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# **On-Demand Student Support with Virtual Labs and Help Desk**

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#### Improving Lab Attendance

Pre-COVID lab attendance in the database courses in computer science was **10 to 40%** with lower attendance early in the day.

This results in students not learning the lab material as effectively and **considerable** wasted computer lab resources and TA time.

# **COVID Changed Expectations**

Students want flexible learning in time and space and will attend lab sessions based on their measure of learning value.

Learning activities previously done in-person in a computer lab can be done on students' computers at their convenience.

Labs should provide real-time feedback and require limited TA grading. Focus on helping students rather than evaluating.

#### Technology

Virtual office hours utilize Zoom at regular times as well as on-demand by students.

Labs use virtualization technology (i.e. Docker) to eliminate use of computer hardware and software at UBC.

Labs use **auto-marking** for programming code with unit tests to eliminate TA marking.

**New question types** developed for activities such as design and data analysis that improve upon Canvas question types.



Accomplishments	St
Removed scheduled labs for two courses (COSC 304&404) freeing up 24 hours per week of valuable computer lab time.	67 ag pre
Replaced all in-person labs for database courses with virtual labs allowing completion anywhere at students' convenience.	89 tha
Reduced overall TA lab hours by 25% by deceasing marking time by 40%. More time spent helping students rather than marking.	Vir 27 mc
Introduced flexible virtual office hours on Zoom for student support on demand.	Pe
Developed software for generating new design questions that can be auto-marked and unique for each student.	wa Virt

#### Auto-Marking Design Diagrams

Check Mark		Manage Relationships	Manage Entities
There are multiple <b>hospitals</b> in the medical system. A <b>hospital</b> is identified by and has a <b>location</b> .	its name	Hospital	×
A doctor is identified by their medical number and has a name. Each hospital	has a	hospitalName {PK}	۵
single doctor as a manager, and a doctor may manage only one hospital.		location	۵
Doctors are located in hospitals. A doctor may be located in more than one he	ospital. A	location	
doctor located at a hospital has an office number and a salary paid by that ho	spital.		
A patient is identified by their health id and also has a name and gender.		Doctor	Û
A patient visits a doctor at a particular hospital. Each visit is ider Add entity	nd	medicalNum {PK}	۵
lso has a <b>visit date</b> .		name	۵
t a visit zero or more tests are run each with a cost and an outc Add attribu	te Hospital	name	
dentified for a particular <b>visit</b> by <b>name</b> .	Doctor		
		LocatedIn	Û
Patient Test	LocatedIn	officeNum	۵
healthId {PK} testName {PPK}	Patient	salary	۹ ش
name cost gender outcome	Visit		_
11	VISIC		
0* Visit 11	Test	Patient	面
visitId {PK} 0*		healthId {PK}	۶
0* date 0		name	۹
Hospital		gender	۶
hospitalName {PK}			
location			
		Visit	<u> </u>
11 Doctor		visitId {PK}	₽ ₪
medicalNum {PK}		date	۹ 🛍
name			
0 * Locatedin 0 *		Test	-
0		Test	Û
officeNum salary		testName {PPK}	۶ 🛍

### Student Feedback

7% of students strongly agreed or greed that virtual labs/help desk was referable to scheduled, in-person labs.

9% of students strongly agreed or agreed nat virtual labs were beneficial.

irtual lab attendance varied widely with instructors that can benefit. '% not attending at all and 37% attending nost weeks. Students appreciated tending only when they needed help.

#### erformance on labs and overall course vas unchanged (within +/- 3%).





# **Next Steps**

Improve some virtual lab content to answer common questions and add video walkthroughs. Examine new Q+A system.

#### Integrate auto-marking system with Canvas.

Discuss virtual lab approach with other

### **Research Publication**

Sarah Foss, Tatiana Urazova, and Ramon Lawrence. Automatic Generation and Marking of UML Database Design Diagrams, SIGCSE 2022: Proceedings of the 53rd ACM Technical Symposium on Computer Science Education, Feb 2022, pages 626–632.

## Acknowledgements

Student developers and teaching assistants that contributed to the work include Sarah Foss, Tatiana Urazova, David Ding, Devon MacNeil, Shawn Mountenay, and Reece Walsh.

Special recognition to Dr. Youry Khmelevsky who evaluated the approach and systems as a sessional lecturer for two offerings of COSC 304 in summer 2021 and fall 2021.

We appreciate all the computer science students that were open to changing their learning with new approaches and provided valuable feedback.

We gratefully acknowledge the financial support for this project provided by UBC Okanagan students via the Aspire-2040 Learning Transformations Fund.