

Tipping Point: A Shift From Physical Media to Streaming

Andrew Morris

Faculty of Education, University of British Columbia

ETEC 511: New Foundations of Educational Technology

Dr. Samuel McCready

July 21, 2025

Tipping Point: A Shift From Physical Media to Streaming

In the winter of 2005, a grade 6 school teacher wheels a TV cart into the classroom and slides the *Bill Nye the Science Guy: Outer Space* disc into the DVD player, kicking off their science unit. Fast forward twenty years and the same teacher, perhaps on the cusp of retirement, opens YouTube on a Google Chrome tab. A quick search of, “gravity videos for middle school” reveals a variety of content for all ages. They select a video with detailed animations that include an Arabic translation to suit their learners’ needs. This is immediately cast on the projector screen in the classroom.

Over the last two decades, the movement from utilizing physical media to digital content and streaming services has made its way into elementary education and the classroom. The fast and easy access to learning materials has allowed for curated resource collection and targeted lesson planning. With increased usability and accessibility afforded by digital media and other technology advancements comes the entanglement of pedagogy with technology as it takes a transformative, but ever-changing role in shaping the attention of the learner. The lifecycle of physical media has a visible impact on the environment as it requires materials to build and fills our landfills when discarded. However, with the increased adoption of digital content and streaming comes an ever growing set of environmental demands and challenges that are less visible. The following case study will look to examine the history of this change, and the impact of this tipping point on education considering usability, pedagogical, and environmental perspectives.

Background

When the BBC first started educational radio broadcasting in the 1920s, the direction was unclear. Who exactly was it for - the teachers or the students? Regardless, the public service station assumed that there was value in educational broadcasting. Over the next decade the newly formed School Broadcasting Council worked to create informative programming that respected teaching autonomy while providing relevant educational content (Barclay, 2024). As the school system itself underwent transformational innovation, so did

the relationship between media and education. Across the Atlantic, Ontario's ministry of education launched TVO in 1970, which became Ontario's largest English language public broadcaster. Their direction and opinion of educational broadcasting was definitive and positive. Relevant educational content was at the forefront of broadcasting and by 1991 TVO was even offering *High School on Air* - a direct teaching series allowing students to complete high school education at home (Historica Canada, 2025). However, broadcasting content was still an ineffective and rigid way of delivering educational content - one needed to be tuned in at the right time and for the whole duration of the program. The advent and widespread adoption of VHS and DVDs through the 1980s and early 2000s significantly advanced the use of instructional media and video in education. These physical media forms provided unprecedented control over content through their "pause" and "play" functionalities. DVDs in particular, with their increased storage and recordable nature, were also offering educators and educational companies an opportunity to create and disseminate media-rich presentations. Interestingly, Summerford (2006) offers this opinion in her defence of the use of DVDs in education:

DVD technology is infinitely superior to other methods, offering better quality video and audio and holding more data.... This means that specific disks relevant to classroom content and instruction can easily be developed and utilized as primary sources or to supplement existing curriculum materials. (p. 55)

In the fast-paced evolution of data sharing and storage, these physical media forms that allowed for better personalization of educational media quickly became outdated. YouTube, launched in 2005, became increasingly used for streaming educational content and was adopted by the Khan Academy in 2006 to share voice-over style math lectures. Apple debuted iTunesU, a digital university lecture library, in 2007 and TED-Ed launched in March 2012, offering concise video lessons for educators. These crucial years indicated a tipping point - streaming digital media promised the advantages found in both broadcasting and in physical media ownership. The modern Ontario classroom no longer relies on physical media. TVO's online platform now offers digital courses to complete a high school

diploma at your own place. YouTube has invested heavily in EduTubers and TedX continues to attract famous speakers to deliver impassioned and educational talks that are viewed live and streamed worldwide. Streaming became the preferred choice of media content consumption in and outside of education.

Streaming, Education, and Usability

The rapid adoption of digital content and streaming services in the elementary educational space makes sense from a usability standpoint. Two well-understood characteristics of broadcasting and physical media were combined into one service - the scale and flexibility. Streaming media offers a chance to reach a wide audience while combining live and playback options. It is also important to consider the major advancements in the underlying infrastructure changes that have made this form of media a viable option in the classroom.

Issa & Isaías' (2015) principles for usability and human centred design give a solid framework to analyze this transition from a user's perspective, specifically streaming media's affordances of learnability, flexibility, efficiency and satisfaction. If we take YouTube as an example, the largest and most well-known streaming platform accessible to educators, the functionality of the play/pause button in the design is no different than that from a DVD player. Regardless of a user's age, the symbols and their use are the same between the two experiences, creating seamless learning and transition. Physical media offered the chance to playback content at any time, an increase in user control. Streaming content also offers the same playback functions, but when combined with the advancement of mobile computer technology, it provides a new dimension of control: the ability to play media *anywhere*. In the dynamic 21st century classroom, this experience allows for more flexible learning options. A teacher does not need to have 30 copies of a DVD to have students watch a 5 minute video to see an example of a math problem, but can simply share a link. Streaming media's flexibility is further enhanced by the platforms themselves offering the potential to enhance usability through access to the right content at the right time. YouTube's related-video feature

continuously suggests relevant content and offers playlists for curated experiences.

Websites like PBS or National Geographic pre-organize streaming content for educators.

However, the volume of content and variety of content creators can also create usability challenges as educators may feel overwhelmed or unsure about the credibility and suitability of the information. This usability framework should also account for the infrastructure that has been set up to benefit the affordances that streaming media can provide. Where it may appear that it is more efficient to share a link to content, we cannot ignore that a teacher still requires a functional computer, a reliable internet connection, speakers, and a projector or display system to use streaming content effectively. In this way, the perceived “frictionlessness” of streaming is conditional on technologies that are still often equity barriers in real educational settings. Finally, with consideration to the infrastructure changes, streaming media continues to advance the user satisfaction. Although far from a measure of a platform's educational quality, user statistics can point to a trend in user acceptance. VidIQ (2025) shows that top YouTube educational content producer, TedX, has over 40 million subscribers and over 8 billion views over its lifetime. Additionally, *The Common Sense* census (Vega & Robb, 2019) found that approximately 60% of K–12 teachers use video-streaming services such as YouTube, SchoolTube, and Netflix in their classrooms, making it the most commonly used type of digital tool. Increases in media playback control and the flexibility to consume or disseminate educational content anywhere at any time, contributes to the usability and appeal of streaming services in educational settings and is a significant factor in its increased adoption.

Streaming, Education, and Pedagogy

The adoption of streaming media in education, and the technologies that support it, is inseparable from the pedagogy of teaching. Methods of teaching and technology are only some of the elements that shape how learning might take place in specific contexts and are most effective when viewed as interconnected, with each influencing the other within a set of other external factors (e.g., political, cultural). Education is moving beyond the idea that we

can pick a tool to suit a teaching style or apply a pedagogy after a tool has been chosen (Fawns, 2022). The entanglement is even more evident when streaming media is viewed as part of the attentional ecology. Traditional models of education with the teacher as the source of knowledge have been replaced by constructive approaches, opening the door to challenge school norms of the past. A political, technological, and cultural shift has reversed the demand on the student to give the teacher attention - the educator must now “earn” it. This reflects deeper cultural patterns in the shift of sustained attention, as seen in a field like video games where interaction is designed to capture and hold focus by design (de Castell & Jenson, 2004).

Education’s shift from using physical media to streaming content can be viewed as one response to the growing need for increasing engagement. This is an important attempt to identify a form of engagement that is multimodal and responsive to learners’ attention and interest (de Castell & Jenson, 2004). Perhaps no streaming platform has done more to the economy of attention than YouTube. The content is easily searchable and consumable and offers users the ability to create and upload their own. Videos end with suggested playlists or videos and autoplay in the next, all in a bid to retain user attention and ultimately increase streamer revenue. YouTube continuously augments its algorithm to favour viewing time - setting the stage for creators to make content that not only captures the attention of viewers but sustain it for longer periods of time (Lozano, 2022). YouTube is one of the most widely used streaming resources in teaching, leveraging the attention economy to shape the multifaceted ecology of attention in which teaching and learning now take place. Videos are embedded into lessons to simplify complex content in science or math classrooms, bring to the past to life in history lessons, and to share student creations in efforts to facilitate better class discussion. Links are easily embeddable into Google Classroom, Blackboard, Canvas, and other learning management systems allowing flexible learning options at home or in the classroom. YouTube, and streaming media, is a useful tool for delivering multimedia that helps to theorize knowledge and compare and analyze ideas, ultimately sustaining user attention (Liemburg et al., 2019).

This tipping point is more than a shift in media use, but a change in pedagogical relationships - one that requires focus on how learners are engaged. As education continues to adapt to the attention ecology, it will also need to respond to the ongoing influence of technology advancements, from uptakes in streaming media in the 2000s to the pervasiveness of generative artificial intelligence in the present, all while balancing the inseparable forces of both culture and politics.

Streaming Media, Education, and Sustainability

The shift towards the use of streaming media for education and general purpose has an impact on the environment. A recent case study from Nair et al. (2019) completed an environmental life cycle assessment comparing the creation and end-use of a video on both DVD and a streaming platform. Both physical and digital distribution models involve media production and file transfers. In the physical media distribution process, the disc is written, packaged, and sent to a retail location for purchase and view by the user. In the digital distribution process, the file is compressed, loaded to a server, and recalled by the user based on the platform such as clicking “play” on a YouTube video. Results from the one-to-one comparison indicate that the digital distribution model outperformed the physical distribution model across each one of the environmental dimensions. However, the investigators are quick to point to a much larger question - how has the increased access to content changed the viewing habits of the consumer? Quick access and vast content libraries are among other factors that continue to increase our consumption of media. When looking to quantify the environmental sustainability of digital media consumption and streaming, it is important to consider the consumption patterns of the average user. In fact, everyday digital activities like web browsing, social media, streaming, and video conferencing could account for up to 40% of an individual’s carbon budget aligned with the 1.5°C climate target (Istrate et al., 2024).

Streaming media has almost fully replaced physical media use in educational settings. It is important to consider the energy demands needed to support the streaming,

but the physical demands needed to create the servers and devices we view it on. The extraction of raw materials for devices has long lasting impacts on fresh water systems, affecting both human and marine life (Istrate et. al, 2024). As energy becomes greener we may be able to reduce the carbon impact of streaming (Nair et al., 2019) and a collective focus towards extending device lifecycles or increasing second-hand device sales can mitigate the impact of resource extraction and freshwater contamination (Istrate et. al, 2024).

Conclusion

The rapid replacement of physical media with streaming content is a tipping point in educational technology use that can be examined from a usability, pedagogical, and environmental standpoint. Streaming platforms are easy to use and continue to entangle themselves in pedagogical change. The increased educational use of digital content fits into a larger trend that begs us to consider the environmental side effects of a post-digital society where streaming is embedded into the fabric of learning and everyday life. This case study provides a simple overview. Further examinations of this tipping point may want to consider the long-term cognitive and social impacts of digital media use in elementary education as studies are short-term and the long-term developmental effects remain unclear.

References

- Barclay, S. (2024). *100 years of BBC Education*. BBC.
<https://www.bbc.com/historyofthebbc/education100>
- de Castell, S., & Jenson, J. (2004). Paying attention to attention: New economies for learning. *Educational Theory*, 54(4), 381–397.
<https://doi.org/10.1111/j.0013-2004.2004.00026.x>
- Ducard, M. (2018, October 22). *YouTube Learning: Investing in educational creators, resources, and tools for EduTubers*. YouTube Official Blog. Retrieved July 17, 2025, from <https://blog.youtube/news-and-events/youtube-learning-investing-in/>

- Fawns, T. (2022). *An entangled pedagogy: Looking beyond the pedagogy–technology dichotomy*. *Postdigital Science and Education*, 4(3), 711–728.
<https://doi.org/10.1007/s42438-022-00302-7>
- Historica Canada. (2025). *TVO*. The Canadian Encyclopedia.
<https://www.thecanadianencyclopedia.ca/en/article/tvo>
- Istrate, R., Tulus, V., Grass, R. N., Vanbever, L., Stark, W. J., & Guillén-Gosálbez, G. (2024). *The environmental sustainability of digital content consumption*. *Nature Communications*, 15(1), Article 3724. <https://doi.org/10.1038/s41467-024-47621-w>
- Liemburg, L., Janssen, M., & Kroezen, J. (2019). *Literature review of YouTube in teaching activities*. *Pacific Asia Conference on Information Systems (PACIS) 2019*. AIS eLibrary. Retrieved July 16, 2025, from
<https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1227&context=pacis2019>
- Lozano, K. (2022, October 4). *The overlooked titan of social media: How YouTube created the attention economy*. *The New Yorker*. Retrieved July 16, 2025, from
<https://www.newyorker.com/books/under-review/the-overlooked-titan-of-social-media>
- Nair, A., Auerbach, G., & Skerlos, S. (2019). Environmental impacts of shifting from movie disc media to movie streaming: Case study and sensitivity analysis. *Procedia CIRP*, 80, 659–664. <https://doi.org/10.1016/j.procir.2019.01.102>
- Retrospekt. (2025). *Bill Nye the Science Guy: Outer Space VHS Tape*. Retrospekt.
https://retrospekt.com/products/bill-nye-the-science-guy-outer-space-vhs-tape?srsId=AfmBOoqG4gwXg_agpmWfIHnwyaWrw4eu4q3McRFQRFoHEBf24rfoilt7
- Summerford, C. R. (2006). *Theory development for the use of DVD technology based on brain research* (Master's thesis, California State University, San Bernardino). CSUSB ScholarWorks. Retrieved from <https://scholarworks.lib.csusb.edu/etd-project/3466>
- TED Conferences, LLC. (2025). *History of TED*. TED. Retrieved July 16, 2025, from
<https://www.ted.com/about/our-organization/history-of-ted>
- Vega, V., & Robb, M. B. (2019). *The Common Sense census: Inside the 21st-Century classroom* [PDF]. Common Sense Media. Retrieved July 19, 2025, from

<https://www.commonsemmedia.org/sites/default/files/research/report/2019-educator-census-inside-the-21st-century-classroom-key-findings.pdf>

vidIQ. (2025, July 18). *TED-Ed's YouTube channel stats* [Web page]. vidIQ. Retrieved July

19, 2025, from

https://vidiq.com/youtube-stats/channel/UCsooa4yRKGN_zEE8iknghZA/