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# Science Video Activities – A New Science Teaching Resource

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## Abstract

*The digital age has fostered the rapid dissemination of information, and has provided various new tools for the access, transfer and use of information. One of its consequences is the fast consumption of interesting information among young students. This enables new learning processes, and broadens the learning environment. This innovative learning environment maintains the teacher's essential role in classroom, but as a mediator, and not as an agent of information transfer. Therefore, teachers need broad, digital tools and should master how to use them within the teaching process for knowledge building.*

*The platform we present is a website that offers creative, scientific activities, based on short science videos on a variety of science-based subjects. The platform uses an existing collection of on-line videos that aim to present science as both interesting and accessible to the general public. The platform offers a search engine that enables teachers to search for activities either by subject area, by curriculum topics (the videos are tagged according to the science curriculum), or by specific skills.*

*The platform also offers activities which focus on new digital and pedagogic skills, and teaching and learning tools. All activities include watching one or more science videos. They can be used in the initial introduction to a subject, as a resource for knowledge building, or as a summary of a topic. Some of the activities include the use of interactive videos. The activities are based on active learning, self-discovery as individuals or teams and using scientific principles in everyday life. The activities require the implementation of a wide range of skills including higher-order thinking, teamwork, collective knowledge building, gathering and integrating information, presentation skills and reflection on the learning process. Some of the activities offer the teachers the means of an alternative assessment.*

Keywords: *Science videos, science activities, digital-pedagogic skills, science-teaching resources*

## 1. Rationale and Background

The digital age has fostered the rapid dissemination of information, and has provided various new tools for the access, transfer and use of information. Further, the networked society has brought about dramatic changes to the way in which people learn. Educational resources are increasingly accessible, not just in schools and libraries, but also on our mobiles and computers. Seamless Learning provides a different approach, connecting learning experiences across settings, technologies, and activities. More broadly, Crossover Learning brings together settings and contexts in a 'learning ecosystem' that makes use of technology to establish and reinforce links between learning that takes place inside and outside the formal education system [1].

Collaboration is an essential component of innovative pedagogies. Collaborative inquiry learning enables learners to converse, exchange opinions, argue, speculate, and examine them. The reciprocal interpersonal relationships between the group members and the collaborative knowledge acquired provide opportunities for the development of cognitive and meta-cognitive thinking and constitute fertile ground for the cultivation of emotional-social skills such as listening, tolerance, mutual respect and helping each other [2]. Cognitively, students share the responsibility for thinking, doing and their knowledge dissemination, so that the burden of managing the process does not fall on one student in the group. In addition, collaborative inquiry requires the creation of strong relationships to infer the significance of processes. This applies, for example, when learners use data for discussing and explaining of conflicting theories. In challenging each other's beliefs and thoughts, learners must be clear in the explanations they give; they must negotiate the contradictions that arise between the beliefs and evidence that arise, and

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they must share and edit their knowledge in order to achieve the common goal of their learning [3], [4]. The added value of learning through a collaborative inquiry is that such learning provides cognitive and social support to the efforts of each individual learner [3]. Teaching with collaborative inquiry by using digital platforms provides a shared environment for communication that supports student ideas. Students can reorganize these ideas, negotiate and advance the community's shared knowledge. Argumentation, reasoning, creativity, planning an experiment, data analysis, data processing, asking questions, working together, problem solving and decision-making, reflectivity to the learning process, are all skills which are being developed and used in collaborative inquiry learning.

Recent developments in technology have made interactions easier to achieve. Networking platforms support greater interaction with other people and new learning environments include these forms of interaction. They have the potential to promote learning that is based on learners' internal values while equipping them with knowledge and competencies they will need as lifelong learners in a networked society. Providing students with the freedom to choose what and how they prefer to study can increase students' sense of ownership of the learning process. They are less likely to feel that they are participating in a process owned by the teacher or the educational system. This freedom can also address the diversity of interests in any classroom. Research shows that 'less can be more' when the breadth of content is reduced, allowing students to dig deeper into smaller portions of the content. There have been many attempts to provide learners with tools that enable them to make choices about what they value as they advance through a given curriculum. Furthermore, pedagogy is concerned with both teaching and learning. Learners are not "stand alone" – they are supported by teachers. Learners need help to recognize and escape their own filter bubbles, they need support to understand how to assess the credibility of a source, they need an expert to work with them to develop the skills that they need, and they need a guide who can help them to identify routes forward [1]. Despite the increasing incorporation of technologies into educational environments, the typical classroom paradigm has changed only slightly over the past decades. Even within the physical traditional classroom, the innovative learning environment keeps the teacher's essential role within the classroom, but as a mediator and not as an agent of information transfer. Therefore, teachers need broad, digital tools and should master how to use them within the teaching process for knowledge building.

## 2. "Science VOD" Platform - a New Science Teaching Resource

The Davidson Institute of Science Education, the educational arm of the Weizmann Institute of Science, aims to enrich science education both in Israel and globally. Its wide variety of educational programs target students and teachers as well as the broader community, with the goal of influencing the educational system and disseminating scientific knowledge. Moreover, the Internet is a tool for communicating science to the masses. Davidson Online is an interactive, educational-scientific platform that offers a variety of unique activities to those interested in science and technology, and is presented in layman-friendly language. The main goals of Davidson Online website are to bring science to a larger audience to include all age ranges and backgrounds, to develop the science communication field using the website as a content generator, and to create lifestyle habits of acquiring science content among members of the public. Today, Davidson Online is the leading science website in Israel with more than 3 million unique page views, working closely with all leading media bodies from television, radio, and news websites.

In recent survey among Israeli science teachers that use the Davidson website as a teaching resource, the teachers mentioned that they use the science videos in order to illustrate concepts and processes which are difficult to understand and subsequently to lead their students towards a whole class discussion and inquiry of the science phenomena presented. It was a surprising finding that both beginner and senior teachers used these videos. The survey also raised the point that teachers would like an easy means of searching for the Davidson's science videos for their use in class. The teachers also asked for videos categorized according to the science curriculum. Until recently, the only way to obtain access to these videos was via the articles they are embedded in.

Based on this, the aim of the "Science VOD" project is to provide a web platform with a search engine for the Davidson's science videos, categorized according to the curriculum. This platform (http://davidson.weizmann.ac.il/videos#/) also includes creative scientific activities based on the science

videos covering a variety of science-based subjects. The search engine enables teachers to search for activities either by subject area, curriculum topics or specific skills.

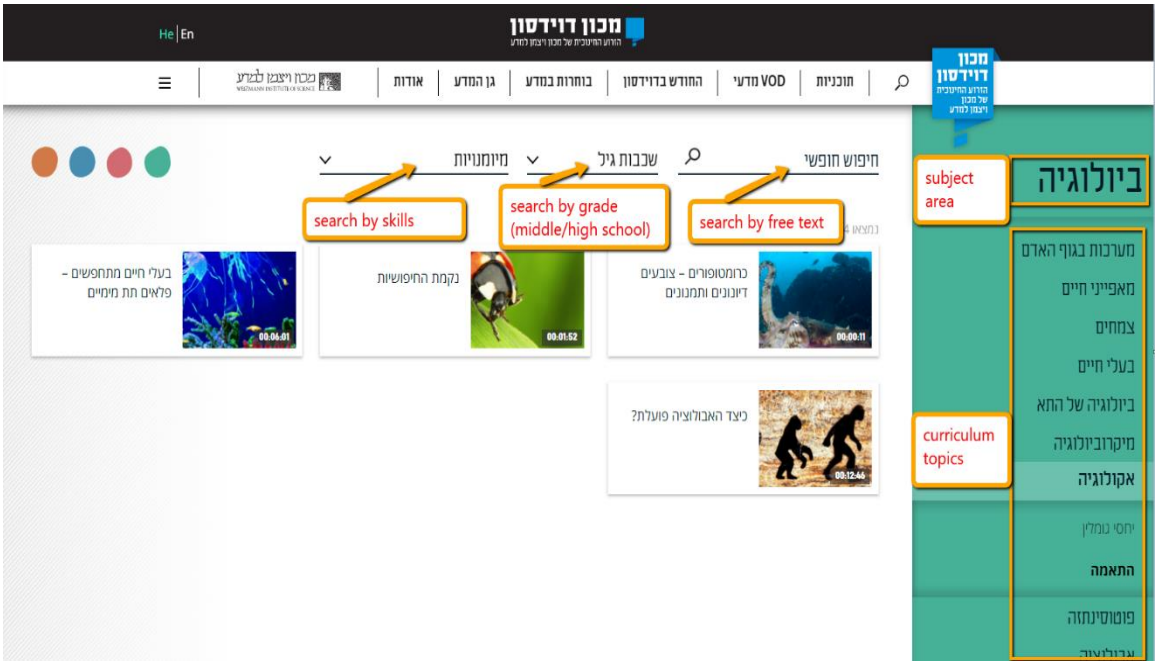


Fig. 1. Example of results of searching

Hundreds of videos were tagged according to the science curriculum. Videos were categorized based on three topic levels to get specification. For example, level one: Biology, level two: Ecology, level three: Adaptation. In this manner, the teacher can be familiar with the videos subject, choose a specific video, reuse it easily, and will also be able to see which other videos are included in the same category.

Suggested activities were developed, focusing on pedagogical skills and on teaching and learning tools. All activities were based on watching one or more videos. They can be used in the initial introduction to a subject, as a resource for knowledge building, or as a summary of a topic. Some of the activities include watching interactive videos. The activities are based on active learning, self-discovery as individuals, pairs or teams and using scientific principles in everyday life. The activities include a wide range of skills such as: higher-order thinking, teamwork, collective knowledge building, gathering and integrating knowledge, presentation skills and reflection on the learning process. Some of the activities offer the teachers an alternative assessment. There is a variety of activities that may be incorporated with different videos and different teaching methods. For example, interactive videos with questions appear during the video, thus providing an interesting introduction to research and inspiring students to experiment; they are always relevant to daily life. The activities include both guidelines and information for the teachers and instructions for students, via two worksheets.

Currently the “Science VOD” platform includes videos and activities for Chemistry, Biology and Physics. We will add videos and activities in Math and Computer science. We also plan to offer activities for use in elementary schools. In addition, we plan a “teachers as designers” training for science teachers, presenting the platform and the activities and teaching them how to develop their own activities via the use of short science videos. We believe that the dialogue with science teachers is essential and plan to evaluate our platform and the suggested activities we offer for teaching.

By using the activities, we aimed to provide the teachers tools for leveraging the videos to promote active and collaborative inquiry learning. We hope that these activities, as well as the science videos repository, will help young student to build their knowledge independently and autonomously while they use reliable resources and take responsibility for their learning process.

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