MACUB

IN VIVO

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The 45th Annual MACUB Conference will take place on Saturday, October 27, 2012 at Adelphi University, Garden City, NY

The Conference Theme is

"Origins"

featuring

Dr. Donald Carl Johanson

Founding Director and Professor of the Institute of Human Origins at Arizona State University

Dr. Johanson, an American paleoanthropologist, who with Maurice Taieb and Yves Coppens, discovered the fossil of the female hominid australopithecine known as "Lucy" in the Afar Triangle region of Hadar, Ethiopia.

Instructions for Authors

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Save the Date - October 27, 2012

45th Annual MACUB Conference at Adelphi University Garden City, NY

Dr. Donald Carl Johanson

Will present the Keynote Address at the 45th Annual MACUB Conference

Dr. Donald Carl Johanson is the Founding Director of the Institute of Human Origins and a Professor at the School of Human Evolution and Social Change at the School of Liberal Arts and Sciences at Arizona State College. For the past 30 years he has conducted field and laboratory research in paleoanthropology. Most notably, he discovered the 3.18 million year old hominid skeleton popularly known as "Lucy." Through grants from the National Science Foundation, the L.S.B. Leakey Foundation and the National Geographic Society, Dr. Johanson has carried out field research in Ethiopia, Yemen, Saudi Arabia, Egypt, Jordan and Tanzania. He is an Honorary Board Member of the Explorers Club, a Fellow of the Royal Geographical Society, a member of many other professional organizations and recipient of several international prizes and awards. In 1975, Dr. Johanson was appointed curator of physical anthropology at the Cleveland Museum of Natural History and, beginning in 1976, developed a laboratory of physical anthropology that attracted scholars from all over the world.

He has written, among other books, the widely read "Lucy: The Beginnings of Humankind" (with Maitland Edey), 1991, and numerous scientific and popular articles. In 1994, he co-wrote "Ancestors: In Search of Human Origins" and narrated a companion NOVA television series seen by more than 100 million people worldwide. Most recently, he published "From Lucy to Language" (with Blake Edgar, principal photography by David Brill), 1996. Dr. Johanson is a frequent lecturer at university and other forums in the United States.

Plant Succession/Community Development

by

Richard Stalter

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ECOLOGICAL SUCCESSION OR COMMUNITY DEVELOPMENT

Ecological succession or community development is an orderly process of community change culminating in the community that is the most mature community for that particular area. The most mature community that is in harmony with the climate and total environment is the climax ·community. Each stage in community development is referred to as a sere.

HISTORICAL BACKGROUND

Dureau de la Malle[1] was the first to use the term succession in its ecological context yet the term ecology, which was credited to Haeckel was first used in 1869[2]. Oosting[3] credits Hult for using the concept of community development or succession in his study of the vegetation of Finland. Cowles[4,5] pioneered the study of succession in the United States with his work on the successional relationships of the vegetation on sand dunes at Lake Michigan. Clements[6] is credited with the formulation of the theory of plant succession which he published in 1916.

Clements[6] applied Hult's theory of the climax to his definitive treatise on Plant Succession in 1916. Clements believed that a climatic region had but one potential climax, "the most mesophytic community that the climate could support"[3]. Succession according to Clements began with nudation, the establishment of a bare site devoid of vegetation[6]. This phase was followed by migration, the invasion of seeds and spores into the bare area. The establishment and growth of the invading species was termed "ecesis" (growth). As the plant communities developed, competition arose between individual plants for nutrients, water, light and space. Moreover, the developing plant community had an effect on environmental factors within the community termed reaction by Clements. The affect of plants on some environmental factors are discussed in more detail later. Finally, with the development of different stages or seres in community development there was a concomitant change in the animal component of the community, termed coaction.

Clements believed in the monoclimax concept of succession, that a climatic region had only one potential climax or self perpetuating plant community. The monoclimax theory was challenged by a number of ecologists including Nichols[7,8] who recognized both climate and physiography as important in the interpretation of climax vegetation. The polyclimax view recognizes the contribution of many environmental

factors including soil, fire, topography, salt spray as well as climate in determining climax vegetation. Watt[9] described succession as a cyclic rather than a linear process while Borman and Lichens[10] interpreted succession as a "shifting mosaic steady state". They contend that a community is "composed of a mosaic of patches, each in a phase of successional development." Patches in the eastern forest are created when mature trees die or are toppled by winds creating gaps which allow more light to reach the forest floor. These patches are exploited by earlier successional species. Since the gaps only compose a fraction of the forest, "the average characteristics of the forest may remain constant, in a steady state". It is important to note that succession differs from fluctuations.

Fluctuation is defined by Smith and Smith[2] as, "non-successional or short term reversible changes. Fluctuations are apt to occur in regions where annual rainfall can vary greatly from year to year as observed by the author at the Galapagos Islands, Ecuador and also on the African savanna. The savanna is a grassland biome with scattered trees. Smith and Smith[2] reported a shift in grassland species in the savanna biome of southwest Zimbabwe from 1971-1981. During the dry years of 1971-1973 the more drought tolerant *Urochloa mosambiensis* was dominant. During the wet period of 1973-78 *Heteropogon contortus* thrived and replaced *U. mosambiensis* as the dominant species by 1976.

An important concept in succession is time and direction. Borman and Lichens[10] viewed a community composed of discrete patches, each patch continually changing. Yet if the forest is viewed as a whole, the forest itself may remain fairly constant with respect to species composition and dominance[11].

Detailed information on succession can be found in the following ecology texts: Oosting[3], Odum[12], Smith and Smith[2] and many others. Community development is also covered in freshman biology texts as well[3]. To appreciate the complexity of ecological succession the reader is directed to Odum (1971) Table 9.I, p. 252, where Odum compares early community development with mature stages[12].

Succession is directional; thus future changes may be predicted with reasonable certainty. There are exceptions; these have been briefly discussed previously. One exception to normal community development will be presented later in this paper.

There are two general types of plant succession, primary and secondary. Primary succession is initiated on sites where plants have not grown previously. A newly formed volcanic island or bare rock exposed by a retreating glacier are examples of dry sites while a pond formed in a depression left by a retreating glacier is a wet or hydric site. Examples of hydrarch and xerarch succession follow.

When a cultivated field is permitted to lie fallow, it produces a crop of annual weeds the first year, numerous perennials the second year, and a community of perennials thereafter[13, 14]. In forest areas, the perennial herbs are soon replaced by woody plants, which become dominant. After any disturbance of natural vegetation such as cultivation[14, 15] lumbering[3], fire[3] or gamma radiation[11] -a similar sequence of communities occurs with several changes in the dominant vegetation throughout the years. The change in plant communities is accompanied with a concomitant change in animal species.

On the Piedmont Plateau of New Jersey, Bard[14] reported that ragweed *(Ambrosia artemisiifolia)* and evening

primrose *(Oenothera parviflora)* were immediate dominants on fields where crops had been grown the same year. Goldenrod *(Solidago nemoralis)* assumed dominance by the second year and was replaced by *Aster ericoides* (Aster) which increased to dominance by the fifth year. Little bluestem *(Schizachyrium scoparium)* was common by the 15th year though goldenrod (*Solidago spp*.) were still dominant. Twenty-five year fields were dominated by *Aster ericoides* while *Solidago spp*. decreased in cover. Red cedar *(Juniperus virginiana)* invaded fields soon after abandonment and remained the dominant arborescent species for over 60 years. The two dominant shrubs on abandoned fields were dewberry *(Rubus flagellaris)* and poison ivy *(Toxicodendron radicans).* At 100 years, oaks and hickories assumed dominance and were the climax arborescent species. On the piedmont of North Carolina, horseweed (*Conyza canadensis*) was dominant on a field abandoned for one year followed by aster (*Aster*) dominance at two years. Broom sedge (*Andropogon virginicus*) dominated fields abandoned for five years and at five years pine (*Pinus spp.*) were well established. Pines were dominant on fields abandoned from 15 to 110 years[16]. Short leaf pine (*Pinus echinata* remained dominant at the "Billings Field," a 175 year old field in the vicinity of Durham, North Carolina[17]. However, there are many exceptions to successional trends[18].

There are numerous investigations of secondary succession, among which are those of Braun-Blanquet[19] , Clements [20], Oosting [3, 21], Rankiaer[22], Weaver and Clements[23], Bard[14], and Stalter[24]. Lutz[25] described old field associations of southern Rhode Island and southeastern Massachusetts and reported that *Juniperus virginiana, Betula populifolia, Prunus virginiana,* and *Cornus spp*. were generally found in abandonment fields. These trees were replaced by *Quercus spp*., and *Fraxinus americana,* tending toward the hemlock hardwood climax community[25]. Bromely[26] contended that the hemlock (*Tsuga canadensis)* was the tree best fitted to dominate the climax forest of southern New England due to its longevity, shade tolerance, and ultimate size. For the last several decades Canadian hemlock has been ravaged by wooly adelgid and may ultimately become extirpated in areas where it was once common.

Oaks (*Quercus spp*.) are the dominant trees at Cunningham and Alley Parks, New York, and at the dry ridge at Inwood Park in northern Manhattan. Oaks at all three sites have remained dominant for 70 years. Arborescent species dominance has remained constant at the moist slope and dry ridge at Inwood Park while there has been a change in tree species and relative dominance rank of lesser important species from 1935-2005.[27]

Stalter and Kincaid[11] studied the revegetation of a gamma irradiated pine oak forest at Brookhaven National Laboratory, New York. They compared vascular plant community change after gamma irradiation at the five vegetation zones described by Woodwell[28]. The vegetation zone from 0-15m from the source of gamma radiation received more than 63,000 roentgens was devoid of vegetation. This zone was invaded and populated by pitch pine (*Pinus rigida*). The adjacent zone 15-25m from the radiation source received between 27 and 63R was dominated by a nearly pure stand of sedge (*Carex pensylvanica*). *Carex pensylvanica* was the dominant plant at this site when sampled in

2007/2008[11]. Normal successional development on a disturbed site would proceed from annuals to perennials to a grass or sedge stage to pine or red cedar to oak dominance. At Brookhaven the most disturbed site, the total kill site is at a more advanced stage of community development than the earlier sedge or "grassy" stage. Stalter and Kincaid[11] reported that the dense roots of *Carex pensylvanica* have impeded pine invasion. White tailed deer selectively browse the few invading *Pinus rigida* seedlings in the zone where *C. pensylvanica* was dominant. However, Stalter and Kincaid[11] concluded, "Eventually, ecological succession shall proceed rendering the entire gamma forest into the climax pine oak forest within which it is embedded." They were unable to predict how long this process would take.

Primary Succession

Primary succession is initiated on a bare area where no vegetation has grown before. If the habitat is extremely dry it is described as XERIC, if wet, HYDRIC, if optimal with respect to moisture, MESIC. Whatever the condition of the initial habitat, the reaction of vegetation tends to make it favorable to more plants by reduction of extremes which is reflected in improved moisture condition. Secondary succession occurs on sites that have been previously covered by vegetation. Since conditions on these sites (e.g. an abandoned cornfield) are not as extreme as those on sites where no vegetation has grown before; secondary succession is usually more rapid.

Hydrarch Succession

Hydrarch succession begins in open water wherever vegetation can become established. The pioneer plants are submerged aquatics; next water lilies and other floating plants may exclude the submerged plants by shading them. In still shallow water emergent species predominate. These plants have their roots and rhizomes in the mud and extend upward, sometimes through water into the air (rushes, reeds, cattails, and sedges). The close growth of these aforementioned species tends to hold sediment. Gradually the bog or pond is filled in, as the plants grow and die and organic material accumulates.

Oosting[3] reported that in glacial lakes in Minnesota, emergent vegetation may form a floating mat that slowly moves over the lake surface. A few bog shrubs grew on this mat, behind which was a girdle of tamarack forming a closed stand. The oldest part of the bog was marked by the occurrence of black spruce, which succeeded tamarack[3].

Xerarch Succession

Xerarch succession on a rock follows a definite pattern whose progress is controlled by the rate at which soil forms and accumulates. Pioneers are either lichens or mosses capable of growing during the brief periods when water is available to them. The pioneer lichens are crustose and foliose types; they contribute by causing erosion of the rock surface and thus provide some anchorage for the other invading species. Mosses catch dust and mineral matter and thus more organic matter and mineral matter may accumulate.

When soil is built up sufficiently, hardy annual herbs appear followed by biennials

and perennials of which the grasses are most common. Later a shrub stage becomes dominant. By this time, the mat may be several inches or even a foot thick; trees may make their appearance.

Succession on disturbed sites may be influenced by the type of community surrounding the disturbed site, soil conditions (including shallowness or coarse texture), topography, position of the water table relative to the surface of the ground, competition for soil moisture, shading, macro and microclimate, phytochemical considerations (allelopathy), faunal influence (including insect activity, activity of small and large mammals), the previous use of the land (including the type of crop grown on the land), and the type of management of the right-of-way[19].

Stabilization and Climax

In successive communities the dominants become more exclusive. Eventually succession terminates in communities whose complex of species is so adjusted to each other, in the environment that has developed, that they are capable of reproducing within the community and exclude new species. This self-perpetuating community in harmony with the environment is the *climax community.*

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Fostering Environmental Stewardship through Study Abroad

by

Kathleen Nolan and Kristy Biolsi

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Field biology courses have increased in popularity in recent years. A wide variety of options exist from a one-week course in marine biology in places such as Belize or Honduras to a semester-long study in tropical ecology in Costa Rica. These courses not only enrich the experiential learning of the student, but contribute to both the economy of the country or state to which the student is traveling, as well as to the college at home. Personal examples of three different types of short courses in Belize, Honduras and the U.S. Virgin Islands will be given, as well as a reference from colleagues who have taken students to Panama and Australia. Input will also be given from Honors students who have taken these types of courses. Our hope is that the knowledge of ecosystems gained by the student will enhance their stewardship of the environment and that future travels of the graduates will contribute to sustainability of natural habitat through ecotourism.

Many of our students today have a "disconnect" with the natural environment. They spend much time on computers, texting on cell phones, and shopping in malls. They, and we, have been brought up to be consumers of products and energy. We do not lack for conveniences. Even a health club uses a tremendous amount of energy in the form of heat for pools, saunas and steam rooms, and energy to power elliptical machines and treadmills. Davidson[1] alludes to the isolation from nature caused by this separation of our modern world from nature in this quote: "The trinity of television, air-conditioning and shopping malls allows most Americans to isolate themselves from the environment to a degree never before possible." We would add cell phones, texting, and Facebook to that list.

Urban students face another challenge: actual fear of the outdoors. They are brought up to believe that it is dangerous to be outside, and will then often feel skittish in a natural setting. Even on overnight trips to a local forest students and faculty have been afraid of taking a walk in the dark, even when they are in a group with plenty of flashlights[2]. Louv[3] provides excellent examples of how this fear begins in childhood and how this aversion to nature continues into adulthood. He calls this "nature-deficit disorder." Russell[4] points out that each person interprets nature differently and gives as an example that students might not be as "thrilled" as we might think to see a whale. We find that this fear element often pervades the students' experiences of nature.

Commuter students (most of St. Francis College's students are commuters from the five boroughs of New York City) face the additional burden of trying to separate from their families. Even though they may have travelled abroad with their

families, they may have never been away from them. They sometimes feel uncomfortable in a group in which they may know no one. This might lead to false bravado that may manifest itself in homesickness if the trip leader is not attentive.

Because our world is in danger environmentally, it is important for students to see the natural world the way it is currently. They can conduct additional studies to ascertain how the world used to look, and can study future projections. If they develop an interest in this natural world, they may then take steps to try to sustain it and thus prevent further environmental degradation.

A short-term experience that is a week to a month long can ease students into an unknown that might seem strange to them. The week-long experience is also more affordable to the student. They will gain countless experiences such as learning about and experiencing a new culture, ecosystems, and perhaps even new behavior from their fellow students and professors. They will learn about group dynamics and will hopefully learn and use good coping and socializing skills. After this experience, they may feel that they would like to participate in a semester-abroad program.

St. Francis College has experimented with a two-week mini-semester in January and May since 2008. Seven field-oriented marine biology courses have now been taught by Kathleen Nolan and the sixth course (January 2011) was taught by Kristy Biolsi as well as K. Nolan. Three of the courses were taught in Belize, two in Honduras, and the most recent two courses was taught in the U.S. Virgin Islands. The goal was to choose a field station that had some non-degraded coral reef and that would provide a variety of marine habitats and organisms for the students to view and study. These courses were two-weeks in duration; the first week was held at the campus of St. Francis College and included New York City field trips. The second week was at the study-abroad field site.

Other colleagues have successfully taught short field-based courses in Panama and Australia[5]. The Panama course, which was taught by Judy Guinan, was a two-week course that incorporated tropical forest ecology along with a study of coral reefs. The Smithsonian Tropical Research Institute was utilized in Panama (http:// www.stri.si.edu/). Ruth Beattie from the University of Kentucky taught a course in Australia that included students from other colleges that were part of a consortium (Cooperative Center for Study Abroad (CCSA)-- http://www.ccsa.cc/). A positive reason for a professor to teach students from a consortium is that one can increase the pool of applicants. A negative point is that one does not always get to know the students before the course begins.

Dr. Nolan initially traveled to Belize (Wee Wee Caye) to partake in a National Science Foundation (NSF)-funded Chautauqua short course taught by Dr. Laurence Meissner, from Concordia University in Texas, in Marine Biology. The course was designed for college professors and was organized so that the participants would gain the knowledge and self-confidence to teach such a course on their own. This course is still being offered although it is not funded by NSF anymore. Interested parties should go to http://www.edb.utexas.edu/ education/centserv/csme/ and link to Chautauqua short courses. Professors can also contact the proprietors, Mary and Paul Shave, of Wee Wee Caye Marine Lab directly by writing, calling, or e-

mailing; their address can be obtained from their web site: http:// www.marineecology.com/contact.html and/or through Mary Shave (Cell #: 011 501 660-8411).

What Dr. Nolan realized after taking this course is that most field-site programs have personnel that will help you design itineraries, and that one does not have to "go it alone" at the study-abroad site. Dr. Meissner also provided us sample syllabi, equipment lists, health forms and waivers of responsibility, which were most helpful and which we incorporated into our courses. In Dr. Meissner's course, we were exposed to different types of coral reefs such as patch reef and fore reef, and supporting ecosystems such as sea turtle beds and mangroves.

Since completing Dr. Meissner's course in Belize, the authors have taken students to the Belize Marine Tropical Education Center Belize MarineTREC (http:// www.belizemarinetrec.com) and Anthony's Key Resort in Honduras on the island of Roatan, thirty miles off the coast of mainland Honduras, and to the Virgin Islands Environmental Resource Station (VIERS) (http://www.islands.org/viers). In all three locations, we introduced the students to the same ecosystems explored during Dr. Meissner's course. The Honduras field station also featured a dolphin behavior component, and manatee behavior was witnessed in Belize. All three locations had numerous plant and bird specimens that we studied, along with hiking. The most extensive hiking took place on the most recent trip in St. John. The Virgin Islands National Park comprises 56% of the island and there was a variety of hiking trails of various levels of difficulty from which to choose.

Even though the activities were similar at each location, each course was quite different. In Belize, we stayed at a hotel-type facility called Belize Marine Tropical Education Center (Belize MarineTREC) that is run by an ichthyologist, Ken Mattes, and his family. We flew into Belize City, and then took a small hopper plane with a 16 passengers maximum seating capacity to Ambergris Caye, where Belize MarineTREC is located. A few students did experience some anxiety on this ten-minute flight. The dock at TREC is approximately a quarter of a mile away from the beach. The director of this program arranges for boat transportation to the reef, which originates a quarter of a mile offshore. This coral reef is part of the Mesoamerican Reef, which is approximately 200 miles long (second largest in the world next to the Great Barrier Reef). The day on the boat begins at 9 A.M. and finishes at 4 P.M. on most days. There are evening activities such as lectures about the ecosystems and fish and invertebrate identification, a night seine, which is fishing off the shore with a large net, and a night snorkel. The students get very excited about the latter. This program had the best science, as the director, Ken Mattes, was the most experienced scientist in the three locations. A doctor was available at a clinic on the corner for emergencies. Dr. Mattes also stressed that the island of Ambergris Caye is a "large sand bar", thus it was incapable of supporting tall structures such as large hotels. The tallest building on the island is a four-story hotel. A resort attempted to build a large hotel, but Dr. Mattes brought a group of students with him to a protest, and the building was not built. This story is a direct example of civic leadership that can stem from environmental knowledge.

On Anthony's Key, a dive resort, a heavy education component has evolved that caters to school groups as well as divers. We only snorkeled, but this facility was the best of the three for diving. The resort was well-equipped with tanks, other diving equipment, and a decompression chamber. A doctor was also on staff. Anthony's Key had wait-service with choices, and probably provided the best food. The accommodations included spacious cabins, sometimes on stilts right over the water. We took a small boat, a water taxi, back and forth from our key to the "mainland" where the dining room and other facilities were located. Horseback riding and a dolphin encounter were provided, as well as lectures by an educator. The educator was sometimes able to accompany us on the daily snorkels by boat to assist with species identification. Anthony's Key also provided cultural experiences in the form of fire dancers and Garifuna dancers. Our educator, Jennifer Keck, was very knowledgeable about environmental issues facing Honduras, especially over-fishing. She was trying to assist local fishermen in coming to an understanding that it would be prudent for their future livelihood to not overfish groupers and spiny lobsters.

The Virgin Islands Environmental Resource Station (VIERS) on the U.S. Virgin Island, St. John, was the location of our most recent trip. The itinerary was divided fairly equally among hiking and snorkeling. We decided to make the course more interdisciplinary to widen our catchment net of students. An additional professor, Kristy Biolsi, joined the team. She comes from a background in marine mammal behavior, so her expertise has been appreciated. We also focused on fish and invertebrate behavior, as well as human behavior. The students recorded peer-group behavior in their journals as well as their individual reactions to new experiences. We also added water quality testing, recording of heart rate under various circumstances, and a night snorkel to the program, and purchased and brought our own dive flashlights. (Belize MarineTREC provides flashlights and Anthony's Key will rent them out.)

The VIERS program was the most focused on stressing sustainability to the students and emphasized the importance of keeping to a three-minute shower, composting, and conserving toilet water. As student Jessica wrote in her journal, "Went to the cabin and took my first three-minute shower. It was not as bad as I thought, however, a few more minutes would have been wondrous!". VIERS uses solar panels, composts food wastes, and has composting toilets. A tour of these facilities was presented to us on our first day.

Although VIERS had volunteers who prepared meals and accompanied us on hikes and snorkeling, the volunteers' knowledge of history, the ecosystems and species ID was uneven. One has to be the most knowledgeable about marine ecosystems and species to take students to VIERS. The program also included guest lecturers. One was a native-born Virgin Islander, Anthony Ital, who provided samples of medicinal plants for us to examine. This lore was passed on to him by his grandmother. Another speaker, Dr. Barry Devine, provided us with information about the history of the development of St. John, which was clear-cut at one time for sugar cane growing, and how over-population and development are threatening the coral reefs. Student Patty: commented on the lecture by Barry Devine, 'that we owe it to the world to help the world." Dr. Barry's lecture definitely motivated me to try and

be more conservative with this Earth." Dr. Devine has co-authored a book on the ecosystems of St. John[6]. Another informative book that presents a short history of St. John and the U.S. Virgin Islands and has maps of hiking trails is "St. John off the Beaten Track[7].

One of VIERS full-time personnel was very engaging with the students and encouraged us to search for, locate, and inform him if they found an invasive species, the lionfish so that the these fish could be destroyed. The students learned that an invasive species can often outcompete and displace native, more "desirable" species. This empowered the students because it made them feel like they could do something to help save an ecosystem.

We decided that four half-days before the trip would provide the student with an orientation to the course, as well as activities that would help them to better understand marine biology, animal behavior, environmental sustainability and the meaning of stewardship. We gave the students pre-and post-tests in marine biology and psychological terms. This year we also added a pre-and post course survey about their feelings about the environment and traveling and other aspects of the course and VIERS and the U.S. Virgin Islands. We then went over the vocabulary with the students and required them to take notes. From past assessments we have learned to stress certain important concepts such as coral bleaching and symbiosis. Coral bleaching occurs when zooanthellae, microorganisms that live in the corals and give them their bright colors, die because of pollution.

We gave them papers that are informational about the areas we were going to visit or that present complicated problems that we could discuss. We also required that the students write two book reports on books that we assign (Davidson[1] and Mowat[8]). Mowat's book, A Whale for the Killing was chosen for two reasons: 1) It took place in Newfoundland, a place that is far removed from the coral reefs, but which provided a contrast as the whales have often been decimated, which depicts a collapse of a part of our environment that most students can relate to and 2) There are many themes in the book to choose from to expand upon, such as greed, Progress, whaling, alienation. One report was due before we visited the field site, and a second report was due the week after our return. The Fire in the Turtle House by Davidson outlines the "discovery" of tumors in sea turtles worldwide. It was not known that these "fibropapillomas" were pandemic until researchers at a conservation conference gathered together from different corners of the world, including Hawaii and Florida. It is necessary for students to see that the process of getting information to other scientists, let alone the public can be a tortuous route.

A popular "stakeholder" exercise we have conducted in the past has been to point out the stakeholders in a particular environmental controversy. One that we have chosen involved an issue close to home—that of the declining numbers of horseshoe crabs[9.10]. We made a table on the computer that projected the different points of view of each stakeholder. To start out, we made two columns: For the Environment (horseshoe crab survives) and Against the Environment (horseshoe crab dies out). Sometimes there are gray areas and we sometimes placed stakeholders on both lists. For examples, condo/hotel developers could be designed with ecotourism in mind, or they could destroy beach habitats[11].

The students love games and one we have added “Saving the Commons” which is a simulation of what happens when companies pollute a lake[12]. The companies have points deducted based on pollution, but can choose to install pollution-saving devices at a cost. Often, unfortunately, the company that pollutes the most makes the most money, but overall, the water quality of the lake deteriorates. It is a sobering exercise for the students in learning about “the tragedy of the commons”[13] in which greedy people want to graze on just one more plot of land, or use up “just one more gallon of water” to their own “good” but to the ultimate detriment of others.

Another game that works well is vocabulary Bingo for which you only need one sheet of scrap paper and a writing utensil. The students make a five-by-five box grid on their paper and fill each square with a vocabulary word or environmental term they have learned that is related to the course. When everyone is ready, call on one student to give a definition of a “secret” word in the form of a question, and ask another student to state what the word is that matches the definition. If that student is correct, he/she can pose the next question. Whoever gets five across or up and down wins Bingo. Prizes such as pens, post-its, and small plastic marine organisms are appreciated.

We also have discussed with them the concept of “ecosystem services” in which we asked them to “guestimate” the value of certain services such as the mangroves filtering the water. If you look up the actual “cost” of running a filtration plant, using oil instead of solar energy and others you will drive home the point of “ecosystem services”. Vatn[14] notes that different cultures and institutions can influence this “value” of ecosystem services. Rowat and Engelhart[15] remark that the value of a species can change as it becomes more widely known. For example, tours have sprung up to take people out on “whale shark sightings”. Coincidentally, our January 2009 group in Honduras actually had a chance to swim with a whale shark that was over twenty-five feet long! This generated much excitement among the students and professors alike.

The concept of ecotourism and its pros and cons can be explored with the students. At VIERS we were allowed only three-minute showers because the cost of water is much higher than it is elsewhere, including New York City. Brightsmith and colleagues conducted a study that depicted how tour operators could make profits by providing room and board for volunteers from the Earthwatch Institute that help researchers with conservation projects in Peru over a seven-year period[16].

The students composed a species list of at least thirty species (common and Latin names) and we stress the importance of using Latin as the universal language in science. We explained that if two scientists are studying an organism such as a sea turtle in Florida and Hawaii and publish their material, the turtle might have different common names local to the region, but might actually be the same species, as would be depicted by the Latin names. They began their species identification on a field trip to the New York Aquarium. We pointed out the organisms that we are the most likely to see in the Caribbean. They were also required this year to observe two different animals for a half-hour each and record various behaviors. The students tend to like the larger animals such as sharks, sea turtles and harbor seals the best for their behavior observations.

The students also need to have an orientation on the culture of the country/ area that they will be visiting. This will allow them to be more comfortable in the new environment, therefore enabling them to better appreciate and learn about this new culture and its history (for a review of Caribbean culture see Scher[17]). Their fears about swimming in open water, snorkeling, insects, and the dark should be addressed. If these fears are not reckoned with, the development of the sense of stewardship by the student will be impeded. The students should practice with their snorkel equipment in a pool, if possible, before the trip, and life preservers should be worn by weak swimmers. You should also be aware that even those who are good swimmers in a pool may panic in open water. Night snorkeling can also be used to instruct students about how different organisms "come out" at night, such as octopi, squirrel fish, groupers and others. Many have a fear of night snorkeling, but are proud when they are able to overcome this. From Melissa's journal: "For dinner the whole time I'm thinking "oh s__t!" we are going night snorkeling. I don't want to go night snorkeling. I don't want to go night snorkeling. I went in it crying and I came out with a smile on my face. I did it!"

Seining should be a component of every course. The VIERS site did not have a working seine net, which we hope is rectified in the future. Seining is an easy way for students to get in the water and actually catch many small fish, crabs, and even larger fish such as checkered puffers[18-20]. This simple hands-on activity has a tremendous payoff. It is a hands-on activity that gives the students a sense of accomplishment. The fish in these nets are usually small and non-threatening, although crabs can bite. We calculate a biodiversity index (Shannon Weiner) that takes into account the number of species and the proportion that they make up of the whole. The health of the environment is directly correlated with the biodiversity index—a greater number of species and an even proportion of species (not too many of just one or a few species) is more desirable.

The journals help the students to reflect on what they have seen. They were exposed to the environment in a way that they had not experienced in the past, and felt a more intimate connection to it as well as to each other. Some students had never experienced seeing stars. Marje said, "It's a new moon tonight and so it is pitch black. I was really excited to walk to the dock and possibly see stars, because it's one of the first things on my bucket list; to see countless stars at night….The feeling you get when lying down on the dock is peaceful. I've never felt so comfortable and stress - free…."

The book reports, participation in discussions, note-taking, attentiveness and participation in all activities on the home campus and abroad, and journals were all used in grading and assessment. The journals were especially telling. We learned this year that the students had often not been exposed to the natural environment and were thus afraid of it. A feeling of comfort will help promote a sense of stewardship in the students and, when queried, all expressed interest in further travel. This would help promote ecotourism in these countries/areas. Students might become further involved in this stewardship through activism, volunteerism and/or monetary contributions. We are committed to continuing to provide a course such as this for our students because of the often intangible value it provides.

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Students' Perception of the Effectiveness of the Use of PowerPoint In Biology Classrooms

by

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ABSTRACT

Two groups of community college students, from Kingsborough Community College/CUNY and Nassau Community College/SUNY, were surveyed in order to determine their perceptions of the use of PowerPoint presentations in biology courses. The students' responses mirrored each other in most respects. They believe that PPT presentations help them in their studies despite the fact that the literature demonstrates no differences in grades between traditional methods of teaching and the use of PPT technology. Students from both schools gave insightful comments concerning the use of PPT in the classroom.

Introduction

In many colleges throughout the country, there exist a trend towards the use of many kinds of Multimedia technologies. One example is PowerPoint (PPT) technology that can be used to present many biological concepts. Literature demonstrates the widespread use of this technology.

Apperson *et al*.[1] have indicated that students in many classes felt that PPT aided them in their learning process. However, these authors show that there were no differences in students' grades where PPT was used. Students believed that PPT made classes more interesting and organized; they expressed a more positive impression of faculty members that used PPT. Furthermore, students stated that faculty should not rush through the material when they use PPT.

Another study by Apperson *et al.*[2] used a PPT preferences survey to obtain students' responses. The following summarizes their results:

- Students prefer well constructed PPT presentations
- Students prefer PPT outlines of discussion points
- Students prefer color to black and white background
- Students prefer dimmed light during PPT presentation
- Students want to have copies of PPT slides

These authors also suggested further research be conducted on the effect of PPT handouts on students' grades.

Frey and Birnbaum[3] found that students prefer PPT slides with graphs rather then text. Susskind[4] indicated that students' motivation declined if PPT lectures were changed in midstream to traditional "chalk and talk" lectures. However, he found that lecture style did

not effect students' academic performance. PPT use was found to enhance effective time management and provide structure to a presentation.

Smith[5] reported that students generally have a good attitude towards classroom technology use and that technology (PPT) improves the learning environment for them. Students, however indicated that often instructors go too fast when using PPT presentations and that they might distance themselves from the students.

Various studies have shown that students that were visual learners most enjoyed PPT presentations. Jackson[6] indicated an overwhelmingly favorable response from students to the use of PPT in comparative politics classes. Students indicated that the PPT presentations supported course content and made courses interesting. Visual learner were especially enthusiastic to PPT usage.

At Kingsborough Community College/ CUNY (KCC) and at Nassau Community College/SUNY (NCC) many faculties use PPT in their lecture classes as well as in their laboratory courses. We decided to survey our biology students at both institutions to assess students' perception of the effectiveness of PPT in biology classrooms. We surveyed 127 students at KCC and 169 at NCC. Their responses towards the use of PPT as well as their comments were collected. The institutional review boards on human experiments at each school granted permission to survey the students. The Likert scale was used to quantify the results of the survey (Table I).

Results and Discussion

In general, students responses at both schools mirrored each other. For example, both groups (65-70%) of students perceived that the use of PPT helped them to achieve better grades in biology courses. (Fig, 1). An overwhelming number of students at KCC and NCC (over 85%) agreed and strongly agreed that PPT was helpful to them for studying the material (Fig. 2). Both group generally disagreed that PPT discourage them from taking notes (Fig. 3). They strongly agreed that they do take notes from the PPT presentations (Fig. 4). Over 75% of students from both groups felt that PPT helped them to understand biological concepts (Fig. 5). A split in KCC and NCC students' responses occurred in Fig. 6. KCC students strongly disagreed that faculty gave students slides from the PPT presentations, while NCC students indicated that faculty did give them copies of the slides.

As far as the effect of PPT on students' attentiveness, 60% of the students indicated that they were more attentive when PPT was used, while 20% to 30% seemed to be unsure (Fig. 7).

Most students in both groups agreed that PPT presentations included material taken from the textbook (Fig. 8). About 60% of students from both groups perceived that PPT presentations contained challenging questions or statements for class discussion (Fig. 9). Students in both institutions strongly disagreed with the statement that instructors should ask them to prepare their own PPT presentations for class discussion (Fig. 10).

Most students' comments from KCC and NCC expressed positive reviews of the use of PPT in the classroom. One concern of students was that PPT presentations were often too fast. Instructor should be aware of this concern. Furthermore, many students stated that they would like to receive copies of the PPT slides which they

Table I: Student Survey of the Use of PowerPoint Presentations During Classroom Instruction

Name (optional) _____

Biology Courses you completed_____

A. Did your instructor use PowerPoint presentations in classroom instruction? (Y or N)_____

B. If no, how did your instructor present class material? (ex- use of chalk board, handouts, overhead transparencies, etc.)

C. Would you want your instructor to use PowerPoint in your class? (Y or N)_____

If you answered "Yes" to the first question, then answer the questions below using the following Likert Scale.
5=strongly agree 4=somewhat agree 3=undecided 2= somewhat disagree 1=strongly disagree
Place number of your response on the line following each statement.

1. The use of PowerPoint by my instructor helped me to receive a better grade in the class._____
2. I find instructor PowerPoint presentations to be helpful in my coursework for studying the material. _____
3. PowerPoint presentations discourage me from taking notes. _____
4. I do take notes from PowerPoint presentations._____
5. I, as a student, can understand the biological concepts better when PowerPoint is used by my instructor. _____
6. My instructor gives students handouts with the slides from the PowerPoint presentations._____
7. I am more attentive in class when PowerPoint presentations are used by my instructors._____
8. My instructor uses PowerPoint presentations that include material taken from my class textbook. _____
9. My instructor prepares PowerPoint presentations (in part or whole) with challenging questions or statements for us to discuss in class _____
10. I would like my instructor to ask us to prepare our own PowerPoint presentations in order for us to present material in class _____

Write any comment that you wish about the use of PowerPoint presentations.

indicated that they are a useful study tool.

The students reflections in this paper often coincided with concerns found in the literature. Comments collected from the students were organized into six categories.

- Organization of material
- Ability to comprehend instructor and textbook
- Speed of PowerPoint presentation
- Note-taking ability
- Accessibility of PowerPoint slides
- PowerPoint for studying

The following selected comments were from students at KCC. Their comments are reported here verbatim and were not edited.

Organization of material:

- PowerPoint is helpful and I like it because it presents the material in an organized manner, instead of having the professor write on the board.
- They are good source for lectures. The presentations break down a topic into smaller sections, which makes it easier to understand.

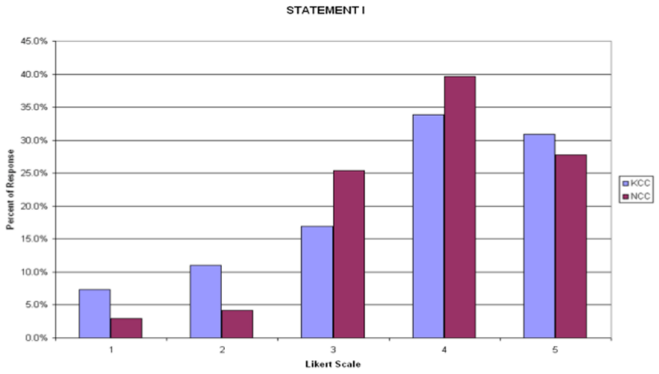

Fig. 1. The use of PowerPoint by my instructor helped me to receive a better grade in the class.

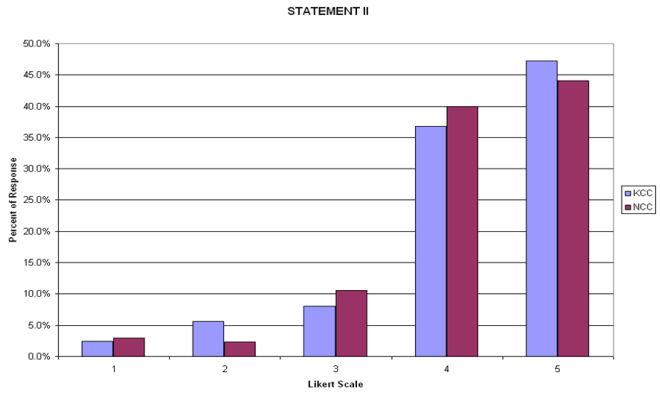

Fig. 2. I find instructor PowerPoint presentations to be helpful in my coursework for studying the material.

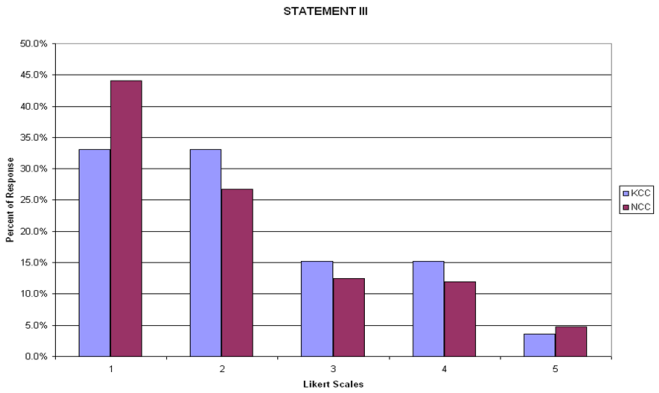

Fig. 3. PowerPoint presentations discourage me from taking notes.

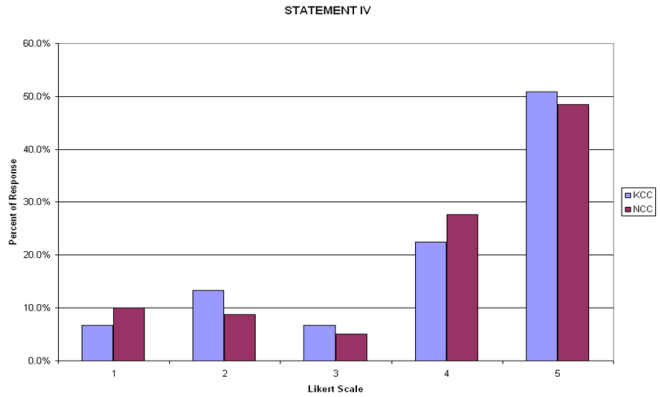

Fig. 4. I do take notes from PowerPoint presentations.

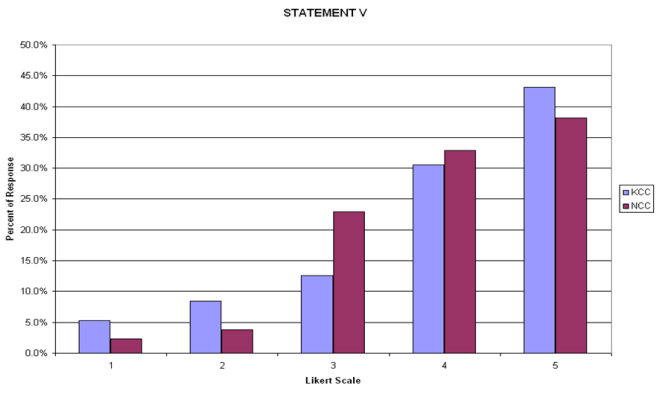

Fig. 5. I, as a student, can understand the biological concepts better when PowerPoint is used by my instructor.

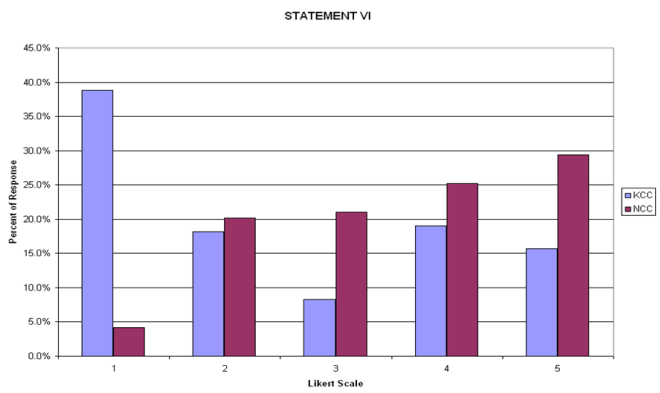

Fig. 6. My instructor gives students handouts with the slides from the PowerPoint presentations.

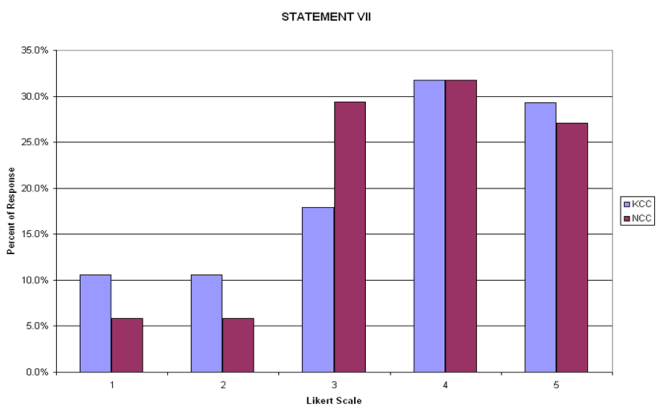

Fig. 7. I am more attentive in class when PowerPoint presentations are used by my instructors.

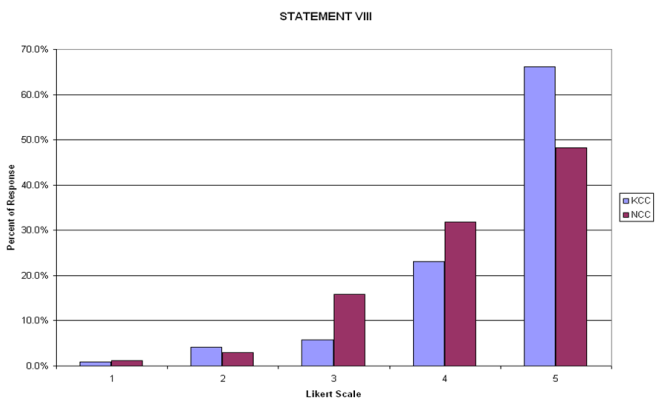

Fig. 8. My instructor uses PowerPoint presentations that include material taken from my class textbook.

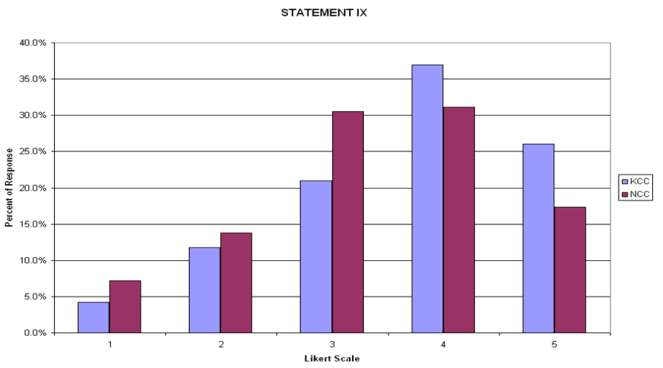

Fig. 9. My instructor prepares PowerPoint presentations (in part or whole) with challenging questions or statements for us to discuss in class

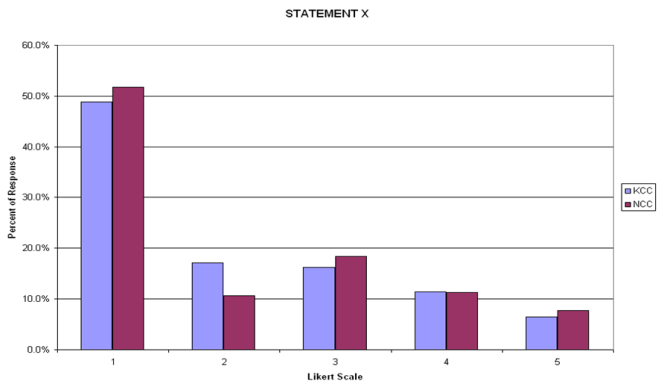

Fig. 10. I would like my instructor to ask us to prepare our own PowerPoint presentations in order for us to present material in class.

Ability to comprehend instructor and textbook

- It's a great way for professors to show their students what they are talking about reinforcing the lecture.
- PowerPoint can be a distraction because you are focused on the presentation rather than what the instructor is talking about.
- They are useful, especially when you cannot understand what the professor is saying or you do not catch what is said.

Speed of PowerPoint presentation

- Sometimes PowerPoint presentations are useful because they save time. However, professors should be specific about the importance of the information presented from PowerPoint presentations.
- Often, when the instructor uses PowerPoint he/she tends to go over the material rather quickly. Moreover sometimes the instructors limit themselves only to the PowerPoint presentation when it comes to explain a concept.

Note taking ability

- The time to copy notes from PowerPoint is very short.
- I have used PowerPoint that were prepared for the class by my professor and I have found it very useful and allowed me to take better notes and understand the material better.
- In some cases, it is a bit more difficult because PowerPoint presentations seem to go by too fast.

Accessibility of PowerPoint slides

- I would like the PowerPoint presentations to be available on *Blackboard*.
- These presentations would be more helpful if I had access to them.

PowerPoint for studying

- PowerPoint has its advantages and its disadvantages. For me it aids in my understanding of the textbook, prior to and after reading the textbook.
- I'm strongly recommending the use of PowerPoint by instructors because they (PowerPoint slides) give us only the necessary information. For example, the textbook chapter in 20 pages and the professors gives us only 5 PowerPoint slides, but the most important, the "Juice of the material".

The following comments were from students at NCC. Their comments are reported here verbatim and not edited.

Organization of material

- I like the presentations, very neat and organized!! Chalkboards are always good
- More organized, easy to read. Add music to keep students alert.

Ability to comprehend instructor and textbook

- The PPT on WebCT makes it easier to review online. I feel it helps me as a student.
- I think that PPT can greatly improve comprehension of the lectures. However, professors should go slower.

Speed of PowerPoint presentation

- I like PPT but we need time to write them down just as if it was on a chalkboard.
- Diagrams on the board or handouts are nice. PPTs are not bad but sometimes teachers go through too fast to take notes.

Note taking ability

- PPTs are useful for note taking when presented in an organized manner.
- PowerPoint slides being available to print make it easier to take notes.

Accessibility of PowerPoint slides

- The availability of the slides online helps if I missed notes, or need clarification.

PowerPoint for studying

- PPT presentations sometimes discourage students from thinking for themselves b/c all the information is already out for everyone. Less questioning on the students part and more daydreaming occurs.
- PowerPoints are very useful as study guides for most students

- It's easier to see what material is important and will be used in exams as opposed to lectures where every aspect is covered

As the reader can see, students at both schools have similar perceptions regarding PPT. These students' concerns and comments could be helpful to instructors in order to improve presentations and use PPT as a valuable tool. Nonetheless, even if students seem to enjoy this technology, it doesn't appear to improve their grades. For a long time the belief in the literature has been that enhancement of teaching methods and enrichment should improve students' performance. More search is warranted to understand this incongruence.

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