attend	0%	0
Totals		81

Respondents' suggestions to improve Day 1 sessions

Response
I have no further suggestion on these above sessions because these sessions were very useful.
Python workshop was not really necessary for the rest of the workshops. Perhaps it could have been higher level and the later exercises not so "copy-and-paste."
This was introductory session and it was just right.
The Python workshop could be made more interesting if little more help and support would be provided to the pre-PhD students by the Tutors.
More information on python basics could be provided.
The python workshop was good and necessary, but was not useful for people with reasonable experience. The first day provided a good overview of the school, but from Day 2 is when the school started being useful.
It was great as it was, very well tailored to everything that was coming later in the program
The Python exercises were already assigned as a pre-school assignment, so running through them again was probably not necessary.
Not much improvement is possible as these are just basics.
The quality was excellent, but these sessions were for people new to the field. I did not gain much from them.
All the sessions were good but can be extended more in time.
We could upload the Python modules of all sessions a little more early.
They were really good and just introductions, I would not change anything
Increase the number of hours per session
For me these sessions were too simple, they don't need to be improved really since they're intended to bring everyone up to speed
I think introducing more packages or tools within Python that we can use would be useful. For example, fft can be used to calculate frequency etc.
In general, It was a wonderful day.
There isn't really much you can do when you have to cover the basics
I would have left the second session as homework previous to the start of the school
x-ray. By increasing no of recorded sessions
The live discussion was good, but in my opinion too easy. But that is probably due to the fact we come from so many different backgrounds - from bachelor to postdocs, so it is probably hard to keep the school on the level difficult/easy enough for everyone.
I did not find the Python Basics very useful, as I am proficient in python.
This was the least useful sessions but I fully support them. They are to make everyone on the same page. I knew these things because I use them in my research but with these two sessions I know what level the school will be
I already knew Python, so the basics didn't do much for me

Note: 35 respondents indicated N/A or no response.

Respondents' suggestions to improve Day 1 sessions (Cont.)

Response
Session 2 could have a easy set up manual for your on computer, even though I understand how complicated that might be.
I think it was perfect and both sessions did a good job.
I was satisfied with the usefullness and quality.
Maybe the python session can be done by the students before they start the school.
No improvement necessary, my score re-session 2 python is due to existing familiarity with Python
Day1 - I think perhaps a lecture that brings together the multiwavelength science at the end of the lecture series could go into more depth and resonate more after a week of learning about all those different techniques.
If the first lecture can give an overview of what is going to be covered and how it is useful pertaining to the overall time domain astronomy without going into too much details on one object. For e.g. quoting science on several events instead of just one.
N/A - I rated the recorded lecture as somewhat useful, but it was only intended as an overview, so this is not criticising how useful the session was - it was good.
The python workshop was not needed for me - it could have been optional in my opinion.
These sessions were necessary to get everyone on the same page, but now useful to a somewhat experienced researcher.
The Python basics were to basic compared to the other python workshops, so I would say it should have been a bit more advanced, with some python tricks we don't usually learn previously...
Mansi and Igor were amazing. I felt that both were preoccupied with teaching and sharing their knowledge with the students. Shout out to Mansi, is always inspiring to see woman in science.
Just to add more details in the lecture
They're ok as an intro
I think all the above mentioned sessions were very well planned and prepared and gave participants a general view of the school without overloading them with too much information.
It was usefull
I understand a basic introduction to python was necessary to keep every one in phase. Personally, I was comfortable with the coding part .
I already knew Python so session 2 wasn't important to me.
more videos

Note: 35 respondents indicated N/A or no response.

Tuesday, August 18 – Day 2 sessions: (recorded lecture): Image Data Reduction (Daniel Perley)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	6%	5
Very useful	22%	18
Extremely useful	70%	57
Did not attend	0%	0
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	2%	2
High quality	96%	78
Did not attend	0%	0
Totals		81

Tuesday, August 18 – Day 2 sessions: (live discussion): Image Data Reduction (Daniel Perley)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	0%	0
Somewhat useful	12%	10
Very useful	23%	19
Extremely useful	62%	50
Did not attend	2%	2
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	5%	4
High quality	93%	75
Did not attend	2%	2
Totals		81

Tuesday, August 18 – Day 2 sessions: (Python workshop): Image Data Reduction (Daniel Perley)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	0%	0
Somewhat useful	6%	5
Very useful	25%	20
Extremely useful	68%	55
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	5%	4
High quality	94%	76
Did not attend	1%	1
Totals		81

Tuesday, August 18 – Day 2 sessions: (recorded lecture): UV/Optical/IR photometry (Chris Copperwheat)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	0%	0
Somewhat useful	7%	6
Very useful	22%	18
Extremely useful	70%	57
Did not attend	0%	0
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	5%	4
High quality	95%	77
Did not attend	0%	0
Totals		81

Tuesday, August 18 – Day 2 sessions: (live discussion): UV/Optical/IR photometry (Chris Copperwheat)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	0%	0
Somewhat useful	10%	8
Very useful	30%	24
Extremely useful	59%	48
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	5%	4
High quality	94%	76
Did not attend	1%	1
Totals		81

Tuesday, August 18 – Day 2 sessions: (Python workshop): UV/Optical/IR photometry (Kishalay De)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	1%	1
Not very useful	0%	0
Somewhat useful	11%	9
Very useful	25%	20
Extremely useful	62%	50
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	15%	12
High quality	83%	67
Did not attend	1%	1
Totals		81

Respondents' suggestions to improve Day 2 sessions

Response
It was pretty good
It was, by far, my favourite day.
All are ok!
All sessions were wonderful. I noticed some lectures were very interactive and insightful. I had a problems to grabs all codes during the python workshop. If the python-lecture's session would have divided into two part for the long code or extend the time for explanation it would be great.
I think the amount of code can be overwhelming sometimes and the time constraints on completing those tasks.
Assignments based on data analysis.
One thing that can be done is to give some take-home exercise as a challenge. In reference to all the workshop sessions.
More details could be appreciated in the advanced data reduction.
I think the live discussions are more useful for those who made the questions or already know something about what is being discussed. For beginners it's a bit harder to follow along, but still possible to learn something.
The photometry workshop was the hardest one in my opinion, and I think it was a bit too fast, although very useful.
I think these sessions were excellent!
The session was perfect.
By increasing time length of solving exercises.
I was happy
it was great
These were excellent sessions!
They were brilliant.
Go more in depth with the topics
Again, these covered the basic techniques I already knew about. Going into advanced topics would be helpful for me here.
No comments, these were maybe my favorite sessions.
The python was done way too quickly with poor explanations
Chris Copperwheat and Dan Perley's sessions were excellent and of an extremely high quality. They were the best sessions of the week in my opinion.
hard to improve. A lot of things were explained
good
Everything was of high quality and extremely useful. I have no problem with any of the recorded lectures, workshops, or discussions. I just wish it was longer and a little bit less rushed.

Note: 32 respondents indicated N/A or no response.

Respondents' suggestions to improve Day 2 sessions (Cont.)

Response
(Session 4)The Python workshop could be made more interesting if little more help and support would be provided to the pre-PhD students by the Tutors.
Everything was ok
I enjoyed everything about these sessions.
I felt that the UV/Optical/IR photometry workshop was a bit rushed, I wasn't able to follow in the end
Day2 - comparatively more content than other days, would be better if it can be more concise.
The session 4 python workshop could have been paced slightly better. It ran slightly too fast and it wasn't always clear what code we were expected to write
this was super useful
Just to spend more time in the sessions
The light curve class was very different to the others. We had about 40 minutes breakout room, I don't think it's appropriate.
Chris and Dan sessions were great. Only the Kishalay De python session was a bit too fast at least for me to follow up. I think it is a least one of the disadvantages of having the school online. Looking at the zoom screen and at the same time to the jupyterhub required some skills.
In the python sessions, I wish there was a bit more time to fully understand everything that was being plotted. I understand that was not possible to explain everything but I would have liked to understand why do we use 0 in `HDUList[0]`on Image Data Reduction. I just learned that on Friday
It was good.
The session 4 Python workshop would be improved by including a bit more example code at the start.
Good enough
I found the pre recorded lectures very nice. Also the hands on sessions were very informative and learning
Everything was perfect.
again, some python workshops had to rush due to time constraints
The tutorial was very rushed for an outsider like me to optical astronomy. A little bit slower pace could have helped, but I guess in the interest of time, it was fine
It's perfect.
The coding exercises, though extremely useful, were quite extensive for the allotted time. This could be restructured.
Tuesday was one of my favourite days. I have learn lots of tricks that will be useful for me in future. I think the lecture contents and workshops was well organised.
This session was useful
The photometry python session was a bit hard to keep up with.
All very well done.
They're both ok

Note: 32 respondents indicated N/A or no response.

Wednesday, August 19 – Day 3 sessions: (recorded lecture): Observing Run Preparation (Robert Quimby)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	6%	5
Very useful	20%	16
Extremely useful	72%	58
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	1%	1
High quality	96%	78
Did not attend	1%	1
Totals		81

Wednesday, August 19 – Day 3 sessions: (live discussion): Observing Run Preparation (Robert Quimby)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	1%	1
Not very useful	0%	0
Somewhat useful	9%	7
Very useful	25%	20
Extremely useful	64%	52
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	1%	1
High quality	96%	78
Did not attend	1%	1
Totals		81

Wednesday, August 19 – Day 3 sessions: (Python workshop): Observing Run Preparation (Vahrun Bhalerao)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	9%	7
Very useful	23%	19
Extremely useful	65%	53
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	5%	4
High quality	93%	75
Did not attend	1%	1
Totals		81

Wednesday, August 19 – Day 3 sessions: (recorded lecture): Image Subtraction (Christoffer Fremling)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	2%	2
Somewhat useful	11%	9
Very useful	21%	17
Extremely useful	64%	52
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	9%	7
High quality	89%	72
Did not attend	1%	1
Totals		81

Wednesday, August 19 – Day 3 sessions: (live discussion): Image Subtraction (Christoffer Fremling)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	2%	2
Somewhat useful	10%	8
Very useful	25%	20
Extremely useful	62%	50
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	10%	8
High quality	88%	71
Did not attend	1%	1
Totals		81

Wednesday, August 19 – Day 3 sessions: (Python workshop): Image Subtraction (Igor Andreoni)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	9%	7
Very useful	20%	16
Extremely useful	68%	55
Did not attend	2%	2
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	7%	6
High quality	90%	73
Did not attend	2%	2
Totals		81

Wednesday, August 19 – Day 3 sessions: Observations using Liverpool Telescope

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	0%	0
Somewhat useful	14%	11
Very useful	14%	11
Extremely useful	53%	43
Did not attend	20%	16
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	7%	6
High quality	74%	60
Did not attend	19%	15
Totals		81

Respondents' suggestions to improve Day 3 sessions

Response
Increase the number of hours per session
It was a very good day. I have only one small thing to say. The tutor from the Observing Run Preparation phyton workshop talks really fast. It was hard to catch up.
good
All lectures were very useful
The observations would have been really awesome if it was done in person.
Did not feel I learned alot from the live observing session. But it was fun.
One thing that can be done is to give some take-home exercise as a challenge. In reference to all the workshop sessions.
(Session 6)The Python workshop could be made more interesting if little more help and support would be provided to the pre-PhD students by the Tutors.
Maybe the observation run with the Liverpool telescope, where everything was done robotically was not extremely exciting. (even though the talk and the presentation were very good)
The recorded video from Christoffer Fremling was a it confusing for me to follow. And the observations made an entire difference for the school. The experience and the explanations gave by Chris, Dan and David in both telescopes were amazing
The session on Observation Run Preparation was the best of all. Prof. Quimby explains everything very well and Prof. Bhalerao took an extremely nice well-planned tutorial.
Just to increase the duration of the session about image subtraction
The live session could have been recorded as some of us live in very different timezones.
I had inconvenience with timing of live observations
We can more time to practise image subtraction.
Go more in depth with the topics
Again, these covered the basic techniques I already knew about. Going into advanced topics would be helpful for me here. example: (for image subtraction, running HOTPANTS or ZOGY)
I'm happy about Quimby's session as I look forward to using his info in personal observational time
I wasn't hugely interested in doing any observing, so I wasn't interested in the preparation for it. It might be useful in the future and it was interesting to see a robotic telescope
I learned a lot of new techniques and I was very happy with these sessions.
This session was useful
Assignments based on lectures and data analysis.
I am happy with the format

Note: 36 respondents indicated N/A or no response.

Respondents' suggestions to improve Day 3 sessions (Cont.)

Response
I definitely wanted to attend live observations, but cannot due to different time zone.
That's pity for me.
I have got all sessions very important
This was the most useful day for my research.
I am not an observer, so maybe provide information for non-observers in the observing runs/lessons as well.
Not an improvement, but I just wanted to say, Robert Quimby's live observing run preparation series was awesome!
Day3-Great!
The lecture on Image Subtraction was dry.
More of Robert Quimby! Both his talks were GREAT and his python tutorial was really good too.
the webcam of the liverpool telescope was not always as clearly visible (the dome etc.)
I think there is no need for improvement.
While I missed the Liverpool Telescope observing session, I did attend the SAAO one. It was a superb idea to integrate these remote live sessions into the school, and should probably be done for future runs of the school too.
Very informative!
In general, it would have been better if we had to do some homework in python (with solutions) before the workshop just to get a better feel on what we would be doing in the session
Loved the observing run lecture!
It would be nice if the live telescope observations were more structured i.e. we decided on the objects to look at before the session.
The light curve class was very different to the others. We had about 40 minutes breakout room, I don't think it's appropriate.
The observation run was amazing and I wish that we could have done it for more than just one day of summer school. I actually wish we did it every day.
I was happy
they were great
I had technical issues with session 6 python workshop, but the tutor helped me follow well enough. I have a lot of experience with optical observations, so I did not learn new things with the 'observing using LT', but I can imagine that it is very very useful for others without experience
I sadly had an assignment to submit so could not attend, but will definitely be completing the notebooks and watching the recordings at the first available opportunity.
Another favourite day was learning about how to use python for image subtraction instead of IRAF. Thank you
It's perfect.

Note: 36 respondents indicated N/A or no response.

Thursday, August 20 – Day 4 sessions: (recorded lecture): Lightcurve Analysis (Melissa Hayes-Gehrke)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	0%	0
Somewhat useful	14%	11
Very useful	21%	17
Extremely useful	63%	51
Did not attend	2%	2
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	10%	8
High quality	88%	71
Did not attend	2%	2
Totals		81

Thursday, August 20 – Day 4 sessions: (live discussion): Lightcurve Analysis (Melissa Hayes-Gehrke)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	12%	10
Very useful	28%	23
Extremely useful	57%	46
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	9%	7
High quality	90%	73
Did not attend	1%	1
Totals		81

Thursday, August 20 – Day 4 sessions: (Python workshop): Lightcurve Analysis (Melissa Hayes-Gehrke)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	15%	12
Very useful	21%	17
Extremely useful	62%	50
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	7%	6
High quality	90%	73
Did not attend	1%	1
Totals		81

Thursday, August 20 – Day 4 sessions: (recorded lecture): Spectroscopy (Robert Quimby)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	5%	4
Very useful	16%	13
Extremely useful	77%	62
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	2%	2
High quality	96%	78
Did not attend	1%	1
Totals		81

Thursday, August 20 – Day 4 sessions: (live discussion): Spectroscopy (Robert Quimby)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	9%	7
Very useful	17%	14
Extremely useful	73%	59
Did not attend	0%	0
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	2%	2
High quality	98%	79
Did not attend	0%	0
Totals		81

Thursday, August 20 – Day 4 sessions: (Python workshop): Spectroscopy (Robert Quimby)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	9%	7
Very useful	14%	11
Extremely useful	77%	62
Did not attend	0%	0
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	5%	4
High quality	95%	77
Did not attend	0%	0
Totals		81

Respondents' suggestions to improve Day 4 sessions

Response
I explored a new area of variable stars which was fun to learn. I liked the python exercises.
The light curve class was very different to the others. We had about 40 minutes breakout room, I don't think it's appropriate.
Increase the number of hours per session
Also, A very good day.
I found no need for improvement
I liked mostly the spectroscopy part and light curve python session.
If the format of the exercises can be normalized that would be great!
All sessions are fine to me!
It was good
One thing that can be done is to give some take-home exercise as a challenge. In reference to all the workshop sessions.
More time for the workshops
The sessions were perfect. Prof. Quimby's session was beyond perfection :)
The quality is good enough.
(Session 8)The Python workshop could be made more interesting if little more help and support would be provided to the pre-PhD students by the Tutors.
The lightcurve analysis session got boring quickly, it could have been better placed.
I would have liked to do some fits of light curves, but no just variable stars, in the session of lightcurve analysis
We can upload solutions to optional problems too.
Go more in depth with the topic
I would have liked some other types of lightcurves (eclipsing binaries, transiting exoplanets, transient lightcurves). I would have also liked to determined uncertainties in the periods we derived and other properties of the objects we were looking at.
I didn't really see the point of talking about variable stars so much, when other transients have lightcurves too. Also there were technical issues during Prof. Hayes-Gehrke's lecture and these made me very furstrated. The spectroscopy session was both too technical and not technical enough?? The lecture was phenomenal as an introduction but then I felt like I did not learn more, really, during the workshop
Not too much to add
happy with the explanations. Clear and useful
Assignments based on lectures and data analysis.
good
I knew the topic in the first part, but the python session included many useful tasks

Note: 30 respondents indicated N/A or no response.

Respondents' suggestions to improve Day 4 sessions (Cont.)

Response
Again, the coding exercise felt too extensive for the time allotted, even though the material was extremely useful.
I would prefer the lightcurve workshop to split in smaller time breakout sessions rather than a long session to help us understand better if we are stuck at earlier on in the notebook.
Day 4 - I think light curve analysis maybe could be somehow combined with light curve related analysis in radio analysis section
It's perfect.
Good enough
The Session 7 Python workshop could have been improved by a bit being a bit more instructor-led, with Melissa talking through the exercises a bit more.
Loved the spectroscopy lecture!
These sessions were fantastic!
I really enjoyed both. I felt like a large portion of the lightcurve analysis was explaining how to interpret a fourier transform, which students were already familiar with.
It was good.
I really did not like the "here is your notebook and now you solve this" principle of the Light curve analysis python workshop. I can do such things with notebooks that lead you through a problem in my spare time. I would much more appreciate if we were guided through the notebook by the lecturer, because this way you learn much more.
The spectroscopy was super dense. There is so much that I do not understand about the code and it felt like we did not have enough time to cover all the work. Overall, everything else was amazing and super interesting.
I was happy
they were perfect
Session 7 Python session was a bit too simple, and I wondered if we could have learned more about the in and out of Lomb-Scargle periodograms and sampling
They were good. Maybe going a bit slower in Python workshop - Spectroscopy
very good
Everything was good
I have some experience with lightcurve analysis, so was familiar with the concepts.
Quimby's session was perhaps too loaded with code
This session was useful
it was useful
Nothing much to say, just that Robert and Melissa were pretty amazing explaining all the details. Very nice sessions.
All sessions were good.
All great!
The best day

Note: 30 respondents indicated N/A or no response.

Friday, August 21 – Day 4 sessions: (recorded lecture): X-ray Astronomy Data Analysis (Brad Cenko)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	2%	2
Somewhat useful	5%	4
Very useful	25%	20
Extremely useful	67%	54
Did not attend	1%	1
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	2%	2
High quality	95%	77
Did not attend	1%	1
Totals		81

Friday, August 21 – Day 4 sessions: (live discussion): X-ray Astronomy Data Analysis (Brad Cenko)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	1%	1
Not very useful	0%	0
Somewhat useful	6%	5
Very useful	28%	23
Extremely useful	62%	50
Did not attend	2%	2
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	2%	2
High quality	94%	76
Did not attend	2%	2
Totals		81

Friday, August 21 – Day 4 sessions: (Python workshop): X-ray Astronomy Data Analysis (Brad Cenko)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	1%	1
Not very useful	0%	0
Somewhat useful	6%	5
Very useful	25%	20
Extremely useful	64%	52
Did not attend	4%	3
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	1%	1
Medium quality	6%	5
High quality	89%	72
Did not attend	4%	3
Totals		81

Friday, August 21 – Day 4 sessions: (recorded lecture): Radio Analysis (David Kaplan)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	7%	6
Very useful	30%	24
Extremely useful	58%	47
Did not attend	4%	3
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	6%	5
High quality	90%	73
Did not attend	4%	3
Totals		81

Friday, August 21 – Day 4 sessions: (live discussion): Radio Analysis (David Kaplan)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	0%	0
Not very useful	1%	1
Somewhat useful	9%	7
Very useful	30%	24
Extremely useful	53%	43
Did not attend	7%	6
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	0%	0
Medium quality	7%	6
High quality	85%	69
Did not attend	7%	6
Totals		81

Friday, August 21 – Day 4 sessions: (Python workshop): Radio Analysis (Arvind Balasubramanian)

Respondents' perceptions of session usefulness in advancing research skills

Value	Percent	Count
Not at all useful	1%	1
Not very useful	2%	2
Somewhat useful	11%	9
Very useful	37%	30
Extremely useful	42%	34
Did not attend	6%	5
Totals		81

Respondents' perceptions of session quality

Value	Percent	Count
Low quality	4%	3
Medium quality	19%	15
High quality	72%	58
Did not attend	6%	5
Totals		81

Respondents' suggestions to improve Day 5 sessions

Response
more time for the q & a
Another excellent day.
Session 10: I found the session to be intense but it could be inexperience in radio analysis
All lectures and python workshop sessions were fruitful.
The radio analysis did get a bit length but I think it was super cool and useful!
More time was needed for the python workshop for session 10
One thing that can be done is to give some take-home exercise as a challenge. In reference to all the workshop sessions.
More time for the workshops/less extensive ones, this day felt quite rushed
The session was perfect and well planned.
It would be better to increase no. of intensive sessions wih more topics in every lecture to get more deeper knoweldge into the field
The last lecture on Radio Analysis could have been better. It was unnecessarily long and got way boring!
The python session held by David Kaplan was very confusing for me. I don't know if it was mainly because was the last session from the last day, but it was hard to follow. Shout out to Viraj who was the tutor in the breakout room and really tried to help us all. Actually, shout out to all tutors. They were all great.
For the session 10 python module, we can devote more time in future.
I feel like both sessions skipped some of the basic concepts and went directly to data analysis, specially in the notebooks
The session were very useful for me, there is potentially the problem for people who are familiar with these subjects not gaining much. However, I am too novice to know what these improvements could be!
(Both Session 9 and 10)The Python workshop could be made more interesting if little more help and support would be provided to the pre-PhD students by the Tutors.
I'm not interested in X rays, so it wasn't exactly a useful session, but it was interesting. I am interested in radio, meaning I have done a fair bit of what was covered before. During the live sessions, neither host has a good internet connection and my Jupyter server stopped responding, so those parts were useless.
Solutions provided after each breakout so that we can continue to follow along -- Session 10 (Python workshop): Radio Analysis (Arvind Balasubramanian)
Very good lectures and python exercises.
I appreciated both
This session was useful
Assignments based on lectures and data analysis.
I got very lost during Session 10
Again, the python workshop on Radio Analysis was hard to keep up with.
These sessions were excellent, but not directly relevant to my current research.

Note: 36 respondents indicated N/A or no response.

Respondents' suggestions to improve Day 5 sessions (Cont.)

Response
For Session 10 (Python workshop), the quantity of exercise is little bit too large for me
I couldn't attend for personal reasons but the jupyter notebooks are very high quality
I didn't know almost anything about this topic. I leaned a lot, although the last python session was difficult to follow. Maybe because was too much unknown information.
Radio analysis workshop was somewhat difficult to finish in the given time, but the content was interesting and important.
I felt that the radio analysis Python workshop was rushed and a bit difficult
Day 5 - could give more depth on differences of radio data with other data - since it is very different, it would be helpful to know a little more background, even if we don't do the cleaning process in python workshop.
The session 10 python workshop could have been improved by reducing the amount of code students were expected to write. It was written in such a way that students needed to anticipate what was in the rest of the workshop to be able to write their code correctly e.g the plotting function required you to know that you would be creating an array with different headings and set up is statements accordingly. This combined this combined with not being shown what the answers were after the breakout sessions meant that it was very easy to become lost and unable to progress to the next section in the next breakout.
There was a lot of work to squeeze in for the Radio Analysis python workshop.
maybe for the session 10 python workshop, go a bit more over what the FFT python function is.
Although MCMC modeling is very useful and applicable to radio analysis, I would have preferred a radio image reduction lecture - very important for me at this stage.
The radio analysis python workshop was fast-paced and somewhat more in-depth compared to the rest of the workshops. Perhaps, break into two sessions or proceed slower.
The light curve class was very different to the others. We had about 40 minutes breakout room, I don't think it's appropriate.
The Python workshop (Session 10) contained too much things to do, maybe it could be better to have less things to code in order to be capable of finishing and understanding everything
And again, the time allotted for the coding assignment didn't feel sufficient to fully go through the code. While it is useful to have the coding notebooks, guides and solutions to complete later at one's own pace, it might be beneficial to redesign the plan for such a session in future.
Radio workshop was long but very useful in terms of content.
The radio python workshop was too ambitious for the timing. However, I know that I can work on it later and learn a lot, because it is very complete
The radio analysis was almost like the spectroscopy. It was way too dense for the time we spent on it. It felt rush. Everything was amazing and definitely worth covering, but it was too much for the time we had. I felt like I was a bit lost with all of the information because I couldnt process that much in so little time.
These sessions were really great! I wish they had included a bit of X-ray spectroscopy too
For both of the Python Workshops, I felt a bit more example code in the workbooks would be useful.
The Python workshop - Radio Analysis could have been slower. This was the fastest workshop.

Note: 36 respondents indicated N/A or no response.

Demographics

Gender	Percent	Count
Male	52%	42
Female	42%	34
Other, please specify:	2%	2
Prefer not to specify	4%	3
Totals		81

Other, please specify:	Count
Middle eastern	1
non-binary	1
Totals	2

First-generation student status	Percent	Count
Yes	41%	33
No	59%	48
Totals		81

Demographics (Cont.)

Race/Ethnicity	Percent	Count
Asian	40%	32
American Indian/Alaskan Native	0%	0
Black /African American	4%	3
Native Hawaiian/Pacific Islander	0%	0
Hispanic or Latino	14%	11
White/Caucasian	33%	27
Other, please specify:	5%	4
Prefer not to answer	5%	4
Totals		81

Other, please specify:	Count
Indian	1
Mapuche	1
Middle eastern	1
Turkish Cypriot	1
Totals	4