

# *Impact of SARS Across a Physics Programme: Exposing Learning Deficiencies*

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In the academic year of 2002–2003, the Department of Physics at The Chinese University of Hong Kong had 220 undergraduate students, 80 graduate students, 21 faculty members, six additional teaching staff, and 20 other supporting staff. In its BSc, MSc, MPhil and PhD Programmes in Physics, the department has always upheld a vigorous course requirement for students to acquire a solid foundation in physics. The department has also recently established a comprehensive portfolio of courses in materials science and engineering for its relatively new BSc, MPhil and PhD Programmes in this subject. In addition, the department offered a variety of general education courses for students of other departments to appreciate the beauty of physics and astronomy.

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In the local academic community, the department has always been praised for its conscientiousness in teaching. Indeed, in the past ten years, the department had tried a variety of curriculum designs to enhance the overall student learning outcomes in the department. Several teaching development projects have been conducted to incorporate concepts such as web-based, problem-based, and case-based approaches in teaching and learning. In addition, trials have been deployed to motivate students to engage themselves in various forms of learning other than the traditional credit-earning course work in class. Some of these led to the establishment of the mentoring program (students taking guided studies), summer undergraduate research exchange program (students experiencing frontier research overseas), student research program (students conducting research in the department), summer teaching apprenticeship program (students learning teaching at local high schools), and summer industrial internship program (students working in industry). On top of these measures, the department has formed a partnership with the Centre for Learning Enhancement And Research and thereby engaged itself in studying new cognitive techniques for teaching and learning physical sciences.

On the platform of this conscientiousness in teaching in the department, we constantly strive to improve the teaching and learning environment for our students. As shown in the following recollection of the effects of SARS on teaching and learning in the department, SARS and its ripple effects have helped us to recognize some critical teaching and learning deficiencies, and stimulated us to overcome them. In this context, I must say that SARS has given us a very important lesson in our journey of continuous improvement in teaching and learning.

### **University Class Suspension: Press Release by CUHK on 28 March**

The Severe Acute Respiratory Syndrome (SARS) was officially recognized as a potential global epidemic on 12 March 2003 when the World Health

Organization issued a world-wide alert about cases of this atypical pneumonia. By the end of March, about 900 infection cases were recorded in Hong Kong and clusters of these cases had emerged from hospitals, a hotel and an apartment building. Evidently the outbreak had already spread to the community. On 28 March, The Chinese University of Hong Kong decided to suspend its classes from 29 March to 6 April.

The Chinese University of Hong Kong has shown great concern about the effect of the Severe Acute Respiratory Syndrome (SARS) on its students and staff and the campus as a whole. The CUHK Campus Severe Acute Respiratory Syndrome (SARS) Task Force was formed on 22 March 2003 to monitor the impact of SARS in CUHK. The Task Force has also proactively taken precautionary measures to safeguard the health of staff and students against the possible occurrence of the infection. Proper education about the disease has been emphasized.

Up to 26 March, two documented SARS cases were found, but the disease had been contracted outside the campus. Both students were admitted to the Prince of Wales Hospital. Counseling and medical screening were provided for students who were believed to have had close contact with the infected students. The infected students' hostels (including their rooms, the common room and toilets) and other affected facilities were thoroughly disinfected and cleansed.

On 27 March, another student of the University was reported to have contracted SARS, also from a source outside the campus. In view of the occurrence of SARS cases on more than one location on campus and that the infected students have been to classes and used facilities in various parts of the campus, The Chinese University of Hong Kong has, after careful consideration and deliberations, decided that teaching on the Shatin Campus be suspended from Saturday, 29 March until Sunday, 6 April.

This would help to reduce the risk of cross infection of SARS among students and staff on campus and enable thorough cleansing and disinfecting to be carried out extensively on campus including classrooms, and other academic facilities, hostels, restaurants and other amenities. All students are strongly advised to stay home as far as possible during this class suspension period. However, research students may continue to carry out research work on campus. Despite the suspension of classroom teaching, the University campus will remain open and maintain normal operation. With the exception of courses offered on the Shatin Campus and the Prince of Wales Hospital, all courses offered on off-campus locations will continue. University libraries will also open. Students may approach their teachers for advice on their study, and web-based teaching will not be affected.

## Teaching and Learning in the Department of Physics During SARS

As Chairman of the Department of Physics, I held the view that teachers should not give up teaching and students should not give up their learning during class suspension. In practice, I saw an urgent need to make a response by launching a department-wide operation for facilitating student learning because, with the final examinations commencing on 25 April, any further extension of the class suspension might well wipe out all remaining classes in the teaching term. In an emergency meeting on 1 April, I showed other teachers in the department my procedures for engaging the students in my own microelectronics course in a process of self-learning during class suspension. All the teachers in the meeting agreed to adopt student self-learning for their own courses, even though some expressed their reservations about whether students would accept responsibility for self-learning. Immediately after the meeting, the department-wide student self-learning plan was conveyed to all relevant students, with their individual acknowledgements either by phone or e-mail. It turned out that classes were not resumed until 14 April and final examinations indeed started on 25 April.

To gauge how students reacted to the self-learning plan and if other contingency measures were necessary, I conducted a survey by telephoning 20 students on 5 April. Although the plan was accepted by all students I could reach, many students expressed various difficulties about practising self-learning. In addition to the feedback data from this phone survey, I received two complaints. The first one was a long e-mail from a Year 1 student and the second one was an open letter published in the April Issue of the *CU Student Press*. These difficulties and complaints implied that my expectations were not totally realistic and the self-learning operation might have some fundamental problems.

By early May, the SARS infection in Hong Kong had diminished substantially and the final examination period was nearly over. I felt that I should come to some conclusion about the appropriateness and effectiveness of the

emergency self-learning operation. I also wanted to include, in this conclusion, a follow-up plan to overhaul reliance on passive learning in class, and inexperience in self-learning. With this in mind, I compiled a set of information so that I could track the story of the emergency self-learning operation. Below are a series of e-mail messages that illustrate the dilemmas we need to consider in deciding how well our students are prepared for self-learning.

### **The Emergency Student Self-Learning Operation Begins on 1 April**

In the emergency meeting with my colleagues on 1 April I shared with them my plan to engage students in my own course (ELE 2510) in self-learning during class suspension. In this plan, my teaching assistants would phone every student of the course to inform them to follow the following learning instructions which had been posted on the course website:

To : All ELE2510 students  
From: Professor Leo Lau  
Date: 1 April 2003 2pm  
Subject: Learning requirements during class suspension

I am sorry that I cannot meet with you directly in class to engage ourselves in the scheduled teaching/learning activities. However, I would like to transform the current crisis situation into an opportunity for us to practise self-learning which is a key learning outcome of this course according to the discussion in our first meeting in class. Please take the below learning instructions step by step and adhere to the time:

Time: 1 April – 5 April

1. Discuss with your team members about the term project on the phone or via Internet, to wrap up the project presentation design and preparation. Contact with your TA and send your presentation file to him/her and arrange with him/her a presentation time during which all members of your team can be reached by phone. The TA will examine your presentation file with his/her own computer and phone each team member with a short question on the presentation. The TA will mark the project presentation according to the

scientific content (40%), novelty (20%), packaging and attractiveness (15%), and your individual knowledge on the project (25%). The best 5 presentations will be posted in the course web-page, so that the whole class can learn from these teams. If we have sufficient meeting time in class after the class suspension, I will still let these groups show off their team products and compete for the best project award.

## 2. Learning plan in this period on Topic 6, Device Fabrication & Packaging

In the learning week of April 1–5, I want you to go through Section 1 of Topic 6 and revise Section 1 of Topic 4. After studying these materials, you should have the following learning outcomes:

- a. You can explain the basic technology in silicon wafer production, oxide formation, doping, lithography and metallization, in a presentation of 5–10 minutes.
- b. You can explain the MOSFET fabrication steps in a presentation of 5–10 minutes.

If you have any problems in this learning process, please feel free to contact me by e-mail or phone.

Leo

With the agreement of my colleagues that they would engage students in their own courses in self-learning during class suspension, I announced to all relevant students the department-wide emergency student self-learning operation. An acknowledgement of the following self-learning operation announcement from every student was confirmed either by e-mail or phone.

To: All students  
 From: Professor Leo Lau, Chairman of the Physics Department  
 Subject: An emergency self-learning operation plan to facilitate your learning needs and duties during the SARS crisis  
 Date: 1 April 2003

While our colleagues in the Prince of Wales Hospital are risking their lives in a battle against the SARS, everyone of us should perhaps turn inwards to examine if we are doing what we are supposed to do too. I hereby request all students of the Physics Department and those taking our courses to adhere to our tradition of conscientious teaching and learning and to follow the Department's

emergency self-learning operation plan. The plan is designed to facilitate your learning needs during the present class suspension so that your learning duties in this term can be fulfilled on time. Very soon you will receive a specific set of self-learning instructions from your teacher in each of your courses in the Department of Physics. I expect you to follow the instructions and reach the associated learning outcomes in the specified time frame. As usual, teachers in the Department of Physics welcome questions and other contributions from students, feedbacks which can be sent to us by Internet or phone.

In the era of information explosion, a progressive career can only be earned by proactive self-learning. I urge you to work with us to transform the inconvenience in our education operation induced by the current SARS crisis to an opportunity of practising self-learning.

Take care and enjoy our learning supports for you.

Leo

## Message from Department Chairman on 12 April: Class Resumption and Related Issues

I assumed that students had been able to access materials and had been making advances in their studies since 1 April. I thought that the resumption of class would be relatively smooth. I was feeling relieved that our students would not suffer academically too much from the SARS crisis.

Date: 12 April 2003 11:02am  
From: Leo Lau  
To: All Students and Staff  
Subject: Class resumption and related issues

Dear Students and Colleagues,

As this turbulent teaching term is coming to an end, I share the anxiety of many students and colleagues. I hope this message will clarify some of the burning issues in your mind.

Colleagues and students have worked conscientiously together during class suspension: To minimize the loss of student learning opportunities induced by class suspension, my colleagues and I launched an emergency student self-learning operation on April 1. We then used e-mail and phone communication channels to reach every student in the department to make sure that every student knows his/her learning responsibility and our facilitation and self-learning

instructions for him/her to fulfill such responsibility. I did a student survey by phoning students in Physics and MSE and was happy to find that all students whom I talked to support and appreciate this operation.

We shall revise what we have covered, including those in the self-learning period: Next week, classes will be resumed and I expect that teachers will use the class time to revise the course materials, particularly those covered in the self-learning period.

Students shall expect exams covering materials including those of the self-learning period: A week later, exams will begin and I expect that students will be ready to be assessed, on materials including those covered in the self-learning period.

We have a tradition of taking care of each other in the department. In a crisis situation, this spirit is particularly important. If you have any problems, please let us (myself, teachers/colleagues, staff in the General Office) know and we will shoulder them. Please note that the university specifically requires all people in class wear mask, also to show we care for each other.

If you have any comments and suggestions, please let me know.

Leo

### **An E-Mail from a Student on 13 April: Complaint Against the Self-Learning Operation**

Clearly all was not well. This e-mail was sent just after midnight, less than 12 hours after I sent my message.

At 12:13 am 4/13/2003, David Yuen wrote:

Dear Professor Lau,

In its notice to all students and teachers regarding class resumption on April 14, the university has clearly instructed its teaching staff to refrain themselves from rushing through the residual course contents in the short remaining teaching time of the term. In addition, teachers were told to help their students to revise what had already been taught, and to prepare them for the final examination. For large classes, teachers should try to conduct teaching in small group tutorials and give students frequent recession breaks. Moreover, both teachers and students were required wearing a surgical mask in class. In short, the university has requested teachers and students to comply with these and other relevant measures with an objective to reduce the risk of spreading SARS in class.

However, the teachers of PHY2002 and PHY2003 have continuously uploaded teaching notes and requested students to conduct self-learning of the relevant course contents. I view that this practice has fundamentally violated the university policy in handling SARS on campus. More importantly, the workload has really exceeded my capacity. Using PHY2003 as an example, I was requested in the past two weeks during class suspension to self-learn four lessons and to complete two assignments. Perhaps I am just not clever enough for this self-learning. However, I know that many students have encountered this same problem.

Perhaps teachers in the department are trying to help us to pass the final exams which have already been designed to assess student learning of the full course contents. If so, can you ask them to trim the parts which have not yet been covered and to go over these materials with us after the final exams? In this arrangement, we can have enough time to learn and understand these course contents. I believe that students in the department do love physics and will conscientiously learn the residual course materials even though they will be taught after the final exams.

I hope that you would share our concerns, look into our problems, and make appropriate changes.

I look forward to receiving your reply.

David Yuen  
Student in Year 1 Physics

## Student Complaint Published in the *CU Student Press*

About the same time there was also an anonymous complaint published in a campus newsletter.

Dear Editor,

I am writing to complain the irresponsible self-study plan of the Physics Department. If such a policy is feasible, I see no reason why the University needs to hire lecturers to lecture. Only with their guidance on what we should learn first can we break our learning barrier without getting lost in our direction of studying. Without this, students themselves need to confront with the apprehension of lecture notes in point-form or a textbook not-well-written for students. Instead of forcing students to self-study, the department should try to make a request to the University if individual department can ask students to come back to attend lectures, for example for a class of size 40 holding a lecture

in a large lecture hall like SC LT1. This would not be more dangerous than for the students staying at home. Certainly, this suggestion still needs further considerations on how it can be realized but at least the department should try to think about other alternatives. Professor Leo Lau, Chairman of the Physics Department, tries to persuade students by affirming practicing self-learning in the era of information explosion; I would say due to this exact reason, students need an experienced lecturer's help to get on to their learning with a good starting point. Only after attending lecture can students know which they should know at this point and where he can get the answer (such as going to the library). I think this is what self-study should be referred to. Here I would like to reemphasize my claim for abolition of the self-study plan.

Yours faithfully,  
CUHK Student

### My Reply to David as Department Chair

Oh dear! It seemed as though I had misjudged the situation. David's e-mail message impressed me by its sincerity and I knew I needed to consider its meaning carefully. I learnt that I had been making the assumption that students would feel able to learn if they were provided with sufficient information. Apparently I had underestimated students' difficulties in conducting self-learning. This was also supported by the other student complaint which was published in the *CU Student Press*. However, I really wanted to encourage the students to try this new approach and to reduce their reliance on passive learning. So I sent the following reply to David Yuen.

Dear David,

I understand your concern and appreciate your interest in Physics and responsibility of continuous learning beyond satisfaction of examination requirements. In fact, I sent a clarification of the same issue which you raised to "all" and posted in the Physics Web, and I hope that you would understand my action plan and the underlying motives of facilitating our students' learning needs.

In the SARS crisis, I learned a lot from Professor Sydney Chung (our Dean of Medicine), his staff, and other people who have been unselfishly risking their lives to save other lives from SARS. I feel that each of us should also ask ourselves if we are also doing what we are supposed to do. Fundamentally,

class suspension and fear of SARS should not stop teachers from teaching and students from learning, because there are other means of teaching and learning. On April 1, teachers in the department agreed to launch our emergency student self-learning plan, and subsequently we have informed all students either by e-mail or phone about the plan. I did worry that students would not accept the plan and learning responsibility, so I personally called up about 20 students chosen by Mrs. Stella Kam with sampling from all years and high and low GPA groups. I am happy that not one single student in my survey refused the self-learning responsibility. Please also note that I have also requested all teaching staff to make themselves available to help students with questions. If you have problems in getting assistance from them in your learning, please let me know and I promise to rectify it as quickly as I can.

Regarding how much we should include in the final exam of each course, we should understand that final exam is one of the many mechanisms (exercises, midterm, final ...) to assess our learning outcomes in each course. A BSc programme in Physics is a collection of courses in Physics with its scientific contents meeting a certain standard in our scientific community. We respect this standard because we respect our own profession and our students. After saying so, I agree totally with you that we have to be flexible too in a crisis situation like the SARS crisis, and I have asked my colleagues to use the remaining time to revise the course materials, particularly those covered in the self-learning period. In response to your request of further make-up classes after the exam period to help students to accomplish the remaining learning outcomes in each course, I will certainly talk to my colleagues to address your suggestions. It will be nice if we can form a working team together to study how effective this is and how many students will engage themselves in this learning arrangement, for us to make a recommendation to the department so that it will handle future similar situations wisely.

Finally I would like to let you know that I learned much from my recent survey on how our students react to my request of self-learning. While I am happy that all students in my survey confirmed the acceptance of their learning responsibility, I found it particularly encouraging that they rated learning efficiency in classroom learning higher than that in the self-learning mode. For a long period of time, I have worried that I have a generation gap with my students because students are embracing an Internet culture in which one tends to conduct more and more daily activities with a computer instead with direct human interactions. It is thus very comforting to learn that our students still value the human teaching-learning interactions in class. I hope that the self-learning operation and this discussion with you will raise our students' attention to the true values of in-class interactions. In my mind, a proper learning practice requires a preparation of yourself with self-learning prior to your class, and the real value of in-class activities is the synthesis of ideas and concepts with dialogue contributions from yourself, your teacher, and your classmates. Please

don't feel that this is merely an impractical collection of empty words. I am current engaging myself in a course as a student and I am practicing this mode of learning together with other equally motivated students. I do this partly because I want to get some direct experience in this learning approach so that I can tell my own students how to learn. Let me share with you my vision—one day soon, we will have a lot of students like you in each class, expressing their views in the scientific contents of the course in that class.

David, I like your attitude of expressing your view. I also appreciate your effort in giving me your criticism. If we have more students like you, our department will make fewer mistakes and be strengthened with an enhancement of sense of belonging. On the same token, I hope you will also appreciate my attitude of caring for the integrity of my profession and the well-being of my students, and my efforts in the past two weeks in facilitating my students to continue their learning processes amid the SARS crisis. We do not have to agree with each other completely. Let us continue to challenge each other to take our responsibilities seriously, to further justify the current collective battle against SARS.

Leo

After sending my reply to David Yuen, I received a copy of the individual responses from the teachers of PHY 2002 and 2003, both clarifying that the alleged overloads were unfounded. A day later, I received the following letter from David Yuen which made me feel much happier.

Dear Prof. Lau,

I'm surprised by your passionate explanation. Thank you very much for treasuring my e-mail!

I admit it's my fault that I didn't grasp time tight for revising all the course notes. This piled up the load and made it hard for me to follow the self-studying plan. I also admit that my descriptions of the workloads of PHY 2002 and 2003 were not accurate. The replies from the two teachers, which were also sent to you, have already clarified my error. So it's pointless for me to further explain my error to you again.

I don't think you have any generation gap with us, at least no gap with me! I don't like using computer for revision all the time. Although Internet is a very powerful tool for learning, I do enjoy discussing problems with teachers and classmates! I am totally with you on the point "self-learning prior to your class".

At the beginning of this semester, I did finish reading the lecture notes before attending the lessons. However, I then engaged myself heavily in society activities and affairs, and lagged behind the course progress. Regretful !!

As the curriculum of the exam won't be compromised, I must now work very hard in my revision!

Thank you for your attention! Take care as the SARS hasn't be beaten off!

Best wishes,  
David

## Overall Reflections From This Time of SARS

I felt that the situation described in David's second e-mail is certainly not atypical. Lagging behind during the course can induce a time management problem and a vicious spiral of an increasingly high learning barrier. In addition to this problem, I found several other learning deficiencies from my follow-up discussion with colleagues and students in this matter. With inputs from my colleagues and students, I worked out a set of self-learning principles that are to be integrated into future first year teaching. We will begin with the material science students in the 2003–2004 academic year. In this trial, we will use a case-based approach to coach the students in practising learning and self-learning skills, and carefully evaluate our trial. The planned set of principles is summarized as follows:

1. *Self-learning is not easy but there are strategies which can be followed and studied.* It is surprising to me that we have not explicitly tried to support something as important as self-learning before. We need to encourage students to keep the goals of learning in mind and not allow themselves to be discouraged.
2. *Individual learning can be inhibited when a "mental block" occurs; changing activity is needed at this point.* Changing activity does not mean "giving up"; it just means looking for a new angle. Discussion is a very useful way to overcome mental blocks.

3. *Brainstorming techniques are valuable in stimulating collective innovation.* The learning outcomes of a group can be greater than the learning outcomes of an individual; “the whole is more than the sum of the parts”. The ideas of one person can spark ideas in another. Students do need help in recording the ideas from a brainstorming session.
4. *Pyramid model and other techniques for organizing data are useful.* Seeing relationships between concepts visually can be helpful for students to reach a learning level beyond simple memorization of individual facts and laws. On the other hand, different students may have different preferences in how data are organized and linked mentally in their mind. They should be coached to find the mental connection method which is most comfortable and effective to each individual.
5. *Time is an important resource factor that needs to be judged by each individual.* People vary in reading speeds, and in the amount of “thinking time” they need. Students should be coached to recognize that even if they are slow, they can still learn successfully by allowing themselves with more time.
6. *Group and class discussion can add value to individual learning.* People are very different; discussion should be seen as a useful way to get a lot of ideas. Courteous disagreement in a group can be very useful for clarifying ideas. Learning can be more fun this way. Besides, communicating effectively and managing conflicts and criticisms properly are very important social skills.
7. *Many questions do not have simple or unique answers.* Really interesting questions are never simple. Sometimes, the answer to a problem is a definite number, but still there is often more than one way to reach such a unique answer.
8. *Reflecting on how learning takes place (metacognition) aids future learning.* “Metacognition” is “learning about learning”. Learning physics means learning how physicists think about physics. Learning never stops. Learning builds on previous learning.

SARS has been a time of learning for myself, my colleagues and my students. What we have learnt will enrich our teaching, whether it be at a distance or in face-to-face classes. I also hope that the insights I have gained through this experience will be of benefit to other teachers and students in Hong Kong and elsewhere.

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