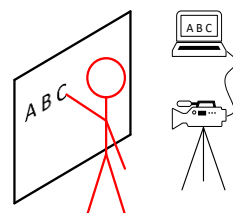


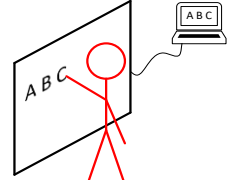


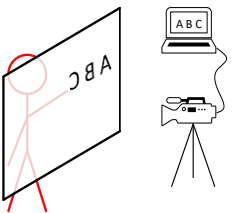












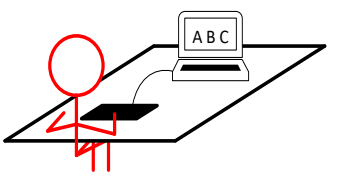


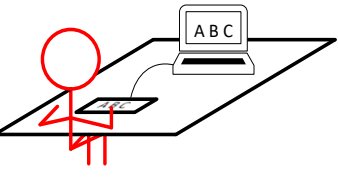


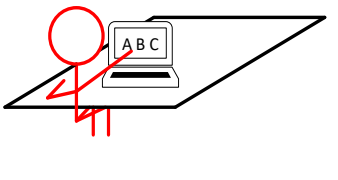


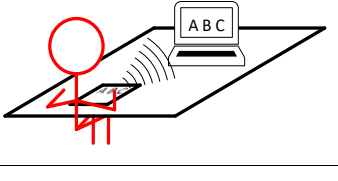


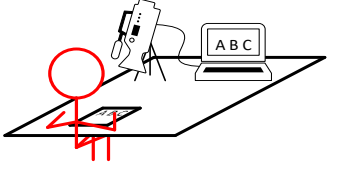


An Quick Guide to Replacing the Board in Synchronous Remote Learning

Instructors often use boards for various pedagogic strategies including demonstrations, responses to exercises, sketches, etc. When classes are offered remotely, sharing hand-written materials in real time requires some

adjustments. This guide offers several solutions that can be used to replace hand-written explanations on the board in distance learning. For the purposes of this exercise, assume the instructor has a laptop and software.

Solution	Schema	Summary description	Position	Comments	Required Material	Streaming Method	Cost (\$CAD)
Conventional whiteboard		The instructor writes with chalk on a blackboard or with dry-erase markers on a whiteboard. A camera films the board. The camera is connected to the computer with a USB cable.		<ul style="list-style-type: none"> ☺ Familiar environment for the instructor. ☹ Difficult to achieve lighting conditions without cumbersome shadows. ☹ Important to have a high-resolution camera. ☹ Board is frequently blocked by the instructor. ☹ Writing can become illegible after erasing the board a few times. 	<ul style="list-style-type: none"> • Board • Chalk or dry-erase markers • Camera with USB • Tripod 		\$150 to \$1,500
Smart board		The instructor writes with a stylus directly on a smart board connected to a computer with a USB cable.		<ul style="list-style-type: none"> ☺ Ease of use. ☹ Materials are relatively inaccessible and expensive. ☹* Instructor is not visible. 	<ul style="list-style-type: none"> • Smart board • Stylus 		\$1,500 to \$3,000
Lightboard		The instructor writes with fluorescent markers on a glass surface with an integrated lateral lighting system. A camera on the other side of the glass films the instructor. The camera is connected to the computer with a USB cable.	  	<ul style="list-style-type: none"> ☺ Smaller model can be placed on a table allowing the instructor to be seated. ☹ Real-time image processing to inverse the required image. ☹ Requires fine control of ambient lighting. 	<ul style="list-style-type: none"> • Glass lit laterally by LEDs • Fluorescent markers • Black background (preferred) • Camera with USB • Tripod 	 	\$200 to \$15,000

Legend:  = standing  = seated at a table  = standing in front of an adjustable-height table ☺* = comments from student members of E-CORE
 = camera streaming  = screensharing from a computer

Solution	Schema	Summary description	Position	Comments	Required Material	Streaming Method	Cost (\$CAD)
Screenless graphics tablet		The instructor writes with a stylus on a screenless graphics tablet. The tablet is connected to a computer with a USB cable.		<ul style="list-style-type: none"> ☺ Some affordable models. ☹ Requires some adaptations to write on the tablet while the result appears on the computer screen. 	<ul style="list-style-type: none"> • Screenless graphics tablet • Stylus 		\$50 to \$500
Graphics tablet with screen		The instructor writes with a stylus on a graphics tablet with a screen. The tablet is connected to a computer with a USB cable. Writing appears over the image displayed on the tablet.		<ul style="list-style-type: none"> ☺ Ease of use. ☺* Easy to mark up slides. ☹ More natural sensation of writing. More similar to paper than a screenless graphics tablet. 	<ul style="list-style-type: none"> • Graphics tablet with screen • Stylus 		\$300 to \$3,000
Tablet or "2-in-1" laptop		The instructor writes with a stylus directly on the tactile screen of the tablet or laptop.		<ul style="list-style-type: none"> ☺ Ease of use. ☺ Only one piece of equipment required (no cables). ☺* Easy to mark up slides ☹ More natural sensation of writing. More similar to paper than a screenless graphics tablet. ☹* Multiple-screen management during class becomes more complex, can break up the flow 	<ul style="list-style-type: none"> • Tablet or laptop with a tactile screen • Stylus 		\$800 to \$3,000
Digital paper		The instructor writes on digital paper using a pen with a built-in camera. The pen communicates with the computer using a Bluetooth connection.		<ul style="list-style-type: none"> ☺ Allows for natural writing on paper. ☹ Complications for editing written elements. ☹ Purchase of digital paper or printing code on plain paper. 	<ul style="list-style-type: none"> • Pen with built-in camera • Digital paper 		\$70 to \$200
Conventional paper		The instructor writes on conventional paper using a standard pen. A document camera is framed on the paper. The camera is connected to the computer with a USB cable.		<ul style="list-style-type: none"> ☺ Allows for natural writing on paper. ☹* Requires fine control of ambient lighting (example: when using a cellphone). ☹* Important to have a high-resolution camera. ☹ Vigilance required to ensure that the paper is consistently well-framed in the camera's field of vision 	<ul style="list-style-type: none"> • Document camera or cellphone/tablet camera • Tripod/support • Conventional pen and paper 		\$0 to \$1,000

Excellent sound quality (no echoes, good levels, no background noise, good microphone quality etc.) is crucial to prevent listener fatigue.

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