



Large TLEF Project – Final Report

Report Completion Date: (2018/07/30)

1. PROJECT OVERVIEW

1.1. General Information

Project Title:	From passively watching to actively learning: ViDeX, a robust video player that supports learning from personalized video		
Principal Investigator:	Sidney Fels		
Report Submitted By:	ViDeX team		
Project Initiation Date:	2016/04/01	Project Completion Date:	2018/03/31

1.2. Project Summary

Our goal for this project is to identify and evaluate the benefits of personalized video viewing capabilities for thousands of students and instructors across UBC. Included in this goal, are reporting capabilities in the video viewer to help instructors improve creating, updating and maintaining their video content by receiving feedback, closing the learner-instructor loop. Toward this goal, we created and evaluated, a cross-platform, personalized video viewer, now called ViDeX. In the first year, we evaluated two main design features (smart filmstrip and variable playback rates), as well as analyzed two large datasets for more effective video tagging. In the second year, we refined the design of the student interface to include a full suite of annotation capabilities including: bookmarking, highlighting, keyword tagging and notes. These have been integrated into a single, coherent annotation mental model. In the second year, we also place attention on instructor needs focusing on first determining what analytics instructor want and need so that these can be designed into an instructor dashboard. We did not develop instructor tools to add context specific content; however, we are currently implementing sharing and a more comprehensive instructor dashboard and video management interface. As well, we are just completing our study on an annotation manager to facilitate searching and browsing the user’s annotations.

During the large TLEF project, we deployed ViDeX in APSC160, ELEC201, ELEC202, ELEC211 CPEN441, ELEC342, FNH325/326, and PHIL102. In total, over 3285 students had access to ViDeX in their courses. We also interviewed about 40 students and 10 instructors for more qualitative studies to better understand their needs and give feedback on ViDeX.

We have published and are continuing to publish results from the various studies that are listed below.



1.3. Team Members – (Please fill in the following table and include students, undergraduate or graduate, who participated in your project).

Name	Title/Affiliation	Responsibilities/Roles
Sidney Fels	Prof/ECE	principal investigator responsible for oversight of project, advising students on project and managing resources
Ido Roll	CTLT Senior Researcher	co-investigator with emphasis on design and evaluation of video interfaces in educational settings
Dongwook Yoon	Prof, CS	collaborator with emphasis on design and evaluation of ideo interfaces in education settings
Christina Hendriks	Prof, PHIL	co-investigator responsible for content and delivery in classroom targeting Philosophy courses
Luis Linares	Senior Inst., ECE	co-investigator responsible for content and delivery in classroom targeting ECE courses
Negar Harandi	Teaching and Learning Fellow, ECE	teaching and learning fellow responsible for research-developer-instructor engagement and deployment of ViDeX in classroom
Gregor Miller	Research Associate	research associate – facilitated transition of project to facilitate partnership
Matt Fong	PhD student, ECE	PhD student targeting design, evaluation and analysis of instructor dashboard and highlighting
Sam Dodson	PhD student, iSchool	PhD student targeting evaluation and analysis of student video watching behaviours while learning
Min Li	MASc student, ECE	Master student responsible for video annotation management design
Rui Yang	MASc student, ECE	Master student responsible for collaborative learning and info ecology design
Ranjitha Srinivasa	MASc student, ECE	Master student responsible for collaborative learning and info ecology design



Junyuan Zheng	MEng, ECE and Programmer	developer responsible for backend of ViDeX implementation
Sameer Sunani	MEng, ECE and Programmer	developer responsible for frontend of ViDeX implementation
Matin Yarmand	UGrad, CS	co-op student developer
Tianqin Cai	MEng, ECE	MEng student developer
Laila Malatawy	Visiting u/grad, Egypt	visiting student responsible for design and evaluation of mobile interface components
Hooman Shariati	MEng, ECE	MEng students who worked on commenting/dialog system of ViDeX
Harsh Brar	MEng, ECE	MEng students who worked on commenting/dialog system of ViDeX
Varalee Chinsomboon	Ugrad, ECE	Undergraduate ECE student doing transcription
Betty Guan	Ugrad, ECE	Undergraduate ECE student doing transcription.

1.4. Courses Reached – Please fill in the following table with **past**, **current**, and **future** courses and sections (e.g. HIST 101, 002, 2017/2018, Sep) that have been/will be reached by your project, including courses not included in your original proposal (you may adapt this section to the context of your project as necessary).

Course	Section	Academic Year	Term (Summer/Fall/Winter)
APSC160	101	2017/2018	Fall
APSC160	102	2017/2018	Fall
APSC160	VE1	2017/2018	Fall
ELEC201	101	2017/2018	Fall
ELEC201	102	2017/2018	Fall
PHIL102	003	2017/2018	Winter
ELEC202	201	2017/2018	Winter
ELEC202	202	2017/2018	Winter
APSC160	203	2017/2018	Winter
APSC160	204	2017/2018	Winter
ELEC211	201	2017/2018	Winter
ELEC211	202	2017/2018	Winter
ELEC342	201	2017/2018	Winter
CPEN441	201	2017/2018	Winter
FNH325/326	001	2017/2018	Fall/Winter
APSC160	101/102/VE1	2018/2019	Fall



ELEC201	101/102	2018/2019	Fall
PSYC300A	101	2018/2019	Fall
ELEC 342	201	2018/2019	Winter
CPEN441	201	2018/2019	Winter
ELEC211	201/202	2018/2019	Winter
BMEG 220	201	2018/2019	Winter
APSC 160	201/102	2018/2019	Winter

2. OUTPUTS AND/OR PRODUCTS

2.1. Please list project outputs and/or products (e.g. resources, infrastructure, new courses/programs). Indicate the current location of such products and provide a URL if applicable.

Product(s)/Achievement(s):	Location:
ViDeX video player	videx.ece.ubc.ca
See publication list below.	
New partnership and funding from Microsoft and NSERC	At UBC
White paper on learner and instructor needs for video started.	https://docs.google.com/document/d/1tJQaxU7K-Jp9vQnGKXaJyTLtGtDiYZA_s-TYHt5bevg/edit?usp=sharing

2.2. Item(s) Not Met – Please list intended project outputs and/or products that were not attained and the reason(s) for this.

Item(s) Not Met:	Reason:
Completion of white paper	Insufficient time to complete; Matt Fong is still working on his PhD; this is part of his dissertation and Kyoungwon Seo (post-doc who started working on ViDeX as part of Microsoft partnership) is working on this.

3. PROJECT IMPACT

3.1. What were you hoping to change or where were you hoping to see an impact with this project? – Please list the intended benefits of the project for students, TAs, instructors and/or community members.

We were hoping to establish a new interaction model for video for learners and instructors. The new interface would enable students to annotate and share annotations with other students and instructors.

We hoped to do a comprehensive evaluation of the new interface for learners and instructors. The evaluation approach would be a template for how other new tools could be developed.

We hoped to create a white paper that provided a comprehensive (and living) document about student and instructor video needs at UBC. The intent would be to have a specification so that any effort to provide a commercial video interface would have a specification to work from.

3.2. Were these changes/impacts achieved? How do you know they occurred? – *To what extent were intended benefits achieved or not achieved? What evaluation strategies were used? How was data collected and analyzed? You are encouraged to include copies of data collection tools (e.g. surveys and interview protocols) as well as graphical representations of data and/or scenarios or quotes to represent and illustrate key themes.*

Please see attached publications that illustrated how the interface was evaluated and what was successful and what was not, including graphs of results.

Key findings include:

1. Students use their notebooks to act as a summarization tool with links to the different learning objects they have. In flipped classes, this becomes critical as students have many different objects that need to be organized. Thus, for a video interface, enabling quick referencing from notebook to video interval is important.
2. There is mixed use of the annotation tools in ViDeX. Some students found the feature very useful, while others did not. We were hoping the usage would reflect textbook markup rates which it appears to mirror. In particular, a number of students do not like to annotate any of the learning materials (whether on paper or in e-format). Another concern raised was that data would be ‘stuck’ in ViDeX, so any annotations could be lost. We are addressing this concern by enabling copy-paste functions and export functions.
3. Instructors teaching with video are interested in engagement levels with the videos they are teaching with. This includes being able to check the number of students who have watched each video, the amount of time students spent watching each video, and areas of the videos that students potentially had trouble with. The ability to access this information would allow instructors to better understand how to create effective videos and how to better incorporate videos into the classroom. These considerations are being used to inform in the design of a video analytics dashboard for instructors.

3.3. Dissemination – *Please provide a list of past and upcoming scholarly activities (e.g. publications, presentations, invited talks, etc.) in which you or anyone from your team have shared information regarding this project.*

1. Dodson, S., Fong, M., Freund, L., Yoon, D., Kopak, R., and Fels, S., **Video-Based Consensus Annotations for Learning: A Feasibility Study**, Proceedings of the Association for Information Science and Technology (ASIS&T, 2018), to appear, Vancouver, BC, Nov. 10-14, 2018.
2. Fong, M*, Dodson, S. *, Harandi, N., Yoon, D., Roll, I., Fels, S., **Instructor and Student conceptions of video and highlighting**, Proc. of ACM SIGCHI (CHI’2019), in preparation.
3. Dodson, S*, Fong, M*, Harandi, N., Yoon, D., Roll, I., Fels, S., **Descriptions of undergraduate students’ information ecology in technology-based classrooms**, Proc. of ACM SIGCHI (CHI’2019), in preparation.
4. Harandi, N., Fong, M., Dodson, S., Roll, I., Yoon, D., Farshid, A., Linares, L, and Fels, S., **Student Video-Usage in Introductory Engineering Courses**, Proc. of Canadian Engineering Education Association Conference (CEEA-ACEG18), 8 pages, June 3-6, 2018.
5. Fels, S., Dodson, S., Fong, M., Harandi, N., Roll I., and Yoon, E., **Active Viewing: A Framework for Understanding Student Engagement With Educational Videos**, Proc. of Learning at Scale 2018, 2 pages, London, UK, June 26-28, 2018.



6. Fong, M., Dodson, S., Roll, I., and Fels, S., **ViDeX: A Platform for Personalizing Educational Videos**, ACM/IEEE Joint Conference on Digital Libraries (JCDL 2018), to appear, TX, USA, June 2018.
7. Dodson, S., Roll, I., Fong, M., Yoon, D., Harandi, N. and Fels, S., **Active Viewing: A Study of Video Highlighting in the Classroom**, Proc. of ACM Conference on Human Information Interaction and Retrieval (CHIIR'2018), pp 237-240, Mar 11-15, New Brunswick, NJ, USA, 2018. DOI: 10.1145/3176349.3176889

4. TEACHING PRACTICES – Please indicate if **your** teaching practices or those of **others** have changed as a result of your project. If so, in what ways? Do you see these changes as sustainable over time? Why or why not?

ViDeX has changed teaching practices in three different ways:

- ViDeX has motivated more instructors to use videos in their courses. Courses like ELEC 221, BMEG 220, and PSYC 300A, never used videos before. ViDeX affordances motivated the instructors to invest time in making the videos. This had resulted in incorporation of blended learning (for ELEC 221 and BMEG 220), and a better supported remote learning (for PSYC 300A).
- ViDeX has changed the lesson planning, and assessments, in some of the courses that have used videos on other platforms before. Instructors in APSC 160, ELEC 201, and FNH325 had a better way of monitoring if videos are being watched by the majority of their class. In some cases, they had designed small in-class/online quizzes to motivate the viewing behavior.
- ViDeX has motivated instructors in their efforts to make videos. In case of ELEC 201 and 202, where videos were up in YouTube before, instructors were encouraged to see actual student-interactions with the videos.

5. PROJECT SUSTAINMENT – Please describe the sustainment strategy for the project components. How will this be sustained and potentially expanded (e.g. over the next five years). What challenges do you foresee for achieving the expected long-term impacts listed above?

We are very fortunate that Microsoft is funding the next phase of this project with \$105K/year for the next three years. This was matched by an NSERC CRD grant with an additional \$160k/year. Thus, we are continuing to improve the interface and provide a high fidelity user experience at UBC. Our plan is not to commercialize ViDeX at this stage, but rather, we are working with Microsoft development teams to integrate a number of the features into their video player and educational products to provide the benefits we discovered to a large body of students and instructors worldwide.

ViDeX is close to a product at this stage. When the Microsoft/NSERC funding comes to the end of its cycle, we will review whether to keep it going or not. Development effort requires about \$200K/year, thus, an I2I grant or other sources of funding may be possible.