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# WIND POWER POTENTIAL IN UPSTATE NEW YORK

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*Sponsor: Robert Ballentine, Department of Earth Sciences*

We have been running the Weather Research and Forecasting (WRF) model over a portion of upstate New York for more than a year to simulate monthly and seasonal power generation from theoretical 1.5 MW wind turbines. This presentation will focus on the wind power potential within a few kilometers of the Lake Ontario shoreline both over land and over the lake.

For these simulations, we run the ARW-core of WRF on a doubly-nested domain so that large-scale meteorological forcing and local geographical effects are correctly represented. The grid spacing is 1.333 km for the finest grid, which covers much of upstate New York as well as the eastern and most of the southern shore of Lake Ontario. Winds predicted by WRF at 10 m, 40 m, and 80 m above the ground have been stored every hour of every day since February 18, 2009.

A wind speed-versus-power generation equation for a typical GE 1.5 MW turbine is used to compute hourly wind power at all of the 36,000 points in the fine-grid domain. For each grid point, the simulated power is summed for every hour of each season. Plots of seasonally-averaged simulated power generation will be discussed.

The New York Power Authority recently called for proposals to install up to 500 MW of wind power on Lake Ontario and Lake Erie. However, considerable local opposition caused legislators in both Jefferson and Oswego Counties to reject support for offshore turbines. Therefore, it is of interest to compare simulated power potential for lake points and land points close to the shoreline. Our results suggest that for winter 2009–10 (December, January, and February), there is excellent wind power potential (approximately 50% of capacity) both over the lake and over the land within a few km of the shorelines of Wayne, Cayuga, and Oswego Counties. This high potential is matched only by locations in the highest elevations of Wyoming and southern Ontario Counties, and in a few spots in the Adirondack Forest Preserve. WRF predicts significantly less power over the Tug Hill in winter. For summer 2009, there appears to be far less potential near the shore of Lake Ontario (averaging only about 17% of capacity), while the average generation is about 21% in the Tug Hill region. During spring and autumn, the model predicts comparable average power near the lake (about 30% of capacity) and in the mountainous regions of southern New York. For all seasons, wind power potential predicted by WRF is higher near the south shore of the lake than at comparable distances close to the eastern shore.

## **I. Introduction**

Consistent with the national goal of decreasing our dependence on carbon-based fuels, there is considerable interest in New York State in developing wind power especially in areas with the highest potential. The purpose of this research is to simulate low-level winds over upstate New York by running the Weather Research and Forecasting (WRF, Skamarock, et al 2005) model every day on a high-resolution (1.333 km) domain. Using the wind speed-versus-power generation curve for a General Electric (GE) 1.5 Megawatt (MW) wind turbine, we can estimate the monthly, seasonal, and annual average wind speed and wind power potential at all of our grid points (covering much of upstate New York and adjacent Lake Ontario).

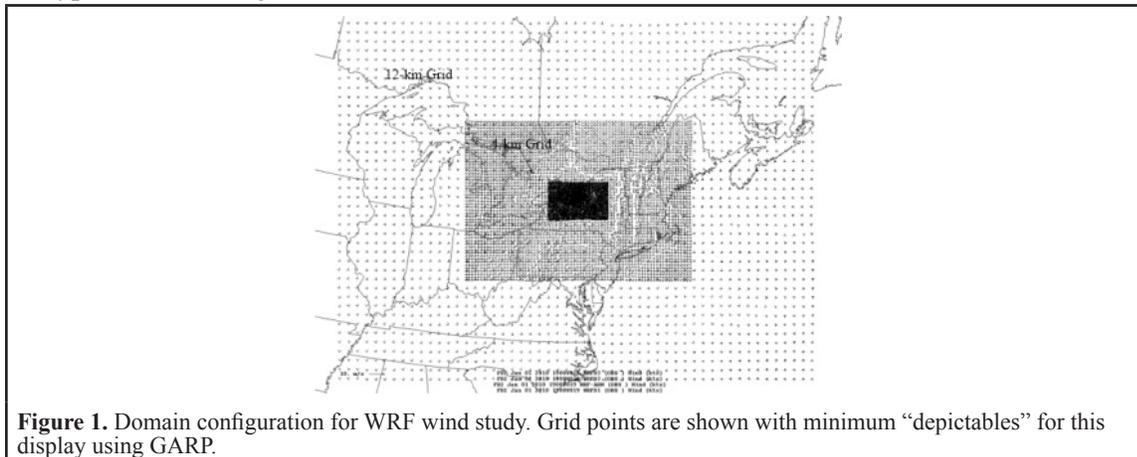
### *Ia. Brief description of wind power sites*

Currently, New York State has more than 1200 MW of wind generating capacity from sites such as Horizon Wind Energy's Maple Ridge Wind Farm in Lewis Counties and farms operated by Noble Environmental Power in Clinton, Franklin and Wyoming Counties. Several European countries (e.g., Denmark and the United Kingdom) are developing shallow offshore wind resources. With the strong prevailing winds near the Great Lakes, New York State ranks 15th in the nation with over 7000 MW of wind power potential according to the American Wind Power Association.

Since the New York Power Authority has recently called for proposals to install up to 500 MW of wind power on Lake Ontario and Lake Erie, it is of interest to compare simulated wind power potential for locations close to the shoreline both on land and over water. An important question is how far offshore turbines should be located to produce the greatest amount of power at the lowest startup and maintenance cost. One of our wind speed cross sections will show how simulated wind speed close to the Lake Ontario shoreline compares with that near the Maple Ridge Wind Farm on a seasonal basis.

## II. Methodology

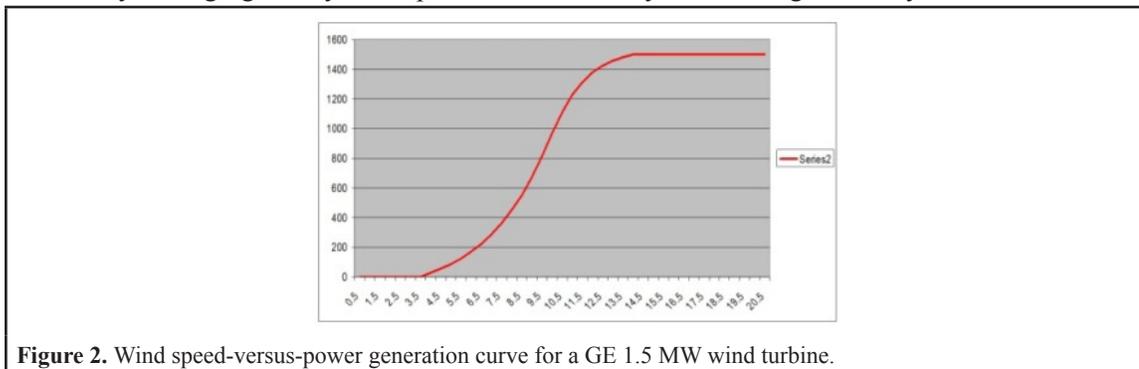
We are running the ARW-core of WRF on a doubly-nested grid (Fig. 1) to ensure that both large-scale meteorological forcing and local geographical effects are well-represented. The grid spacings of the large, intermediate and fine grids are 12 km, 4 km and 1.333 km respectively. We use 33 sigma levels where the lowest levels correspond to 10 m, 40 m and 80 m above ground under typical meteorological conditions.



We have been running WRF out to 24 hours every day since February 18, 2009 on a dual quad-core Dell Precision Workstation. Initial conditions and boundary values for the large domain are obtained using twelve contiguous “tiles” from the 0000 UTC run of the operational North American Mesoscale (NAM) model, available online from the National Centers for Environmental Prediction.

The wind speed predicted by WRF each hour at 80 m AGL is used in a formula that represents theoretical power generation by the GE 1.5 MW SLE turbine. Fig. 2 shows that no power is produced for winds less than 3.5 m/s while separate cubic polynomials are used to fit the GE power curve between 3.5 and 10 m/s and between 10 and 14 m/s. Power output is held constant for wind

speed above 14 m/s, but drops to zero above 25 m/s since the turbine is supposed to be shut down to avoid damage. The plots of the annual-average simulated wind speed and wind power are constructed by averaging hourly WRF predictions for every hour throughout the year.

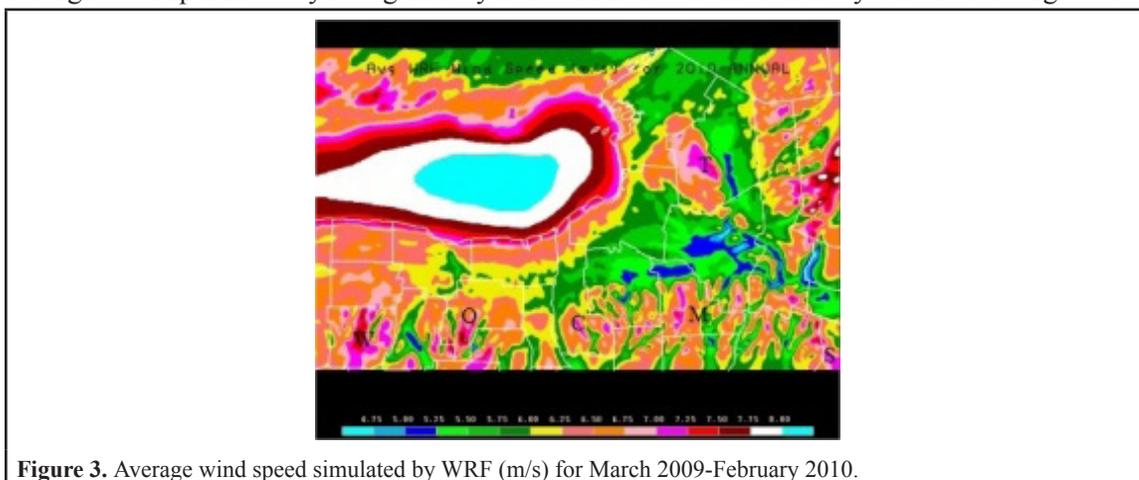


**Figure 2.** Wind speed-versus-power generation curve for a GE 1.5 MW wind turbine.

### III. Results

#### *IIIa. Annual and seasonal wind speeds on the fine grid*

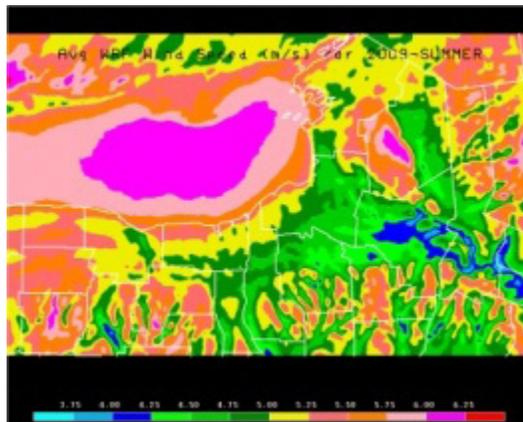
For the entire year that was studied (March 2009 – February 2010), WRF predicts wind speed maxima over Lake Ontario, the Tug Hill Plateau (T in Fig. 3), northeastern Otsego County (S), Madison County (M), southern Cayuga County (C), southern Ontario County (O), and Wyoming County (W) in the southwest corner of the fine-grid. We see from Fig. 3 that WRF predicts a potential for up to 7.75 m/s of average annual wind speed (white contour border) over Lake Ontario within a ‘reasonable’ distance (e.g., 25 km) from the coast. Furthermore, WRF predicts a potential for average annual wind speeds to reach 7.25 m/s (red contour border) over the Tug Hill Plateau. It should be noted that the Tug Hill Plateau is the site of the Maple Ridge Wind Farm which happens to be the largest wind farm in New York State. Moreover, WRF predicts slightly greater annual average wind speeds in Wyoming County and in southern Ontario County than on the Tug Hill.



**Figure 3.** Average wind speed simulated by WRF (m/s) for March 2009-February 2010.

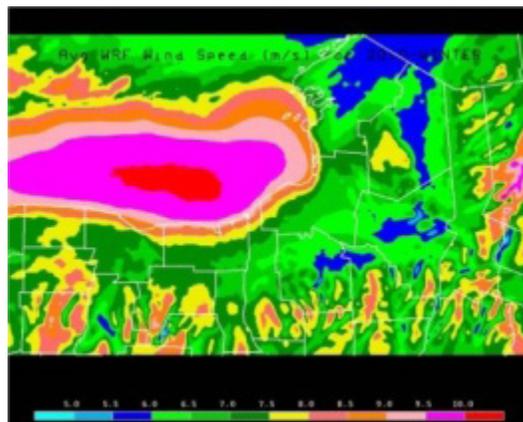
When looking at the individual seasons, it appears that summer 2009 has the lowest potential for high wind speeds. Fig. 4 shows the WRF predicted wind speeds to only reach 6.00 m/s in

the Tug Hill, Wyoming, and Ontario Counties while only reaching 5.75 m/s within a reasonable distance of the coast. Wind speeds along the southern shoreline are predicted to reach 5.50 m/s while winds along the eastern shoreline may only reach up to 5.25 m/s. As shown in Fig. 4, WRF predicted wind speeds on land (Tug Hill, Wyoming and Ontario Counties) are expected to exceed predicted wind speeds both along the shorelines and within a reasonable distance offshore. Wind turbines would have to be installed greater than 25 km off either the southern or eastern shoreline to match the wind speeds on land.

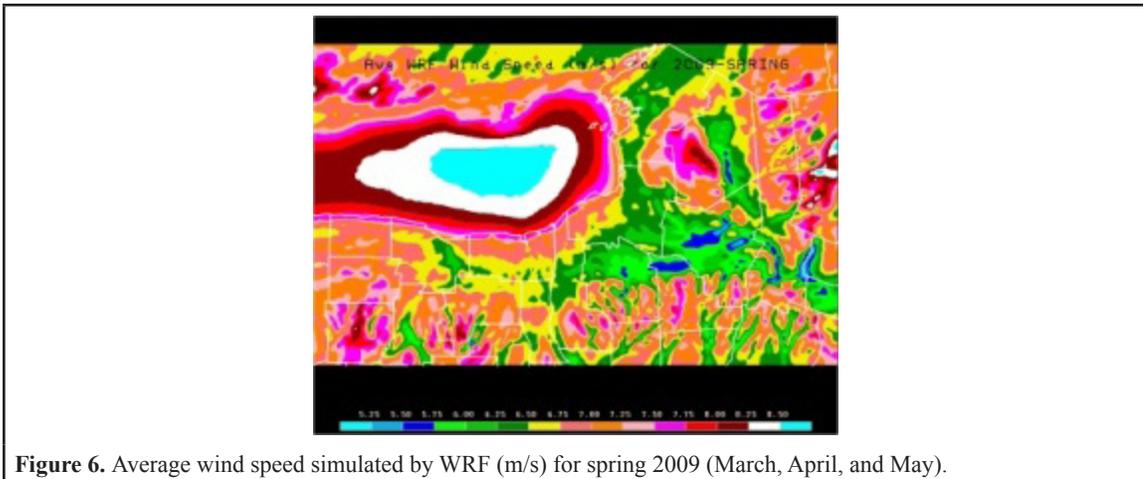


**Figure 4.** Average wind speed simulated by WRF (m/s) for summer 2009 (June, July, and August).

In contrast, winter 2009–10 appears to be the strongest season, as far as predicted wind speeds are concerned. WRF predicted that wind speeds within a reasonable distance of the coast exceed the annual average by about 1.75 m/s, reaching 9.50 m/s. Additionally, it can be seen from Fig. 5 that WRF predicts somewhat stronger wind speeds along the southern shoreline rather than the eastern shoreline. While wind speeds of 9.50 m/s may be found very close to the southern shoreline, turbines would have to be placed about 20 km from the eastern shoreline to reach such wind speeds. Interestingly, Fig. 5 shows somewhat weaker wind speeds in the Tug Hill, barely reaching 8.50 m/s in the southeast corner of the area. Furthermore, WRF predicts wind speeds in the hills of Wyoming and Ontario Counties to reach 9.00 m/s, a greater wind speed than simulated over the Tug Hill and over a much larger area.



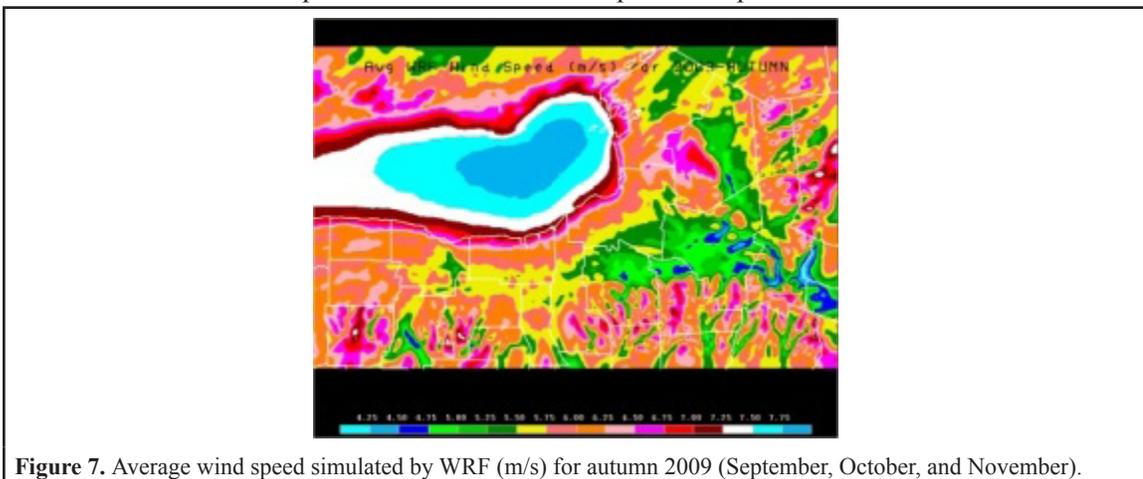
**Figure 5.** Average wind speed simulated by WRF (m/s) for winter 2009-10 (December, January, and February).



**Figure 6.** Average wind speed simulated by WRF (m/s) for spring 2009 (March, April, and May).

The season with the second strongest predicted wind speeds appears to be spring 2009. WRF predicts a potential for wind speeds to reach up to 8.25 m/s not far from the southern coast, as shown in Fig. 6. Wind speeds in the Tug Hill are predicted to reach 8.00 m/s, exceeding wind speeds expected on land along both the eastern and southern shorelines of Lake Ontario. Once again, it appears that we may expect stronger wind speeds along the southern shoreline rather than the eastern shoreline. Furthermore, wind speeds in the hills of Wyoming and Ontario Counties appear to be equal to that of the Tug Hill.

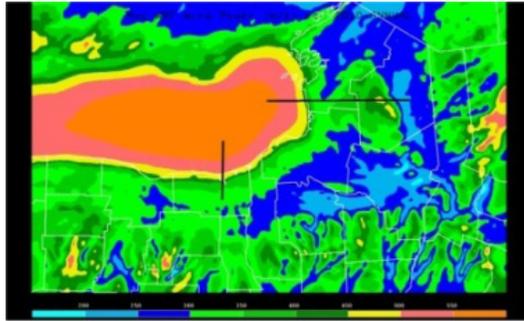
Unlike spring 2009, WRF predicts wind speeds on land along the shorelines of Lake Ontario to be comparable to the wind speeds over the Tug Hill. At some locations along the southern shoreline the WRF predicted wind speeds exceed that of the Tug Hill. As in Fig. 7, wind speeds along the southern shoreline are predicted to reach up to 7.00 m/s while reaching up to 6.75 m/s along the eastern shoreline. Not far offshore wind speeds are predicted to reach up to 7.50 m/s. Over the Tug Hill, wind speeds are expected to reach up to 6.75 m/s while the hills of Wyoming and Ontario Counties are predicted to receive wind speeds of up to 7.25 m/s.



**Figure 7.** Average wind speed simulated by WRF (m/s) for autumn 2009 (September, October, and November).

Similar to the annual WRF predicted wind speeds at these various locations on our fine grid, the annual plot of WRF estimated wind power potential shows similar results. Locations of maxima wind power potential over the entire fine grid are out over Lake Ontario, the Tug Hill Plateau,

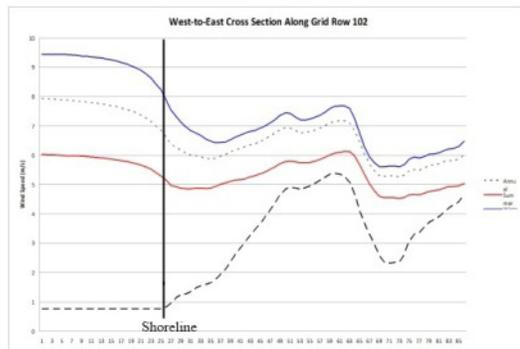
Wyoming and Ontario Counties, and in the Adirondack Mountains. Based on Fig. 8, WRF predicts a potential of 450 kW along the southern shoreline (500 kW at a few spots) and about 550 kW offshore within a reasonable distance of the shoreline. The hills in Wyoming and Ontario Counties show a potential for up to 500 kW of power while the Tug Hill may only expect up to 450 kW of power.



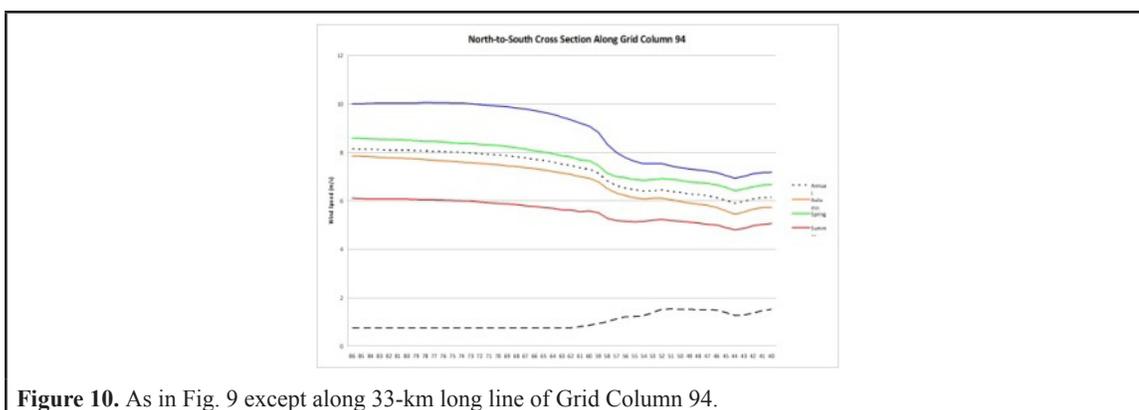
**Figure 8.** Average wind power simulated by WRF (kW) for March 2009 – February 2010.

### *IIIb. Wind speed cross sections*

Since there appears to be growing interest in offshore wind power in New York State, we will examine both west-to-east and north-to-south cross sections of wind speed simulated by WRF. The approximate locations of these cross sections are shown by the heavy black lines in Fig. 8. The first runs eastward through the Tug Hill Plateau and the second extends southward over Sodus Bay into Wayne County. The west-east cross section (Fig. 9) shows a decline in predicted wind speed as we move from the lake toward the eastern shore. For each season, predicted wind speed increases over land with a slight decrease in extreme western Lewis County where the terrain levels off followed by another steady increase to the summit of the Tug Hill along model grid Row 102. WRF predicted wind speed decreases sharply as we approach the Black River Valley (near the right edge of Fig. 9).



**Figure 9.** Wind power (kW) simulated by WRF along 92-km long west-to-east line of Grid Row 102 shown in Fig. 8. Terrain elevation/100 (dashed) in meters using the same scale as that used for wind speed.



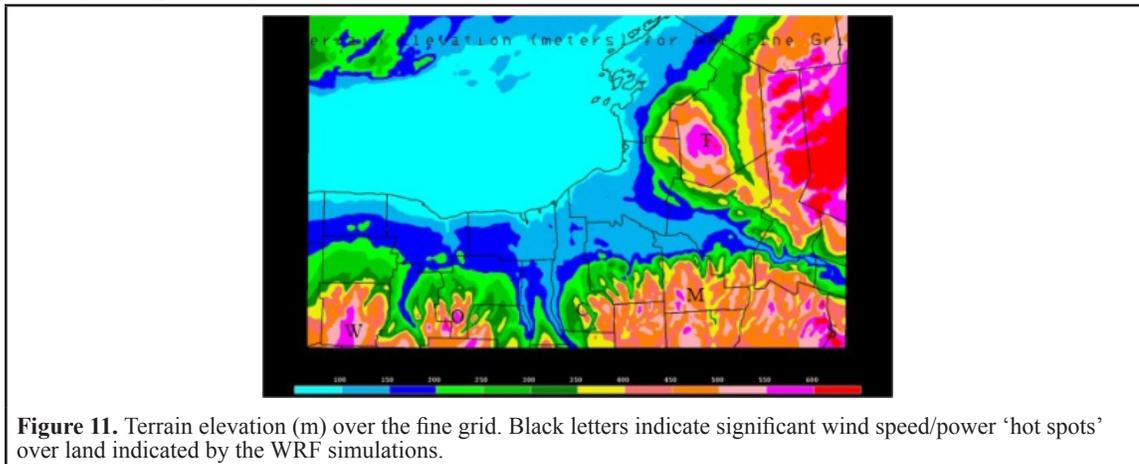
**Figure 10.** As in Fig. 9 except along 33-km long line of Grid Column 94.

The north-south cross section through Sodus Bay (Fig. 10) shows a gradual decrease in WRF predicted wind speed from a maximum well offshore of the lake to a minimum a few km inland. The largest wind speed decrease is predicted by WRF just inland from the south shore. The model suggests that no significant increase in wind speed should be expected over the slightly elevated terrain just south of the lake in Wayne County.

## IV. Discussion

### IVa. Influence of terrain

As expected, WRF predicts good potential for onshore wind power (e.g., averaging at least 30% of rated power) near the peaks of hilly areas. This is especially true for those hills where there is a large gradient in terrain elevation such as shown in Fig. 11 in Lewis County (Maple Ridge) and Wyoming County.

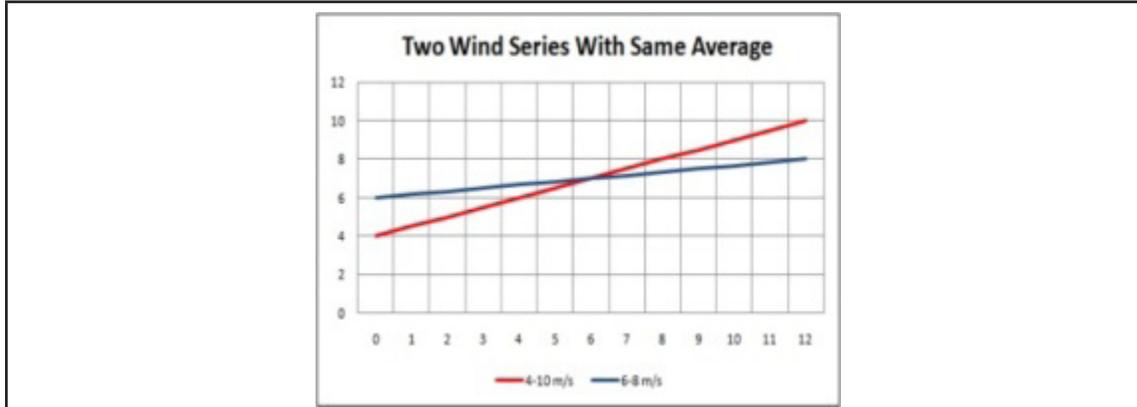


**Figure 11.** Terrain elevation (m) over the fine grid. Black letters indicate significant wind speed/power 'hot spots' over land indicated by the WRF simulations.

WRF indicates that wind power potential is good in portions of Herkimer and especially in Hamilton County along the eastern border of the fine grid. While there is high terrain and steep terrain gradients in these locations, it is not likely that wind turbines will be permitted there because these areas are within the Adirondack Park and Forest Preserve. Ideally, wind turbines should be located over cleared land or in shallow water rather than in forests.

**IVb. Two wind speed series with the same average wind speed**

A question that may arise and is especially important to consider is would one expect more power generation from a steady, constant wind speed over a set amount of time or a series of wind speeds that varied greatly, but still averaged the same wind speed. Fig. 12 illustrates two wind speed series, one that ranges from 4–10 m/s and another that ranges from 6–8 m/s over a 12 hour period. Note that both situations average 7 m/s.



**Figure 12.** Two wind speed series with the same average wind speed. The 4-10 m/s series is in red while the 6-8 m/s series is in blue.

Using the cubic polynomial used to fit the GE 1.5 MW power curve for wind speeds of 3.5 m/s to 10 m/s:

$$\text{Wind Power} = 2.154 * sp^3 - 21.69 * sp^2 + 124.92 * sp - 263.85$$

where sp is the wind speed in m/s, the predicted wind power could be calculated. From Table 1, we can see that more power would be expected over a 12 hour period from a wind speed series that has a wide variability rather than a steady, constant flow. This is because we are generally cubing the wind speed to get the wind power, and the difference between 4<sup>3</sup> and 6<sup>3</sup> is much smaller than 10<sup>3</sup> and 8<sup>3</sup>.

**Table 1.** Expected wind power from two different wind speed series.

Hour	Red Speed (m/s)	Blue Speed	Red Power	Blue Power
0	4	6	0.26940	1.70094
1	4.5	6.5667	0.5536975	1.9679391
2	5	6.3333	0.8775	2.04492132
3	5.5	6.5	1.2545925	2.2326975
4	6	6.6667	1.70994	2.4317632
5	6.5	6.8333	2.2326975	2.64258687
6	7	7	2.86602	2.86602
7	7.5	7.1667	3.6170625	3.10253636
8	8	7.3333	4.50198	3.35258634
9	8.5	7.5	5.5366275	3.6170625
10	9	7.6667	6.73895	3.89541961
11	9.5	7.8333	8.1215325	4.19107474
12	10	8	9.7035	4.50198
		Cumul Power	47.97078	38.4485295

However, this may not always be the case. If we recall Fig. 2, we are reminded that wind power increases exponentially with wind speed from 3.5 m/s to 10 m/s. For wind speeds greater than 10 m/s, wind power still increases, but not as much until it plateaus for wind speeds greater than 14 m/s. Therefore, had we chosen two different wind speed series, both that averaged over 10 m/s, we may have gotten different results. This is not of much concern though, as none of the locations on our plots averaged over 10 m/s.

#### ***IVc. Offshore versus onshore wind power***

Which is more cost effective, onshore wind power or offshore wind power installed in shallow bodies of water? WRF suggests that except during summer, there is at least as much potential just off the eastern and southern shorelines of Lake Ontario as there is over the Tug Hill. During winter, expected wind power just off the southern and eastern shorelines actually exceeds predicted wind power over land with December 2009 averaging up to 56% of capacity (capacity meaning the total amount of power that the turbine could generate, in our case, 1.5 MW) within 15 km of the shoreline as compared to barely 43% of capacity over the Tug Hill. We also find that the average power predicted by WRF *over land* within a narrow strip about 10 km wide adjacent to the shoreline exceeds that over the Tug Hill all the way from Rochester, NY nearly to Watertown, NY.

Additionally, the plot in Fig. 8 suggests that wind power potential along the coastal strip of Lake Ontario (and presumably the other Great Lakes) both onshore and offshore is at least as great in winter as for any of the hilly locations over land. For any season, it appears that the wind speeds (and in effect, wind power) are greater along the southern shoreline as compared to the eastern shoreline. In contrast, the WRF simulations for summer suggest that power potential is less along the onshore coastal strip than over the hills. Since the air in the lowest few hundred meters is usually more unstable over the lake in winter as compared to spring and summer, it is possible that the lake influence on wind speed extends somewhat farther inland during the cold season.

Some possible concerns about installing wind turbines on Lake Ontario include damage to the turbine and its supporting structure due to migrating ice flows and winds up to 80 mph in winter, the cost of cables to transmit electric power onshore, the cost of travel for maintenance, harm to birds and other wildlife, disruption of shipping lanes, restriction of fishing and other recreational activities. Some people may oppose turbines on the lake because they diminish the natural scenic beauty including the famous sunsets as viewed from the eastern shore of the lake.

Even if these challenges can be overcome, is there enough power potential over the lake to justify the extra cost of construction and maintenance? According to Windustry.org, the cost of commercial turbines over land ranged from \$1.2 to \$2.6 million per megawatt capacity in 2007. It has been difficult to find cost estimates for erecting and maintaining turbines on the Great Lakes, but we suspect that the support structures will need to be very rugged.

Another major problem with wind (and solar) is that it fluctuates from day-to-day and even hour-to-hour. However, electric utilities must provide a continuously reliable supply of electricity. Wholesale electricity prices can change by a factor of four (or more) from periods of high demand to low demand. It seems likely that there will be a need for meteorologists who have the ability to make short-range predictions (e.g., 3–36 hours) of energy demand and energy supply, especially the supply of wind and solar. Based on this research, it appears that WRF, run on a well-equipped desktop workstation, can provide useful guidance for meteorologists attempting to make detailed, short-range prediction of regional wind power.

## V. Conclusions

WRF running on a doubly-nested, high-resolution fine grid appears capable of representing the effects of large-scale meteorological conditions and irregular terrain. Using winds simulated each hour at 80 m, WRF predicts the greatest wind power potential over the interior of Lake Ontario where turbines are not likely to be installed. However, there appears to be very good potential (about 34% of capacity), over the shallow waters close to the shoreline. This includes the summer months where the average wind power for this region is only about 20% of capacity.

Over land, WRF predicts the greatest potential near the peaks of hills having a steep terrain elevation gradient such as the Tug Hill and the hills in Wyoming and Ontario Counties. For this past year (March 2009–February 2010), the average simulated power over the Tug Hill is about 31% of capacity, while the average in the narrow strip of land adjacent to the southern shore is about 33% of capacity, with the eastern shore averaging about 27% of capacity. Except for summer, the potential is greater just inland from the southern shore than just inland from the eastern shore of the lake. Furthermore, just off the southern shoreline, average simulated wind power is predicted to reach up to 37% of capacity within a reasonable distance of the coast. Additionally, wind power in Wyoming and Ontario Counties is predicted by WRF to extend up to 34% of capacity which is also very good.

We plan to keep running WRF every day for at least another year in order to expand our wind speed and wind power climatology. We will carry out sensitivity tests with different physical parameterizations to determine if any errors can be reduced. We will also determine if running with more vertical levels makes any difference in the accuracy of wind predictions. We will investigate a few of the rare cases where the model winds were much different than those reported at stations near the lake to determine the source of these large errors. Additionally, we would like to work with wind power companies at selected sites in Lewis and Wyoming Counties to help make short range (e.g., next day) forecasts for them.

## VI. References

Skamarock, W. C., J. B. Klemp, J. Dudhia, D. O. Gill, D. M. Barker, W. Wang and J. G. Powers, 2005: A description of the Advanced Research WRF Version 2. NCAR Tech. Note, ncar/TN-468+STR, 88 pp.

## VII. Acknowledgements

This research was supported by grant number DE-FG26-08NT01994 from the Department of Energy. We acknowledge the National Centers for Atmospheric Research and its collaborators for development of the WRF model, and the National Centers for Environmental Prediction for providing access to operational model forecast tiles which we are using to provide initial and boundary data. We are grateful to the Office of Research and Sponsored Programs at SUNY Oswego for purchase of the computer used to run WRF.

# RARE EARTH ELEMENT AND URANIUM-THORIUM VARIATIONS IN TUFFA FROM THE MONO BASIN, CA

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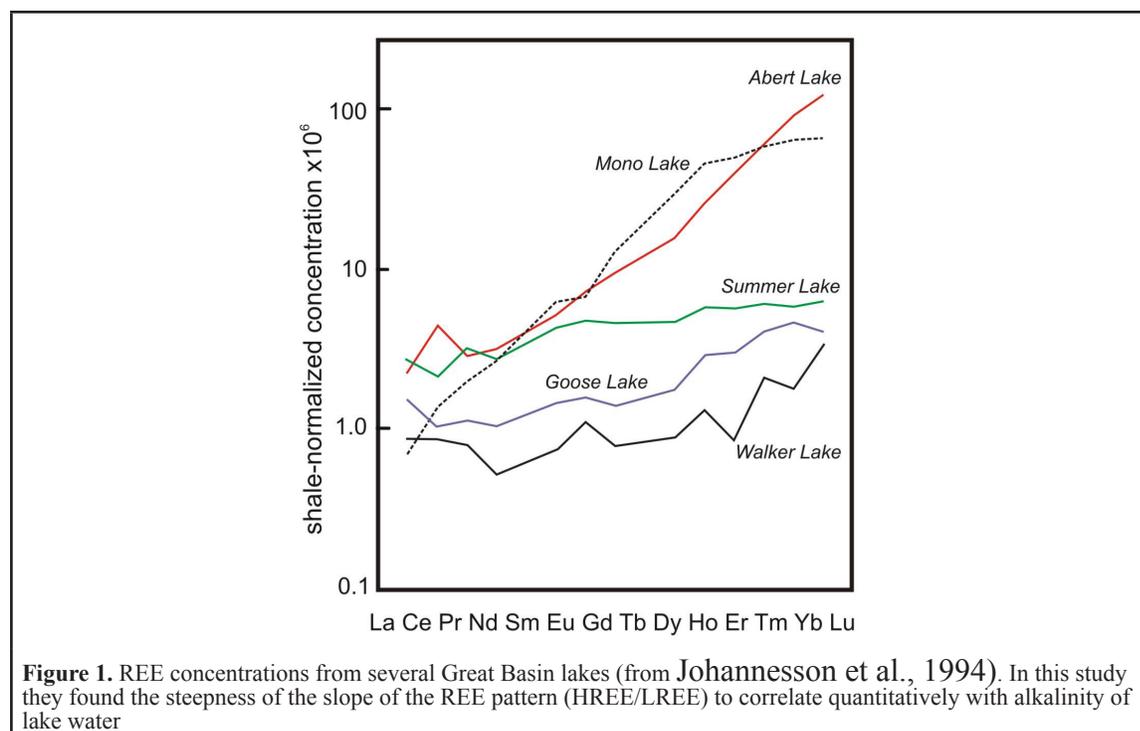
*Sponsor: Paul Tomascak, Department of Earth Sciences*

Samples of fossil tuffa deposits from several localities in the Mono Basin, eastern California, were analyzed for trace element concentrations in order to better understand changes in lake composition in the past. Seven elevations, ranging from 1,945 to 2,082 m above sea level are represented by the analyses. Tuffa samples have total lanthanide rare earth element (REE) concentrations ranging from 0.029 to 0.77 times average shales. Concentrations of U and Th range from 0.5 to 12 ppm and from 0.2 to 12 ppm, respectively, with substantial variability in U/Th (0.08 to 20). Relative to modern Mono Lake water the tuffa samples have 29 to 144,000 times the total REE contents, but the ratio of heavy to light REE (HREE/LREE) in lake water is nearly twice as high as the most HREE-enriched fossil tuffa. In general the results show promise for the application REE and U/Th to quantifying paleo-alkalinity, although analyses of modern precipitates as well as laboratory precipitation experiments are needed to fully address the processes.

## Introduction and Literature Review

Hydrographically closed lakes present an extraordinary opportunity to study the effects of climate change, as they respond on very short time scales to variations in temperature and aridity (Newton, 1994). One of the primary goals of sedimentary geochemistry of this type is to use measurable compositions of ancient materials as proxies for parameters that are not directly quantifiable. Tuffa is a rock made up principally of calcium carbonate precipitated under near Earth surface conditions. In lacustrine settings, tuffa commonly forms from the interaction of Ca-rich fresh water with carbonate-rich saline lake water (Jehl, 1983). Tuffa structures have long been noted surrounding Mono Lake, in the Mono Basin in eastern California (e.g., Russell, 1889). Tuffa deposits record water conditions during formation, so an elemental analysis of samples allows insight into how the lake composition has changed in the past. The use of tuffa in the study of ancient climate has centered primarily on stable isotope geochemistry and geochronology (Berelson et al., 2009; Lin et al., 1998; Nelson et al., 2005; Talbot, 1990), and not on elemental proxies.

Previous studies of lake waters have demonstrated a broad connection between REE concentrations and alkalinity (Figure 1; Johannesson et al., 1994). The relationship appears twofold, with higher alkalinity water correlating both with elevated ratio of heavy to light REE (HREE/LREE) and with total REE concentration. A similar correlation has been suggested for U/Th (Anderson et al., 1982; Simpson et al., 1982), but this relationship has yet to be rigorously demonstrated. The overall suggestion from these studies is that Th and the REE (in particular the heavy REE) are stabilized in water of higher alkalinity. The hypothesis of the current study is that as lake level drops in the Mono Basin, alkalinity of water increases, and that this geochemical signal will be transferred to the sedimentary record preserved in tuffa.



### Mono Lake and Tufa

Mono Lake, located in eastern California, is also at the western edge of the basin and range province in North America (Figure 2). This natural topographic depression was filled with water during Pleistocene glacial retreats, forming part of an extensive pluvial (freshwater) lake system. With fluctuations in temperature and aridity over the last million years, the basin has frequently hosted the hydrographically closed (saline) lake as witnessed in modern times. Being in a hydrographically closed basin, Mono Lake has limited inputs from streams, meteoric ground water and precipitation, and does not drain, resulting in concomitant increase in salinity.

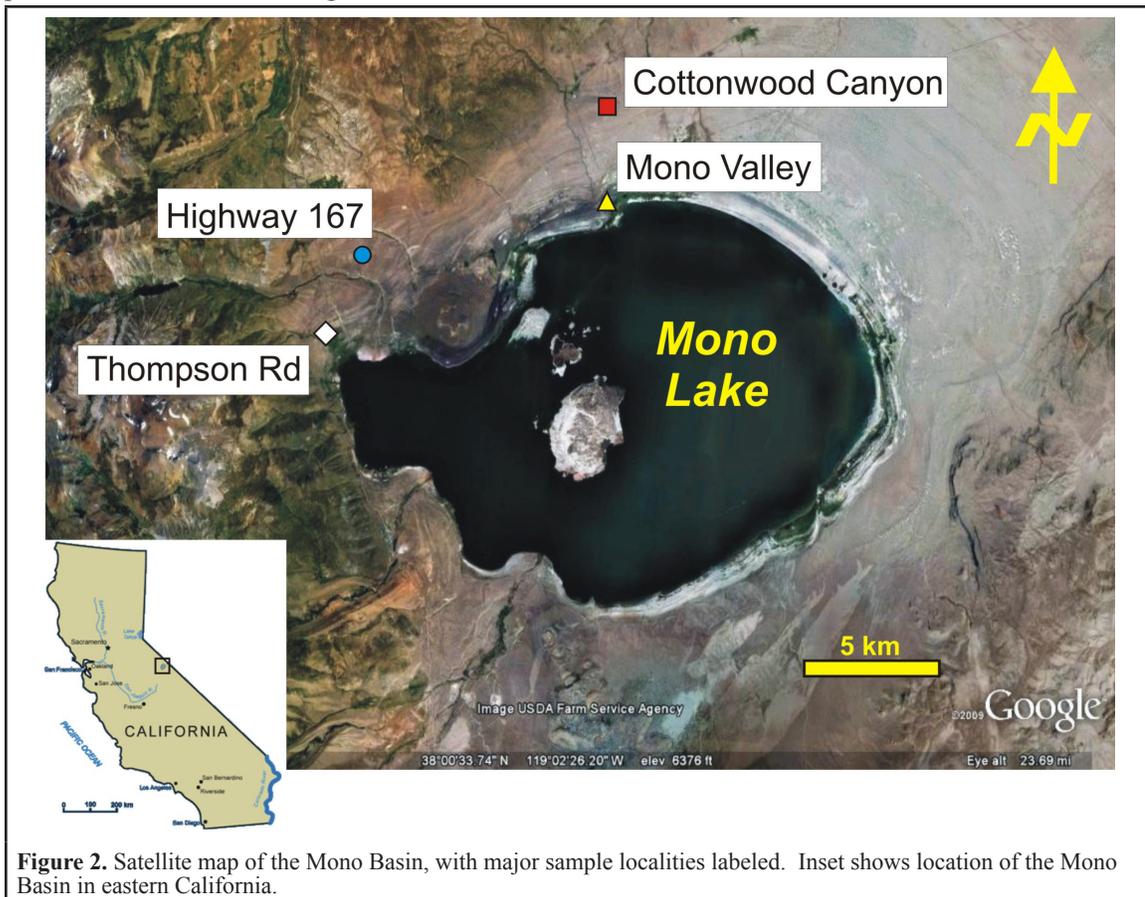
Tufa forms exclusively within lakes, where lake water and spring or stream water mix. Thus, tufa mounds and towers found at higher elevations than the present lake mark positions of pre-existing lake. Lake level increases should be accompanied by increased freshening and decrease in alkalinity, although the details of this relationship are not well understood. Hence, one way of assessing lake paleoalkalinity may be through elemental proxies in tufa.

The use of tufa may be complicated, however. Different forms of tufa currently crystallize in Mono Lake. Based on inferences from radiocarbon studies (Stine, 1990), the form of tufa most likely to record lake water composition in a direct and reliable way is material that begins not as calcite ( $\text{CaCO}_3$ ), but as ikaite ( $\text{CaCO}_3 \cdot 6\text{H}_2\text{O}$ ). Ikaite is a metastable mineral which forms in near freezing waters ( $\sim 3^\circ\text{C}$ ) and its formation has been observed at Mono Lake (Bischoff et al., 1993). It is thought that after precipitation and burial, ikaite crystals decompose to pseudomorphs of calcite. The characteristic morphology of this skeletal calcite is called thinolite, a vestigial term from the early geologic surveys of the area. Thinolite is a major component of many of the tufa mounds and towers around the Mono Basin. One assumption that must be made in the use of thinolite tufa

as a quantitative geochemical proxy is that only limited elemental fractionation between water and ikaite takes place, and further, that fractionation is similarly limited when ikaite converts to calcite.

### Samples and Analytical Methods

During the summer of 2009, collaborators on the project from Columbia University and the Lawrence Livermore National Laboratory collected tufa samples from a series of localities in the Mono Basin. Some samples represent one locality, whereas others were taken from different portions of single tufa towers. Samples were collected from elevations of 1,945 m (above sea level), which is essentially modern lake level, up to 2,082 m. An image of geographical context and sample localities is shown in Figure 2.



**Figure 2.** Satellite map of the Mono Basin, with major sample localities labeled. Inset shows location of the Mono Basin in eastern California.

Aliquots of samples were brought to SUNY Oswego for preparation and trace element analysis. Millimeter-scale chips were cleaned with purified water (18.2 M $\Omega$  cm) in an ultrasonic bath, dried, and crushed to a powder. Based on estimated concentrations of REE, U and Th, crushed samples ranging from 3 to 20 mg were digested in 7 M ultrapure nitric acid. Appropriate dilutions were made so samples in solution (1% HNO<sub>3</sub>) were in the working analytical range of the instrument. An internationally certified limestone reference standard (CCH-1; FNRS-NOW) was processed along with each set of samples in an identical fashion to the samples.

Diluted sample solutions were analyzed with a Varian 820MS quadrupole ICP-MS in the Interdisciplinary Elemental Measurement Facility at SUNY Oswego. The instrument was optimized for the mass range containing the elements of interest. Internal standard solutions containing either Be and In or Rh and In were aspirated along with sample solutions to monitor instrumental drift. A total of 63 samples from were analyzed for REE, U, and Th. Blank-equivalent concentrations for the REE were typically in the low- to mid-ppt (part per trillion) range; due to somewhat poorer background values for Th, and samples with solution concentrations below 1 ppb were not quantifiable in the initial analytical sessions. Repeat measurements of individual sample solutions yielded  $2\sigma$  standard deviations of  $< 4\%$ . Lanthanide analyses of the CCH-1 standard agreed with recommended values to generally better than 5%, except Ho, which was consistently high. Although we continue to examine this aberration, it does not affect the interpretations in the current study. Because of low Th in CCH-1, our measurements of the standard agreed poorly with the recommended value. Data for U in CCH-1 were consistently low (c. 9%). Our preparation left a small amount of solid residue in which U-bearing material (potentially chemically resistant organics) may be variably retained. We continue to work to improve the analytical method for low U, Th samples.

## Results

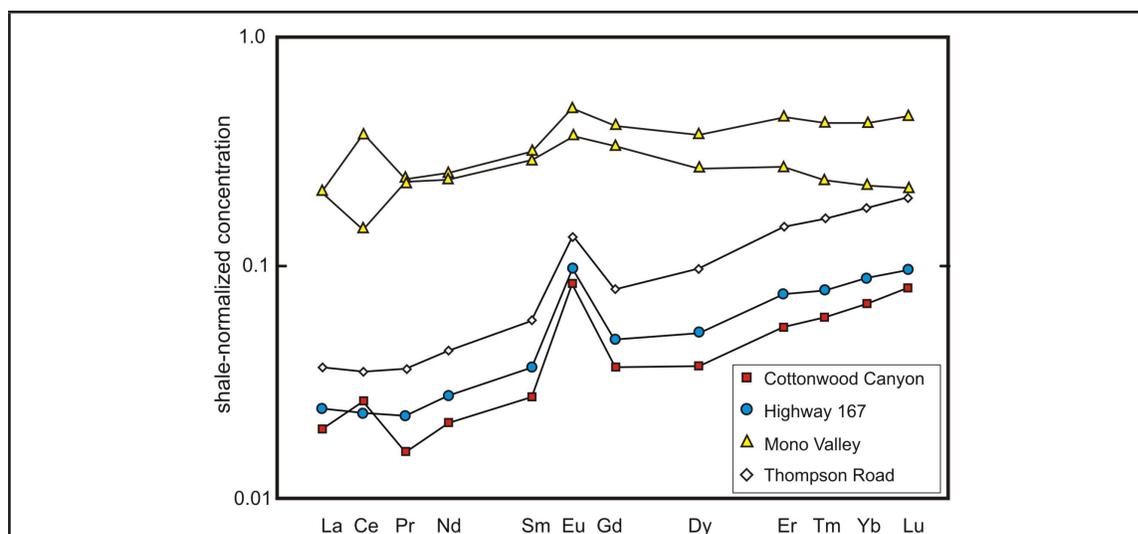
Data collected in this study are represented in parts per billion (ppb or  $10^{-9}$ g/g). To facilitate comparison, REE data are normalized to accepted values for the North American Shale Composite (NASC) of Gromet et al. (1984). Summary data, including elevations relative to sea level, are given in Table 1. This study included a number of less-heavily sampled localities; for simplicity, the current report focuses on the four most thoroughly studied areas within the Mono Basin.

The total REE content of samples shows a general inverse correlation with elevation, with samples from higher elevation possessing lower average total REE contents. All shale-normalized REE plots (Figure 3) have positive slopes, though variable. Most have negative Eu anomalies, and a majority also have positive Ce anomalies, although many have negative Ce anomalies.

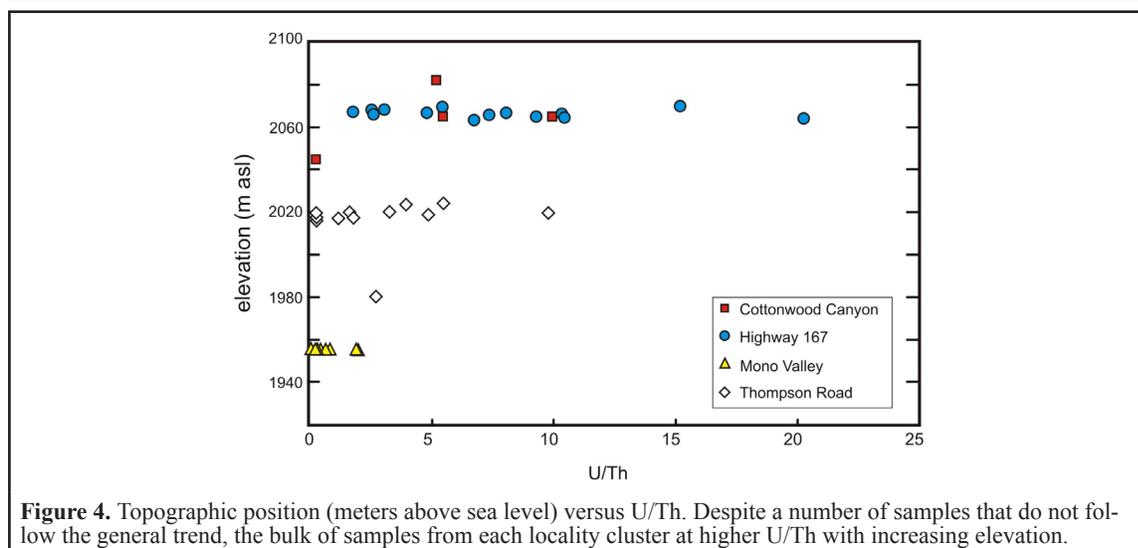
The average U/Th increases (and shows increasing variability) with elevation (Figure 4). Even with complications in measuring U and Th in some samples, average U/Th is higher in samples from localities at higher elevations. Compared to current Mono Lake water, REE plots have a more shallow slope (lower ratio of HREE/LREE; Johannesson and Lyons, 1994).

**Table 1.** Summary data from samples in this study.

<b>Sample (<i>locality</i>)</b>	<b>Elevation (m)</b>	<b>sum REE (ppb)</b>	<b>U/Th</b>
<i>Cottonwood Canyon</i>			
CC-1	2081.784	31545	5.1
CC-2	2065.02	5609	9.9
CC-3	2047.037	2374	217
CC-4	2044.598	161120	7.4
<i>Highway 167</i>			
Hwy 167-1	2069.287	17172	15.2
Hwy 167-2	2068.982	22504	5.4
Hwy 167-3	2066.544	18705	4.8
Hwy 167-4	2067.763	9484	3.0
Hwy 167-6	2063.191	13701	6.8
Hwy 167-7	2065.934	21511	10.3
Hwy 167-8	2065.63	13344	7.3
Hwy 167-9	2066.849	74689	1.8
Hwy 167-11	2064.106	7316	10.4
<i>Mono Valley</i>			
MV 2-2	1954.987	100697	0.4
MV 2-3	1954.987	118333	0.1
MV 2-8	1954.987	44384	0.4
MV 2-9	1954.987	47490	0.3
MV 2-10	1954.987	44664	0.3
MV 2-11	1954.987	95814	0.2
MV 2-12	1954.987	132107	0.08
MV 2-13	1954.987	129759	0.2
MV 2-14	1954.987	73022	0.08
MV 2-15	1954.987	34528	0.6
MV 2-16	1954.987	31805	0.8
MV 2-17	1954.987	55151	1.9
<i>Thompson Road</i>			
TR-1	2018.386	19048	4.8
TR-2	2015.338	174875	0.2
TR-3	2023.872	7466	3.9
TR-4	2016.862	185096	0.2
TR-5	2016.862	47779	1.7
TR-6	2020.214	36942	3.3
TR-7	2019.3	8272	9.8
TR-8	2019.605	205580	0.2
TR-10	1979.676	4480	2.7



**Figure 3.** Example REE distributions for tufa samples from the major sample localities in this study. Concentrations are normalized to NASC (Gromet et al., 1984). Samples show a general slight elevation in HREE/LREE, as well as variable Ce and Eu anomalies.



**Figure 4.** Topographic position (meters above sea level) versus U/Th. Despite a number of samples that do not follow the general trend, the bulk of samples from each locality cluster at higher U/Th with increasing elevation.

## Discussion

The ratio U/Th in the samples from this study ranges from 0.08 to over 200. Due to the high charge and small radius of the  $\text{Th}^{4+}$  ion, we hypothesized that the ratio U/Th would be sensitive to alkalinity, such that more alkaline (and hence more saline) lake water would precipitate carbonates with lower U/Th than more dilute waters present in higher Mono Lake stands of the past. In a general sense (when average data for individual tufa localities are used) there is a consistent trend that supports this hypothesis (Figure 5a). From this plot, it appears that a quantitative relationship may exist between U/Th and elevation, and hence U/Th may permit the indirect calculation of alkalinity.

Within each tufa locality there is considerable variability in U/Th (Figure 4); a similar order of variability is apparent in the REE concentration data of individual samples (not shown). In particular, the samples analyzed from localities higher above modern lake level show broader U/Th variability than samples from lower-elevation outcrops. One component of this is likely the larger number of distinct sampling sites at higher versus lower elevation introducing a larger degree of dispersion of data. The variability could also represent sampling of tufa mounds of greater age variability at higher elevation. One of the larger goals of this study is to identify samples for U-series dating (work under way at Columbia University by Dr. Xianfeng Wang), thus observations such as these are pivotal to the understanding of overall Mono Basin history.

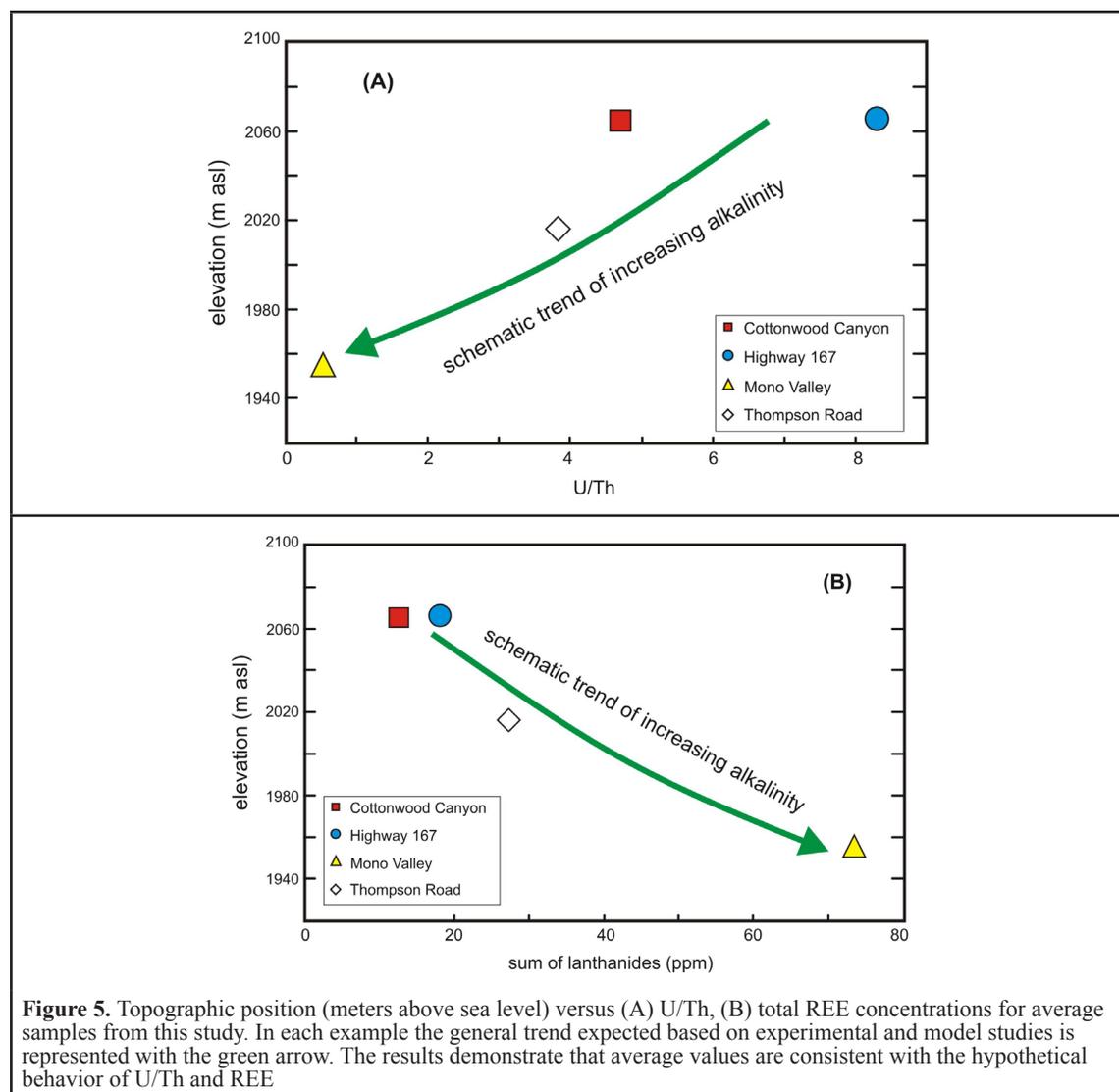
Similar to the average U/Th data, there is a general trend relating elevation and total REE content of tufa samples from each major locality (Figure 5b). The sense of this trend is consistent with the hypothesis, such that more REE-rich tufa tend to originate from more REE-rich (and more saline and alkaline) water. Used in concert, the U/Th and REE data argue that these trace elements may indeed be useful geochemical proxies.

Zhong and Mucci (1995) have showed that the alkalinity of seawater solutions affects REE during carbonate precipitation, similar to modeling from Johannesson et al. (1994) based on saline lakes. These experiments demonstrate that water with higher alkalinity produces precipitates with increasingly higher total REE. Relative to modern Mono Lake water (Johannesson and Lyons, 1994) the tufa samples have 29 to 144,000 times the total REE contents, but the water has HREE/LREE nearly twice as high as the most HREE-enriched fossil tufa. Thus, although our current data set is consistent with a link between alkalinity and total REE budget, we do not appear to resolve similarly correlated variations in HREE/LREE (Figure 3). The Johannesson et al. (1994) data were for lakes wherein alkalinity varied by two orders of magnitude. It is conceivable that the alkalinity change manifest in Mono Lake level change of c. 130 m is insufficient to drive that kind of REE fractionation.

The REE pattern anomalies are another significant feature of the Mono Basin tufa samples. Europium is most likely inherited from the ultimate weathered rock sources of REE, but Ce has some geochemical proxy potential, as its oxidation state is more sensitive to conditions that may prevail nearer the Earth's surface. For example, seawater has a substantial positive Ce anomaly. Nevertheless, the interpretation of the Ce data is outside the scope of the present project and remains to be followed up in future work.

## Summary and Future Work

Elemental proxy analysis like that demonstrated in this study of tufa in the Mono Basin is a new research direction, and the results thus far appear promising for future paleo-alkalinity studies. Coupled with ongoing geochronologic work, data will further contribute to the understanding of paleoclimate in the Mono Basin and western North America in general. Thus far, the data indicate that alkalinity has increased with decreasing lake level through time. Further work on this project will include improvement of the analysis of small U and Th samples. Microsampling complexly-textured tufa deposits may add a new layer of depth to the paleolimnological interpretations.



In tandem with our study of natural samples, colleagues at Queens College of CUNY will perform laboratory experiments to build on the work of Zhong and Mucci (1995) and to further assess the extent to which the proxies studied in the natural tufas can be made quantitative. Finally, colleagues at Mono Lake recently sampled cold-water precipitates that may be ikaite. Analysis of the trace metal contents of this material (once its identification is finalized by x-ray diffraction study) will help to resolve questions of to ikaite-water elemental fractionation.

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## **APPLICATIONS OF ELECTRICAL RESISTIVITY METHODS TO MAP THE SUBSURFACE DISTRIBUTION OF BEDROCK, GLACIAL TILL AND GROUNDWATER IN THE OSWEGO FORMATION, SUNY OSWEGO CAMPUS**

**Jessica Halsey**

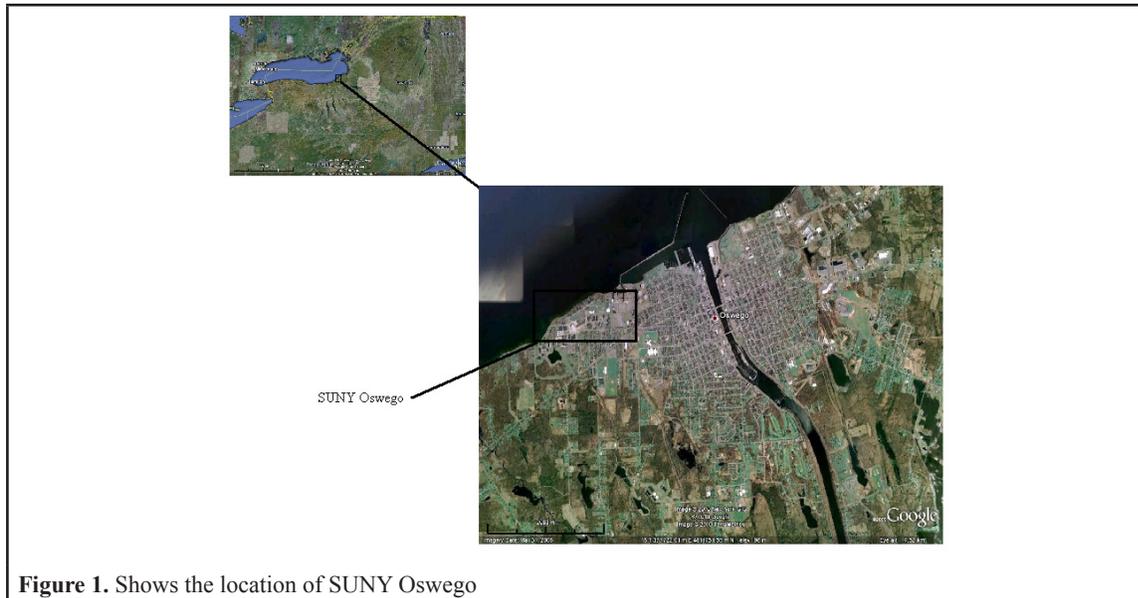
*Sponsor: David Valentino, Department of Earth Sciences at SUNY Oswego*

Resistivity techniques can be used to characterize the subsurface geology of a target area. During this investigation, a 24 node automated Wenner array with an electrode spacing of 3 meters was used to characterize the subsurface geology and hydrogeology of the Oswego Formation and related glacial cover in the eastern section of the SUNY Oswego campus. Several lines of data were collected across the study site. The lines were oriented depending on structural constraints (both natural and anthropogenic). Each line consists of 84 electrical resistivity measurements distributed in 7 subsurface levels spaced approximately 0.5 meters apart, for a depth about 11.9 meters. Low resistivity anomalies are consistent with saturated subsurface materials, while high resistivity anomalies are consistent with bedrock or undersaturated glacial till. The data collected and analyzed show variations with depth to bedrock moving toward the surface as the lines progress northward, in the direction of Lake Ontario. The interpreted depth to the top of the water table also shows a similar pattern although is slightly more complicated due to outside structures affecting the water table such as building locations.

### **I. Introduction**

SUNY Oswego is a college campus located in Oswego, NY. (Fig. 1). The bedrock in the area is exposed along the shoreline of Lake Ontario. This exposure has made it for easy access to identify the rock type and age of the bedrock. The primary rock type is sandstone that is gray to red, (Oswego Sandstone 2010) and locally interlayered siltstone and shale. Sedimentary structures include cross beds, ripple marks, channels, and rare trace fossils. The bedding is subhorizontal. The bedrock has many joints and minor faults within it (Valentino 2005). The age of the bedrock is Upper Ordovician. The bedrock was formed from deposition in shallow waters along a coastal setting (Oswego Sandstone 2010). The main sediment in the area is glacial till deposited after the last glacial period.

Electrical resistivity methods are commonly used for shallow subsurface analysis especially in groundwater studies make up a good amount of the shallow subsurface experiments done (Burger 2006). The wenner array (the array this study utilized) has advantages in that the electrode spacing can be larger compared to other arrays. This allows less demand on the resistivity unit sensitivity (Burger 2006). Why resistivity chosen? Many small towns and communities still use wells for their water supply. Resistivity methods can help locate aquifers beneath the subsurface. When there is a material that is homogenous, depth to water table can also be mapped out. This is due to the resistivity difference of the water table (low resistivity) and surrounding material (high resistivity) (Burger 2006). Sandstone makes up the majority of the Oswego formation so the bedrock is rather homogenous. Other important applications of this method is the location of contaminated water, this is due to the resistivity difference between contaminated and non contaminated ground-water, and mapping fault locations (Burger 2006).



**Figure 1.** Shows the location of SUNY Oswego

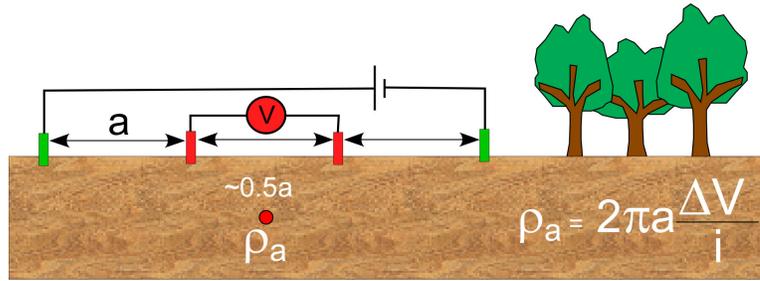
SUNY Oswego provides much economic growth to the Oswego community and surrounding areas. Many construction projects have been started to update the campus. One of the major projects to take place in the next couple of years is the renovation of Piez Hall and the destruction of Syngg Hall (“Gold standard in green building set for science center.” 2009). Both buildings are located on the eastern part of the campus. Knowing the subsurface geology, such as bedrock and depth to the water table, can help current and future construction projects proceed more smoothly. A resistivity survey was done with the goal to map out depth to bedrock and water table.

## II. Methods

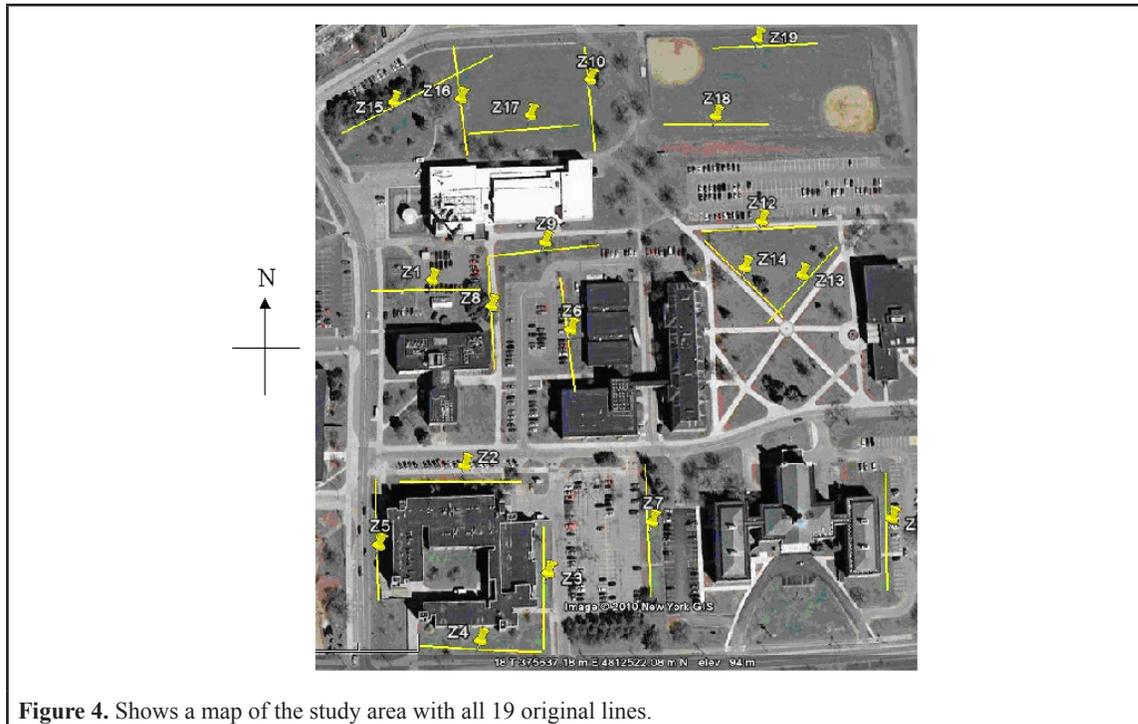
The resistivity survey used a resistivity unit made by Iris Instruments (Fig. 2). The array done was an automatic wenner array. With this array 24 metal electrodes were placed out at 3 meters apart, for a total length of 69 meters, in a line (one line was 105 meters) (Fig. 3). The number of layers chosen for this survey was seven; this means that the electrical currents penetrated the ground to a depth of 11.9 meters. For each line, a total of 84 readings are taken (150 for the longer line). A total of 19 lines were surveyed. The location of each was chosen to maximize coverage of the study area, taking in the restrictions due to buildings and other structures such as sidewalks into consideration (Fig. 4). For each line, GPS coordinates were taken at each end point, to later be used for mapping purposes. The survey was done between late September and mid November in order to beat the majority of the late rain and snow season. Structures that were in the immediate area were noted, in case smaller anomalies were to show up in the models later generated.



**Figure 2.** Shows the resistivity unit used during the survey. The unit is about the size of a car battery.



**Figure 3.** Figure 3A shows the set up of a line. Note that this is only half a line. Figure 3B shows a close up image of an electrode and shows how it connects to the cable. Figure 3C shows the set up of the 4 g electrode wenner array. The letter “a” denotes the spacing. The letter “V” is the voltage source, in this g case the Iris Instrument. The equation shown is how the apparent resistivity is calculated.



**Figure 4.** Shows a map of the study area with all 19 original lines.

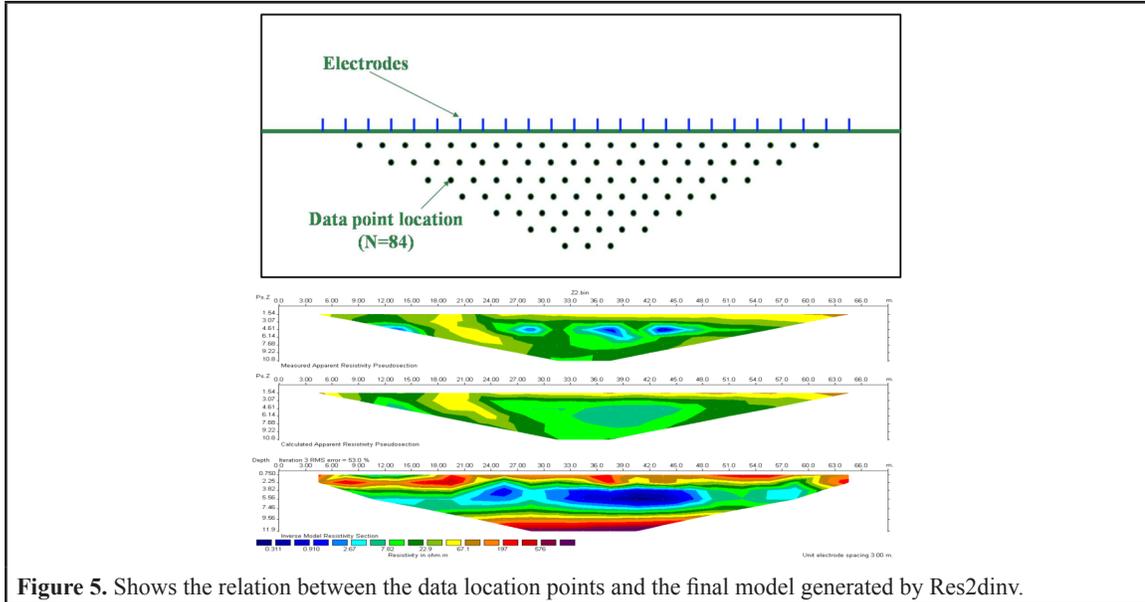
Once the data was collected, models were generated and analyzed using various programs. The data was uploaded from the unit to a program called Prosys II. From this program, the data was transferred to another program called Res2dinv. With this program, models were able to be generated. The unit measures the apparent resistivity, and this program takes this data and calculates the actual resistivity and shows it in pseudosections (Fig. 5). For each line, low resistivity anomalies were looked for as an indication of water, and high resistivity were looked for as an indication of bedrock. Not all low anomalies were assumed to represent water and not all high anomalies were assumed to represent bedrock. Since the survey occurred in a more urban environment, both anthropogenic (sidewalks and pipes) and natural (tree roots) structures could also show up as anomalies, which was why nearby structures were noted during the survey.

Anomalies were compared with known locations of structures to see if there was any interference.

The models were then saved as JPEG files, to be used in a program called Canvas X. This program allowed “picks” to be taken to get the depth to the bedrock and water table accurately. The picks were usually taken where the electrodes were located since the location for each can easily be located using the GPS coordinates gathered earlier. This was done using Google Earth using the UTM coordinate system. Once the depths and coordinates were gathered, the data was transferred into a program called Surfer 9 to generate contour maps. These maps are the final results from the survey showing how the depth to bedrock and water table vary over the study area.

For lines “Z2” and “Z3” it was noticed that in Process II and Res2dinv, the data was the same. The data had been downloaded twice in two different locations for backup purposes. Both of these downloads had the same result in that the data was the same. In the extremely rare situation that these lines did have the same data both lines were eliminated from the final products. It is believed that in the unit “Z3” data was also saved under “Z2.” This was done to eliminate error. This can,

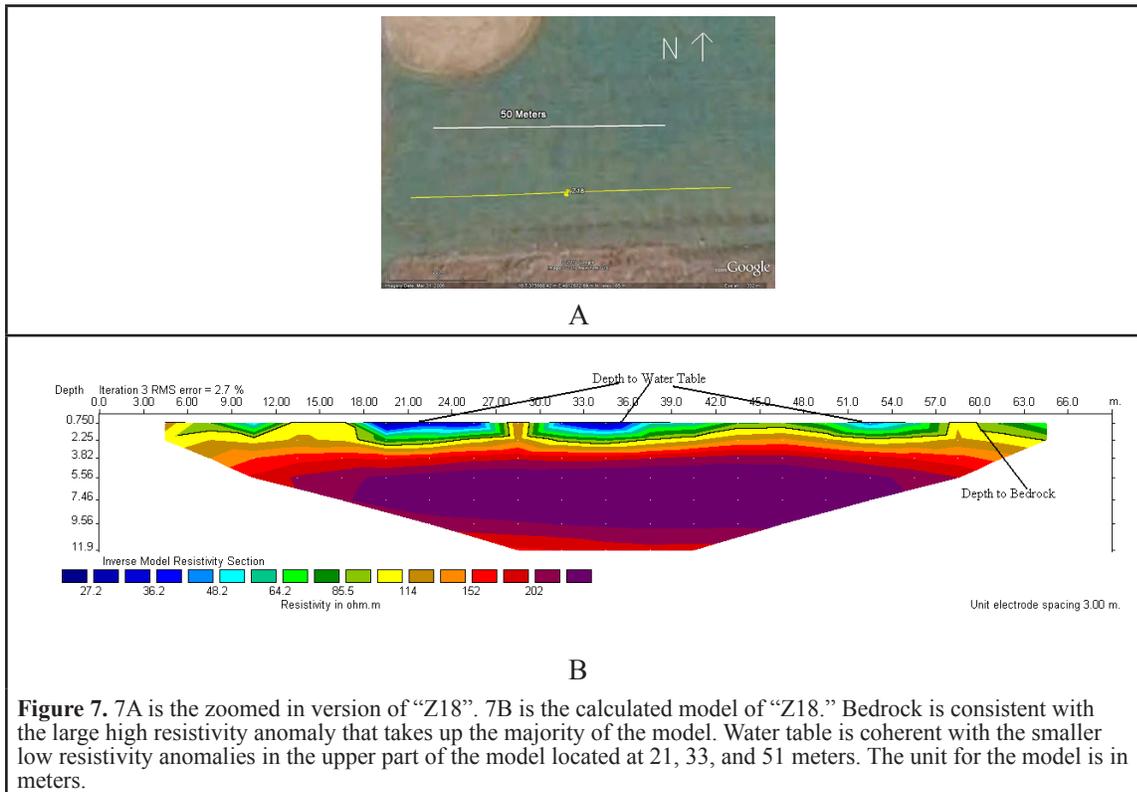
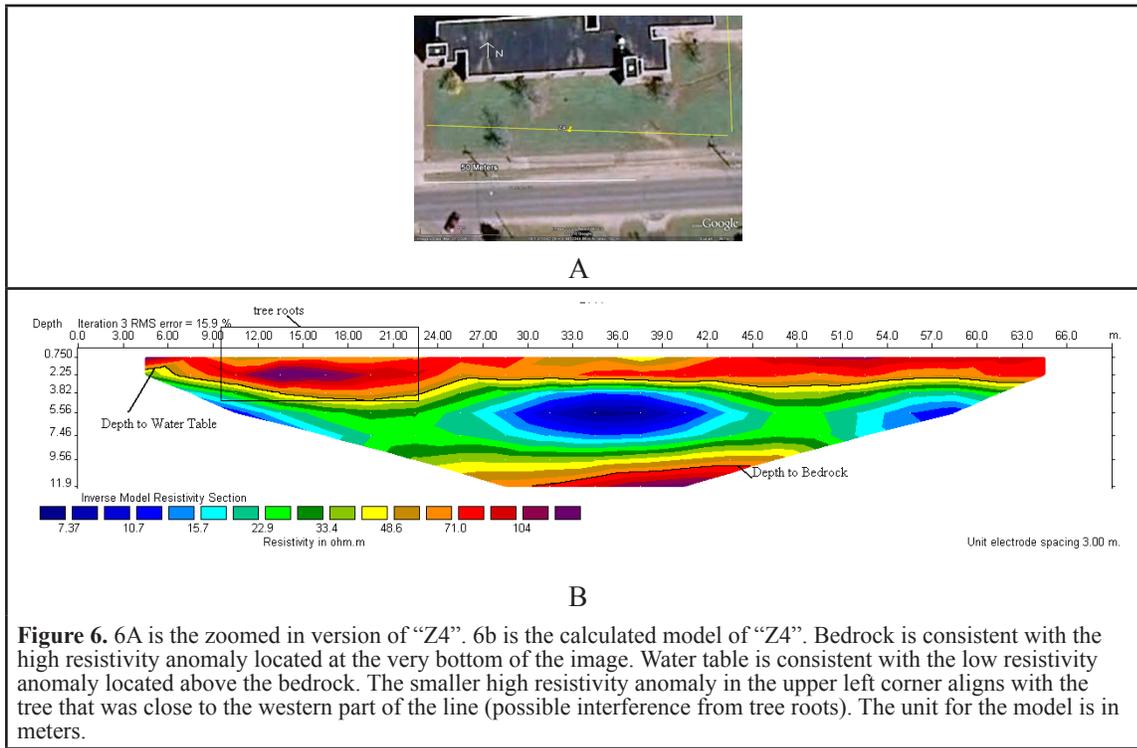
however, be easily fixed. Even with now only 17 lines being represented in the final result there is still a large amount of data to work with, so this has minimal effect. It was also noticed that “Z16” data was switched: electrode 1 was actually electrode 24. This error was noticed by comparing line Z15 to Z16, since they cross each other.



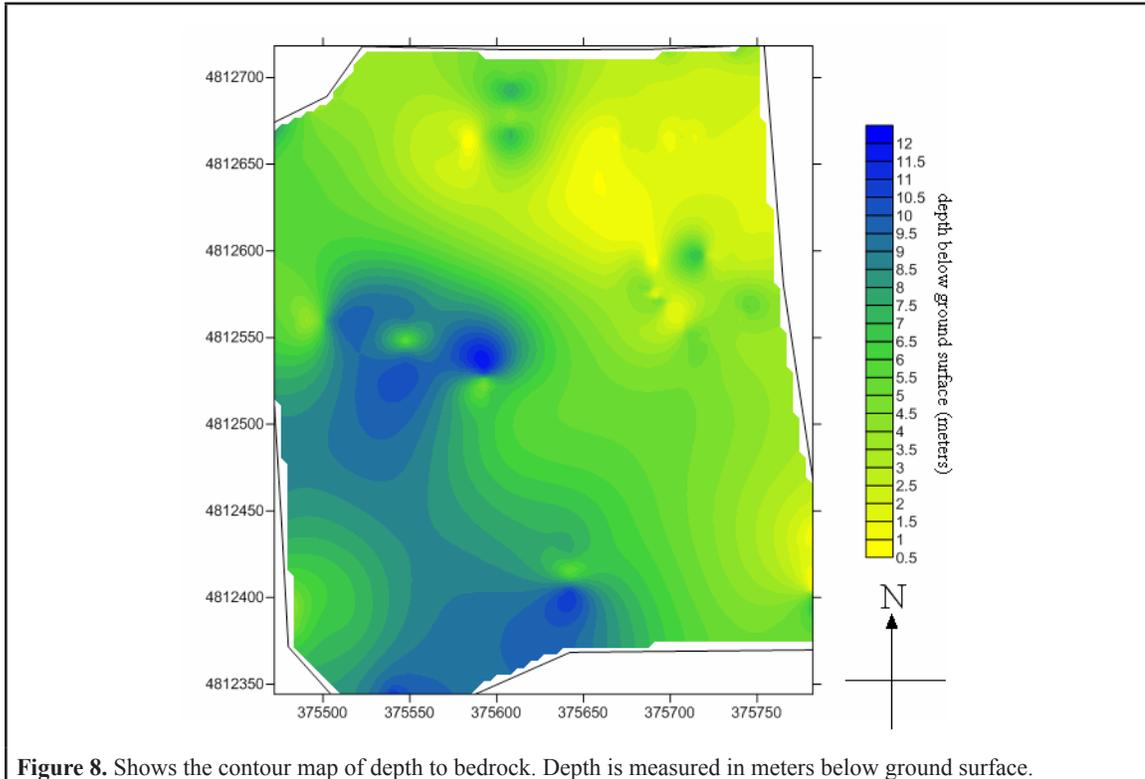
**Figure 5.** Shows the relation between the data location points and the final model generated by Res2dinv.

### III Results and Interpretations

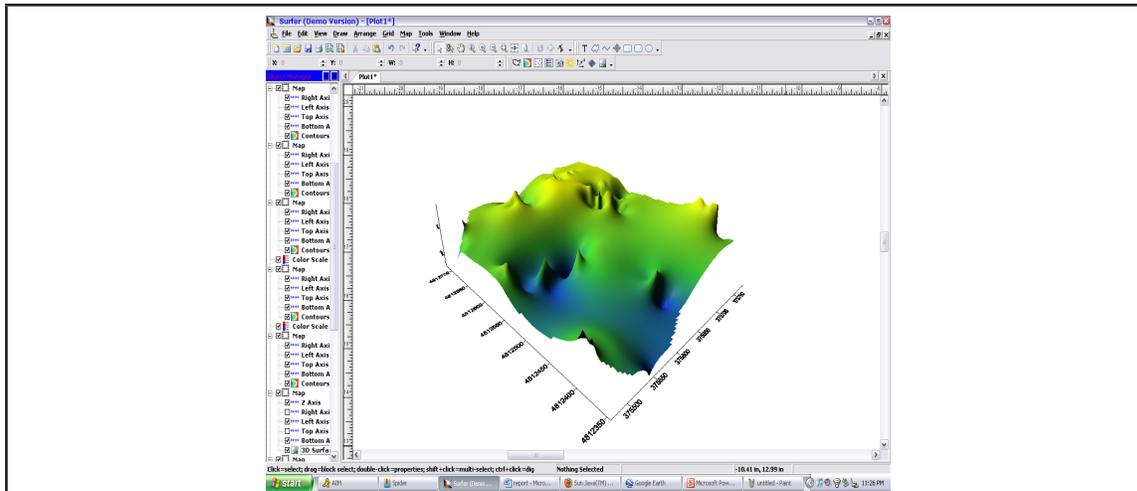
Below are examples of the final models of certain lines. These lines and the other 15 were used in the contour map. With them are the interpretations of bedrock and water table depth along with other structures that may have interfered with the survey. Interpretations also include explaining some smaller anomalies that may be caused by other structures (sidewalks, tree roots, etc.) located above ground. Not all of the smaller anomalies can be explained this way so some may also be caused by other materials that are located beneath the subsurface (boulders, pipes, etc.). Note that the figures below only show the calculated resistivity model. Also note that the images that show zoomed in images of the line in the study area have been rotated to align with the models. North direction is indicated on each one.



Once all the picks from the models for depth to bedrock (Fig. 8) and depth to the top of the water table (Fig. 10) were chosen contour maps were generated to show how the depths vary over the study area. The depth to bedrock is located deeper towards the south end of the study area and becomes shallower across the study area to the north east. The depths ranged from the deepest of almost 12 meters to the most shallow of 0.5 meters. The depth moves in a gradual change from deeper in the south west to shallower in the north east. This trend shows that the bedrock actually forms a ridge in this area. This can be better seen in a 3D surface map generated by the same program that creates the contour maps (Fig. 9). During the last glacial maximum ice covered this area with some places having a thickness of over a mile. During the glacial retreat the ice scoured the land forming the Great Lakes (Larson 2001). Just by looking at the size and depth of the Great Lakes we can see the power of erosion due to glaciers. This bedrock ridge shape is also most likely a product of the last glacial retreat. The bedrock was then covered by the glacial till which was deposited during the retreat as well. There are also areas by looking at Fig. 9 that shows peaks or troughs in the bedrock. Glaciers do not erode smoothly, that is the ice can create irregular striations and ridges. This is shown from the peaks and troughs.

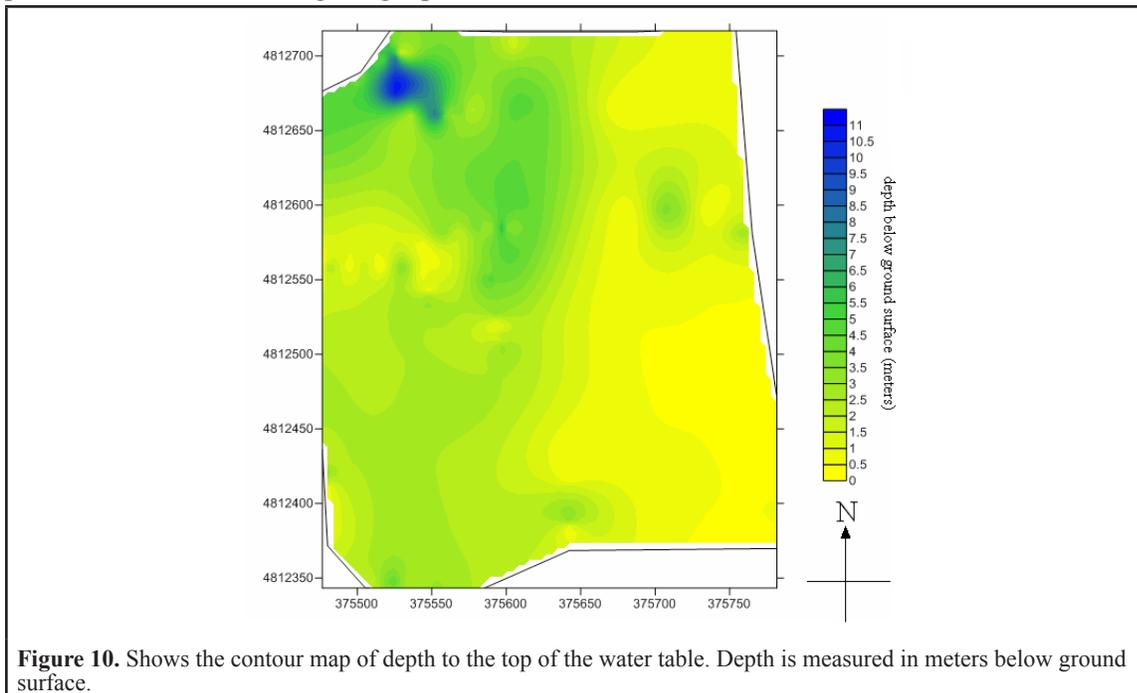


**Figure 8.** Shows the contour map of depth to bedrock. Depth is measured in meters below ground surface.



**Figure 9.** Shows a 3D model of the depth to bedrock. Notice that the bedrock is in the shape of a ridge (blue is deeper and yellow is shallower). Depth is measured in meters.

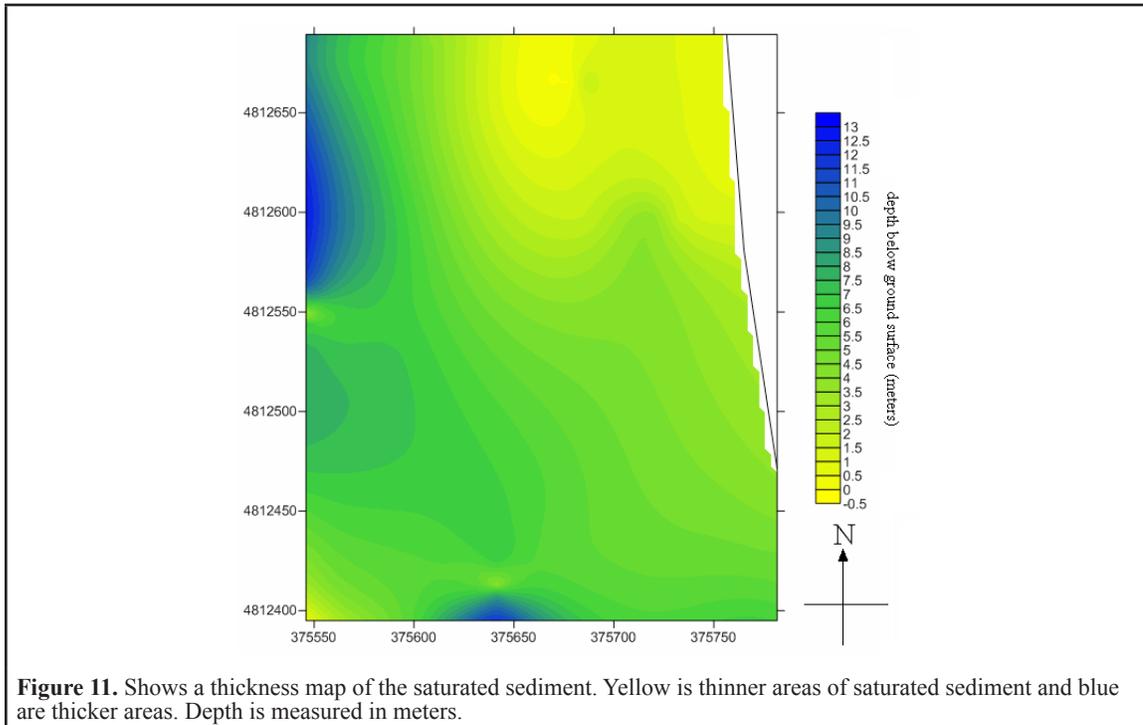
Figure 10 shows the depth to the top of the water table (saturated sediment). For the most part the depth to the top of the water table is shallow. The majority of the map is shallower than three meters. Comparing the depth to bedrock map and depth to the top of the water table, there appears to be some correlation. Where the bedrock is deepest so is the top of the water table and where the bedrock is shallowest so is the depth to the water table. This is not surprising since the water table profile tends to follow the geologic profile.



**Figure 10.** Shows the contour map of depth to the top of the water table. Depth is measured in meters below ground surface.

The water table can be restricted to not only geological structures but to anthropogenic structures as well. By looking at the south west corner of Figure 8 the bedrock is slightly deeper here than the majority of the map (approximately 4 to 5 meters). There are two campus academic buildings located in this area (Piez and Snygg Hall). The buildings foundation may restrict the depth

to the water table since the foundation material would create an impermeable layer restricting the water table. It is possible there are other places where buildings or parking lots restrict the depth to the water table. Once the depth to bedrock and depth to the top of the water table were generated, both were used to create a contour map that showed the thickness of the saturated sediment (Fig. 11). Looking at Figures 8 and 11, the areas where the bedrock is closer to the surface, the thickness of the saturated sediment tends to be thinner than areas where the bedrock is deeper. Knowing the thickness of saturated sediment is important for construction purposes. The more saturated areas are good for wells or geothermal energy.

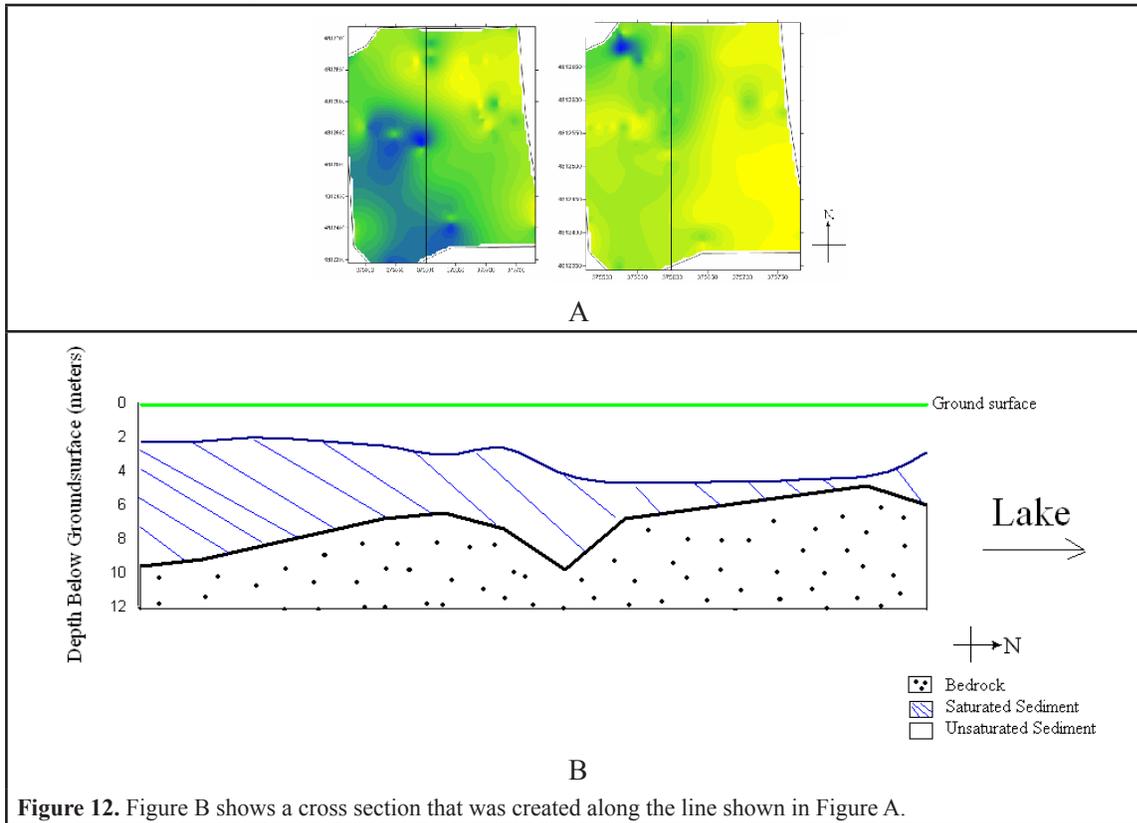


**Figure 11.** Shows a thickness map of the saturated sediment. Yellow is thinner areas of saturated sediment and blue are thicker areas. Depth is measured in meters.

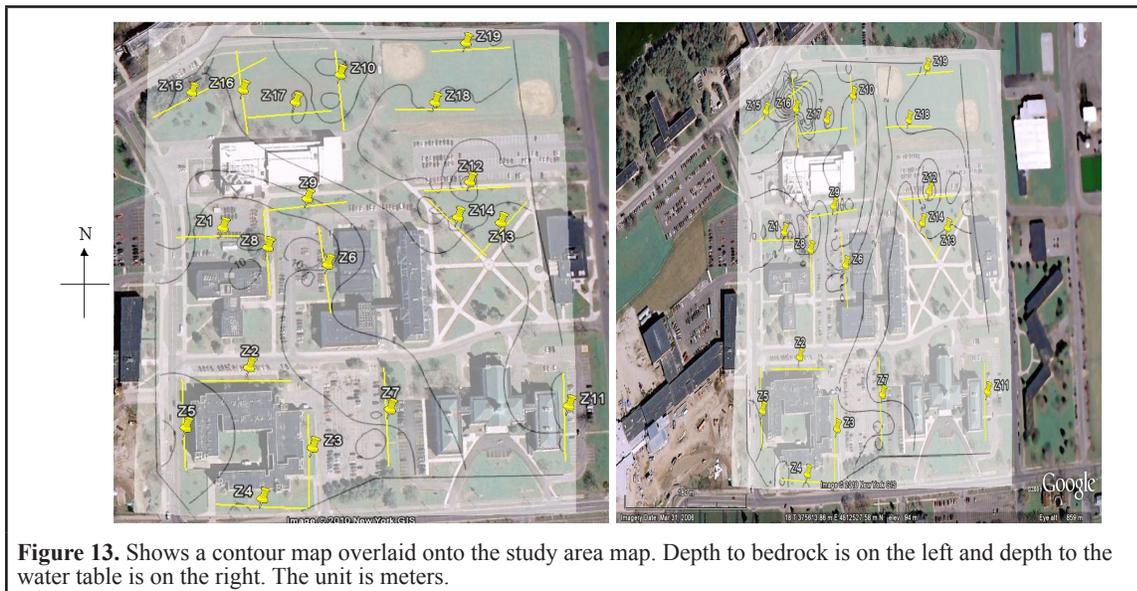
Looking at both Figures 8 and 10, a line (shown in Fig 12) was chosen for both of them in the same location. This line crosses an area where both contour maps demonstrate distinctive changes. Figure 12 shows the cross sectional view of the line. Looking at Fig 12 the bedrock shows a general trend of becoming shallower below the ground surface from south to north (towards the lake). This is not surprising since this is part of the ridge discussed earlier. What is interesting is the saturated sediment. For the most part the saturated sediment in this area has a rather constant thickness. This is one area towards the northern part of the line where the thickness gets very thin compared to the rest of the area. Mentioned earlier it appears that the contour maps are related in that as depth to bedrock gets shallower so does the depth to the water table. In this particular part of the map this is not so for this particular area. As depth to bedrock gets shallower the depth to the saturated sediment gets deeper. This causes the thickness of the saturated sediment layer to become exceedingly thin.

As mentioned earlier, anthropogenic structures can cause restriction to the depth to water table. This area is interesting, for while there is a building, this building does not cover the usual thin saturated sediment layer completely. This leads us to believe that some geologic structure in the subsurface is the reason why the saturated sediment layer is thin in this area. This structure is act-

ing as some sort of impermeable layer, restricting the water table to be deeper. A non porous layer is the most likely cause of the restriction. This non porous layer could be a clay lens. As clay is known to act as an aquitard, this is an excellent possibility.



**Figure 12.** Figure B shows a cross section that was created along the line shown in Figure A.



**Figure 13.** Shows a contour map overlaid onto the study area map. Depth to bedrock is on the left and depth to the water table is on the right. The unit is meters.

#### IV: Conclusion

Looking down by the shoreline by Lake Ontario, the bedrock of the Oswego formation is exposed. This exposure has led to the classification of fracture type, density, and orientation. The joint density for the bedrock at the lakeshore is substantial (Valentino 2005). Normally this would allow the water to travel downward via the joints. The part of the Oswego Formation that SUNY Oswego rests on however has a low joint density. This knowledge and the results from the study show that the travel of water through the bedrock that SUNY Oswego sits on is not evident. This fact makes the bedrock a good lower aquiclude (water that is not easily transported due to the low porosity of the surrounding rock). This is also supported from the fact that sandstone is low porosity.

Recommendations for further study are to repeat the study several times throughout the year. This would show how the water table changes throughout the seasons and would allow the creation of a contour map that shows the average depth to the water table. Doing the study again would also confirm the depth to bedrock by getting the same or very similar results. This is to be expected of bedrock below the ground surface as erosion takes place much more slowly due to less exposure to the elements.

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# BODY IMAGE AND VISUAL ATTENTION

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The current study investigated factors related to body image dissatisfaction (BID) in 60 college-aged females. BID is the negative subjective view of physical appearance. However, little has been done examining visual attention and internet attitudes/usage's relationship to body image dissatisfaction. The primary goal of this study was to investigate the effects of exposure to different size models on visual attention by using an eye tracking device. Furthermore, the study examined how internet usage and attitudes contribute to internalization of the "thin ideal" and in addition, body image dissatisfaction. Participants viewed one of two different sized female models while their direction of gaze was recorded. They also completed questionnaires about factors that may contribute to BID. Initial results have demonstrated that the model they viewed did not affect the discrepancy between self-rated body image and desired body image. However, Body Mass Index (BMI) was found to be positively related to the discrepancy between self-rated and desired body image: the higher BMI, the greater the discrepancy. Therefore, the participants' size was a factor influencing how many sizes participants' wanted to change. As predicted, the more positive one's attitude towards the internet, the more they internalize the "thin ideal." Moreover, there was a strong positive relationship found between internalization of the Western media and the discrepancy between self-rated body image and desired body image. The implication of these findings illustrate that the more someone accepts and adopts the notion of the "thin ideal", the more likely they are to experience body image anxiety and dissatisfaction.

## 1. Introduction

Body image is defined as a subjective view of one's own physical appearance. According to Bedford and Johnson (2006), the formation of body image is a developmental process and continues to change throughout one's life. Extensive research has been conducted in order to uncover influences on an individual's body image perception.

Body image research is crucial because body image is a concept central to the self, mental health and the acquisition of healthy eating habits (Dittmar, Halliwell & Stirling, 2009). Research on body image has generally focused on body image dissatisfaction (Grabe & Ward, 2008; Bradford & Petrie, 2008; Jones & Buckingham, 2005). Body image dissatisfaction is defined as the negative subjective evaluation of one's own physical appearance, body and/or parts of body. Silberstein, Striegel-Moore, Timko and Rodin (1998) proposed that body image dissatisfaction is a consequence of the discrepancy between the perceived and ideal self.

The formation of body image is a developmental process. Body image dissatisfaction has not only been discovered in adult females but also in young girls. Even children as young as eight years of age express body dissatisfaction (Dittmar & Halliwell, 2006). Moreover, even before children have a fully formed sense of self, body image dissatisfaction may be induced through common play objects. Barbie has been named an icon in American culture and plays a role in many young girls' lives. Dittmar and Halliwell (2006) investigated Barbie's influence on young girls' body image. They found that young girls aspire to look like Barbie. In particular, the youngest girls in the

sample experienced greater body image dissatisfaction as a result of viewing Barbie in comparison to viewing the control stimulus, an Emma doll. In addition, Barbie's physical appearance has been described as an unattainable form of beauty (Dittmar & Halliwell, 2006). More importantly, this work shows that body image dissatisfaction can emerge early in psychological development.

Researchers have discovered many factors that contribute to individuals' body image dissatisfaction. Research has demonstrated that exposure to the "thin ideal" promotes feelings of body image dissatisfaction (Grabe & Ward, 2008; Bradford & Petrie, 2008; Jones & Buckingham, 2005; Cattarin, Thompson, Thomas & Williams, 2000; Lew, Mann, Myers, Taylor & Bower, 2007; Trampe, Stapel & Siero, 2007). The "thin ideal" is defined as the female figure portrayed as the most desirable in the Western media (Bradford & Petrie, 2008; Cattarin et al., 2000; Grabe & Ward, 2008; Jones & Buckingham, 2005; Trampe et al., 2007).

Internalization of the "thin ideal" is one of the known predictors of body image dissatisfaction in young adult females (Maddox, 2005; Ahern, Bennett & Hetherington, 2008; Bradford & Petrie, 2008; Grabe, Ward & Hyde, 2008; Dittmar, Halliwell & Stirling, 2009; Tylka, 2004). Internalization refers to the degree to which an individual believes in and accepts Western society media's messages. Findings have been consistent among researchers who state that exposure to the thin ideal increases body image dissatisfaction.

Given that the "thin ideal" is conveyed through many different sources of media, researchers have examined the role of the various types of media on body image dissatisfaction. The most common mediums discussed in the literature are magazines and television. In attempting to uncover influences of magazines on body image dissatisfaction, Park (2005) examined the effects of viewing fashion magazines on adult females' body image dissatisfaction. Results showed that the usage of fashion-based magazines increased participants' desire to be thin. Additionally Park's (2005) work showed that fashion-based magazine usage not only increased the participants' desire to be thin directly, but also indirectly increased it by communicating their desires with peers. These results demonstrated that time spent reading fashion-magazines increased anti-fat attitudes, unhealthy views of one's body image and even more the desire for the "thin ideal". Furthermore, Lin and Reid (2009) along with Dalley and Bunk (2009) also discovered that fashion magazines affect ones' body image perception unfavorably, creating body image dissatisfaction.

Many theories have been developed over the decades in order to develop an explanation of body image dissatisfaction. Social Comparison Theory (Festinger, 1954) states that humans assess how they are doing across many domains and in order to assess this they seek standards in which to compare themselves. This theory has been widely accepted in explaining how body image is formed (Trampe, Stapel, & Siero, 2007; Corning, Krumm & Smitham, 2006; Hausenblas, Janelle, Gardner & Focht, 2004). Social Comparison Theory contains two domains: upward social comparison and downward social comparison. Upward social comparison is characterized by an individual's comparison with one who is superior to them on a considered dimension, while downward comparisons are defined by a comparison with one who is inferior in any considered dimension (Hausenblas, Janelle, Gardner & Focht, 2004). Studies have shown that as a result of an upward comparison, one may have lower levels of self-esteem (Corning, Krumm & Smitham, 2006). Moreover, Trampe, Stapel and Siero (2007) argue that it depends upon who the comparison target is and who the viewer of the target is whether body image is affected. Body image research to date demonstrates that the typical types of comparisons that individuals engage in tend to be upward comparisons, especially in regards to their body image (Wheeler & Miyake, 1992; Morrison,

Kalin, & Morrison, 2004). Specifically, this theory is related to body image because a thin female is portrayed as desirable and being an overweight female is seen as undesirable. Therefore, an upward comparison (an individual who is thinner) is most likely to result in negative feelings about ones' self. However, a downward comparison (an individual who is more overweight) is more likely to result in positive feelings about ones' self. Additionally, Maddox (2005) discusses the notion that exposure to the "thin-ideal" is supported by The Socio-cultural Theory used to understand the relevance of body image concerns among individuals. In explaining body image dissatisfaction, this model states that continuous exposure to an ideal body type reinforces Western Culture's emphasis on the relationship between being slender, physical attractiveness and a positive social standing (Maddox, 2005).

Additionally, technology such as eye tracking has been used a new tool to study body image dissatisfaction (Hewig, Cooper, Trippe, Hecht, Straube & Miltner, 2008.; Hausenblas, Janelle, Gardner & Focht, 2004.; Mulkins & Jansen, 2009.; Roefs, Jansen, Moresi, Van Grootel, Van Der Borgh & Willems, 2008). Assessing individuals' eye movements is helpful in studying body image because researchers can further investigate the visual attention of participants on certain parts of the body. For example: Roefs, Jansen, Moresi, Van Grootel, Van Der Borgh and Willems (2008) investigated visual attention bias and the relationship to Body Mass Index (BMI) and attractiveness. Eye movements were recorded when looking at participants' own bodies, and then again looking at the models' bodies. Attractiveness of body parts was assessed previous to the eye tracking manipulation. The results showed that when females with eating disorder symptoms were looking at their own bodies they paid more attention to their self-rated unattractive parts. Moreover, when the participants looked at the model's body, visual attention was higher towards the body parts rated most attractive. In a similar study conducted by Hewig et al. (2008), the desire to be thin was assessed in relation to visual attention towards body parts. Eye movement was recorded in females when viewing photos of other young attractive people. The desire to be thin was assessed by the completion of a questionnaire. The findings illustrated that participants with a high desire to be thin paid more attention to the waist, hips, legs and arms rather than the face of the models (Hewig et al, 2008). These results are compatible with other studies that demonstrate the usefulness of eye tracking for understanding body image perception (Mulkins & Janson, 2008.; Hausenblas et al, 2004).

In order to extend previous work on body image dissatisfaction, the present study incorporates a measure of internet usage and attitudes as well as utilizes an eye tracker to better assess cognitive factors that may relate to BID. There is limited research focusing on the internet as a form of media promoting internalization of the "thin ideal". Therefore, in the current study the amount, types of internet usage and attitudes towards the internet will be investigated in order to uncover a possible relationship with exposure to the "thin ideal" and body image dissatisfaction. It is important to incorporate the internet because it is a type of media in which the "thin ideal" and other messages can be communicated.

### ***Primary Hypotheses:***

A) The duration in which participants gaze at the specific body parts of the models will be related to ratings of their own anxiety towards those same body parts.

B) Participants' Internet Attitudes Scale (IAS) scores will be positively related to their scores on the Internalization scale (SATAQ-R). Therefore, the more positive their attitude is toward the internet, the more they will internalize the "thin ideal."

C) Exposure to different types of models (thin vs. overweight) will be related to the discrepancy between the sizes of the figures chosen to represent themselves (SABS).

D) Participants who score high on the anxiety towards body parts questionnaire (PASTAS) will also score high on the internalization scale (SATAQ-R). This prediction is based on previous research (Maddox, 2005.; Ahern, Bennett & Hetherington, 2008.; Bradford & Petrie, 2008.; Grabe, Ward & Hyde, 2008.; Dittmar, Halliwell & Stirling, 2009.; Tylka, 2004)

The results of this study may help to gain more insight into exactly which factors are affecting female's body image perception and in addition, creating body image dissatisfaction. It may also contribute to the discovery of an uncovered relationship between attitudes and usage of the internet and internalization of the "thin ideal" and furthermore, body image dissatisfaction. Furthermore, it will investigate how body image dissatisfaction can be communicated through an individual's visual attention patterns.

## **II. Participants**

Sixty college-aged females were recruited from a State University using the Psychology Department Human Subjects pool bulletin board. There were efforts to collect a sample of females with diversity in: body mass indexes (BMI) and various racial and ethnic groups. Each participant who completed the experiment was given \$10 (awarded by a SCAC grant) as well as extra credit points towards psychology classes. College-aged females are an appropriate sample because a vast amount of research has indicated that females of this age are the population most affected by body image related problems and eating disorders (Tylka, 2000).

## **III. Design**

Participants were randomly assigned to one of the two conditions (thin model vs. overweight model). All subjects participated in questionnaires assessing general demographics, anxiety towards body parts, and attitudes towards the internet and internalization of the western media.

### ***Measures***

General demographics of the participants were obtained using a questionnaire (See Appendix). The participants were asked to report their race and ethnicity, age, and class standing. Subjects were also asked to state their weight and height so the experimenter can calculate their Body Mass Index (BMI). Calculating BMI is appropriate because it has been previously linked with body image dissatisfaction (Roefs, Jansen, Moresi, van Grootel, van der Borgh & Willems, 2008). There were also efforts to control for confounding variables such as: diet, age, race/ethnicity, the amount and types of internet usage (e-mail, social networking, etc.), presence of a romantic relationship, class standing, college major and exercise habits.

Self-Assessment of Body Shape (SABS) is a measure created by the experimenter to determine which body shape participants' identify as closest to their own body. Nine figures of varying

sizes and shapes were adapted from Stunkard, Sorenson, and Schulsinger's (1983) Figure rating scale (FRS). These figures are composited in a 3 by 3 layout on a standard computer screen (See Appendix). They were spread out on a computer screen with an equal amount of space between each female figure. To help eliminate participant bias, the arrangements of the figures pre and post manipulation were different.

Visual attention was measured using an eye tracking device to identify patterns of visual attention during 3 phases of the study. The eye tracking was during both shape rating phases and also the web page phase (manipulation). A diagram of the phases is located in the procedure section (Fig. 1). The make/model of the eye tracker is an Eye Trac-6000 and was created by Applied Science Laboratories (ASL). The machine identifies in mega-pixels where the subject is looking on the computer screen and also measures the duration of the fixations.

Physical Appearance State and Trait Anxiety Scale (PASTAS) was used to measure one's current feelings of anxiety towards specific parts of their bodies (Rutt, Garcia & Coleman, 2002). The 16 items are scored on a 5-point scale (0=not at all, 1=slightly, 2=moderately, 3=very much so, exceptionally so) with appropriate items reverse scored. The directions state "Right now, I feel anxious, tense or nervous about" then participants are expected to circle the number reflecting their answer to the statements. Sample items are "The extent to which I look overweight" and "My waist." Cronbach's alpha=.82 to .92 (Rutt, Garcia & Coleman, 2002).

Internet Attitudes Scale (IAS) assesses ones' attitudes toward usage of the internet (Zhang, 2005). It is a 40-item scale scored using a 4-point likert scale (1=Strongly disagree, 2=Disagree, 3=Agree, 4=Strongly agree) with appropriate reverse score items. Sample items of this scale include "Time spent on the internet is worthwhile" and "The internet does not threaten me." Cronbach's alpha = .96 (Zhang, 2005). The use of this questionnaire within this study was to investigate a possible link of internet attitudes to body image perception.

Sociocultural Attitudes Toward Appearance Questionnaire Revised (SATAQ-R) was used to measure participants' internalization of the Western media's ideal body type and beliefs about physical appearance (Heinberg, Coughlin, Pinto, Haug, Brode, & Guarda, 1995). It is a 30-item scale which is scored on a 4-point likert scale (1=Strongly disagree, 2=Disagree, 3= Agree, 4= Strongly agree) with appropriate reverse score items. Sample items of the scale include "I've felt pressure from TV or magazines to lose weight" and "I compare my appearance to the appearance of TV and movie stars." Cronbach's alpha =.88 (Heinberg et al., 2008).

#### **IV. Procedure**

As the participant enters the HCI Lab they were welcomed politely and informed consent was obtained. Next, the subject was asked to complete the demographics questionnaire. When they were finished they were taken to the eye tracking station. Next, the chair was adjusted to the appropriate height for the comfort of the individual. The chin rest was cleaned in front of the participant with an antibacterial wipe for sanitary purposes. The participant was asked to put their chin on the chin rest and gently lean their forehead into the forehead rest on the upper portion of the machine. Then they were instructed to move the head stabilizers (plastic rings that sit next to the temporal region of the skull) gently against their head as a reminder to keep their head straight forward during the experiment. The machine was adjusted in order to gain accuracy in the tracking of the eyes

and also ensuring comfort for the participant. A measurement of the distance from the screen to the eye was recorded. The calibration step followed in which the participant was directed to look at a variety of numbers on the screen to make sure the camera was adjusted properly.

Following this step, the Self-Assessment of Body Shape (SABS) was administered. The experimenter explained to the participant that the pictures and directions are shown in a slideshow format and they do not have to press the space bar to proceed to the next slide. The only time they were asked to use the keyboard was when they were asked to pick the figure that best represents their own body. During this time, the eye tracking device was recording the directions and durations of the fixations on the computer screen.

The experimental manipulation was an exposure to one of two sets of visual images. The image sets were designed to look like Facebook pages and each set features a single female model. Subjects were randomly assigned to view one of two sets of pictures (thin model vs. overweight model). First, participants viewed the social networking page of the model, followed by a picture of the model's whole body and then a picture of just the face of that same model. The directions were to view the pictures for 30 seconds each. During this phase, the eye tracker was still recording the direction of gaze (See Appendix).

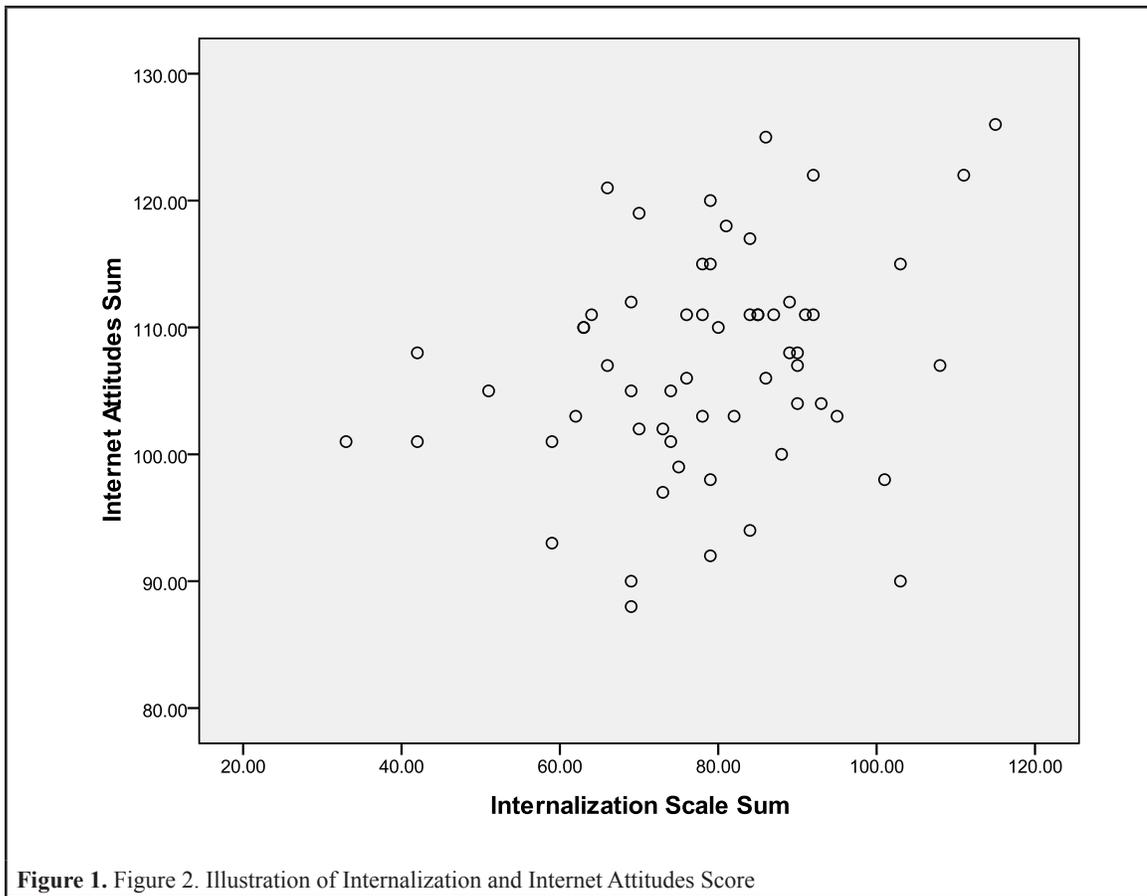
Next, the participants were instructed to repeat the Self Assessment of Body Shape (SABS) a second time using the same procedure discussed previously. In an attempt to eliminate participant bias, the figures shown in each Self Assessment of Body Shape (SABS) phases were mixed. After the second shape rating, the participant was asked to step outside the eye tracker and move to a table to complete the questionnaires.

The first questionnaire being administered after the eye tracker was the Physical Appearance Trait and Anxiety Scale (PASTAS) assessing how anxious the subject feels about different parts of their bodies at that specific time. Following, the Self Assessment of Body Shape (SABS) was administered. However, this time participants were asked to circle the figure that represents what they would like want their body to look like. To counterbalance, every other participant received one of the two figure sets. Next, the Internet Attitude Scale (IAS) was completed in order to measure usage and feelings towards the internet. The intention of the order was to help eliminate or minimize carryover effects because two of the questionnaires, PASTAS and SATAQ-R assess factors pertaining to body image. Lastly, the Sociocultural Attitudes Toward Appearance Questionnaire Revised (SATAQ-R) was administered to evaluate the degree to which the participant has internalized the Western media's messages about appearance and beauty. The subjects were then debriefed and thanked for their participation in the study. A representation of phases of the study is provided on the following page (Figure 1).

## V. Results

To date, the results have demonstrated that type of model participants were exposed to (thin vs. overweight) did not affect the discrepancy between self-rated body image and desired body image ( $M=2.18$ ).  $F(1, 43)=.819, p>.10$ .

However, Body Mass Index (BMI) was found to be related to body image dissatisfaction: the higher BMI, the greater the discrepancy between the participants self-rated body image (how they



view their own bodies) and the desired body image (how they would like their body to look) ( $r = -.461, p = .001$ ).

The results also illustrated a strong positive correlation found between internalization of the “thin ideal” and the discrepancy between self-rated body image and desired body image ( $r = -.368, p = .013$ ). In addition, a strong positive correlation between participants’ body image anxiety and internalization of the “thin ideal” was found ( $r = .658, p < .001$ ). This can be interpreted as the more participants who accept the “thin ideal”, the more they experienced body image anxiety and dissatisfaction. Moreover, as predicted, the more positive attitudes were toward the internet, the greater the extent of internalization of the “thin ideal” ( $r = .266, p < .05$ ). (Refer to Figure 2 in Appendix)

Additional analyses will be conducted by the Quest conference. These analyses include an examination of visual attention to specific body parts of the models and the figures presented in the Self-Assessment of Body Shape (SABS) sections of the experiment. The relationships between the visual attention before and after exposure to the different types of models will be investigated. Furthermore, more analyses will be used to look at the relationships between the variables such as internalization of the “thin ideal” in accordance with type of model and visual attention. The results of this research contribute to uncovering many different factors that impact body image dissatisfaction. More importantly, this research examines possible factors that have not been previously studied in regards to body image dissatisfaction (i.e., internet attitudes and usage). The study also uses new technology (the eye tracker) to examine another possible communication of body image dissatisfaction, visual attention. In addition, the findings from this study may help individuals to understand their own body image and to recognize any negative feelings about their own body image so that they can avoid disorders of eating (i.e., anorexia nervosa, bulimia nervosa).

VI. Appendix

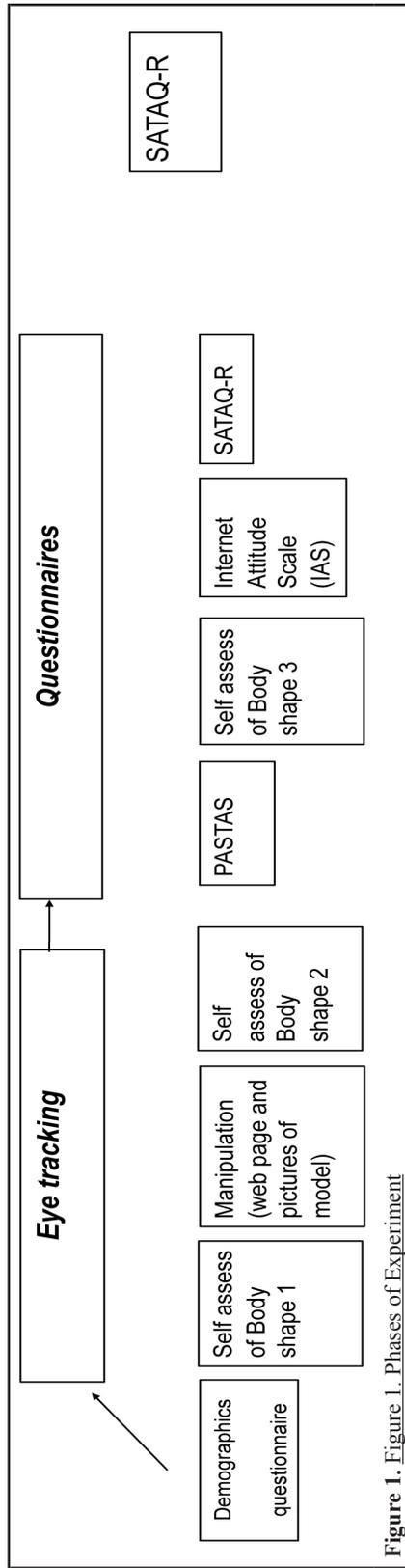


Figure 1. Figure 1. Phases of Experiment



# INVESTIGATING THE LEARNING BENEFITS OF INTERDISCIPLINARY VISUAL ART AND ENGLISH LANGUAGE ARTS PROJECTS

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The main purpose of my study was to investigate the impact of integrating English Language Arts concepts into my Visual Arts classroom. I was interested in discovering the specific learning benefits of interdisciplinary work for my students and to record their reactions and reflections to this type of in-class activity. I believe that art is a content area that can easily intertwine with many other content areas and because of this unique attribute I utilized the integral subject area of English Language Arts, specifically creative writing, for my study.

## **I. Introduction**

During the course of my action research project I studied the effects of an interdisciplinary project that happened simultaneously between my class and one of my colleague's classes with a group of ninth grade students. The main project included the integration of two-dimensional collage and creative writing; the writing was in three forms: haiku writing, personal statement writing and color and word association. It is important to note that in this project visual art and English language arts were given equal prominence. In addition to this I used a sketchbook assignment to supplement the major assignment and test the short-term learning effects of a direct integration of content material.

This was a quasi-experimental research study in which a pre-test and post-test was given to a number of ninth grade students. The methods I used were both qualitative and quantitative. I also used coded observations to test them while they worked. Lastly, I used exit interviews to get more in-depth results from a varied sample group at the end of the project.

## **II Literature review**

In reviewing literature for this study, a number of themes emerged: a) authentic learning and assessment; b) strengthening creativity and innovation; and c) fostering a professional atmosphere.

### ***II.a. Authentic Learning and Assessment***

John Eger (2008) found that by integrating multiple subject areas into a visual arts class the instructor is guaranteed to reach more than one type of learning style, or differentiate instruction. In his research, Eger interviewed 2,500 students and 200 employees at High Tech High School. Eger (2008) also found that many students are hands on learners and they absorb much more information when they manipulate it physically. Lecture hall instruction does not meet the needs of the hands on learner and that is where the benefits of interdisciplinary projects start to manifest. When students see that the same information, for example creative writing, can be applied to many different situations and in many different ways they absorb the information in an authentic way. If a student could learn how to write poetry while creating a piece of art, for example, they would see the multiple dimensions of this information.

“The arts provide young people with authentic learning experiences that engage their minds, hearts and bodies” (Eger, 2008, p.3). This is a perfect example of how art is an example of authentic learning. When a student’s mind, heart and body are engaged in their learning they have an experience that will stay with them far beyond the classroom. Eger’s finding is interesting because it provides a foundation for the positive aspects that art has when it is infused in a school environment. Eger also points out the fact that creativity is a skill that is very valuable in a global community. He argues that: “It isn’t just about math and science anymore. It’s about creativity, imagination, and above all, innovation.” (Eger, 2008, p.2).

### ***II.b. Strengthening Creativity and Innovation***

Eger (2008) found that art can be used to strengthen creativity and innovation. Since technology is advancing so quickly our students cannot even be trained for the exact future challenges or professions that will come their way. Eger states this as the ability to “solve problems that we don’t even know are problems.” (Eger, 2008, p. 2). We need to teach our students critical thinking skills and foster their ability to be innovative so they can be competitive in the world they live in and will live in as adults.

Nathan (2008) advocates the fact that teachers should “vividly engage” students through art. Nathan’s (2008) study is another example of why students need to develop creative thinking skills through art. Nathan uses the Boston Arts Academy (BAA), as the location of her study and interestingly she is also the Principal of the school. The school is a public school located in the heart of Boston and has the goal of infusing art in all academic aspects but also teaches art for “art’s sake”. In her study she observed her students over a ten year time period to record the benefits of an arts-centered curriculum. I found this study compelling because Nathan wants to “vividly engage” students through art. (Nathan, 2008, p. 1) The students at BAA have consistently continued success and this supports my research in the fact that there are documented long-term benefits to art-integrated curriculums.

### ***II.c Fostering a Professional Atmosphere***

Edens and Potter ( 2007) describe the results of a case study on the relationship between children’s drawings and mathematical problem solving. They also express the fact that the relationship between art and other subject areas is one of equals, thus art is not designed to support and enhance other subject areas, and they are made to support each other (Edens, et al., 2007). Their study found many connections between student’s drawings and the math skills they were developing. They also needed to work with their peers to do this study therefore enhancing the relationship.

### ***II.d. Filling the Gaps***

After reviewing the literature for this study I have found a few gaps that I would like to address. The first is the fact that many of the studies are general in nature and do not expand upon specific learning benefits that teachers can expect to see through interdisciplinary work. Therefore I am hoping to pin down some specific learning benefits for ninth grade students in a small rural district. The second is the fact that I could not locate any research that involved both the Visual Arts and English Language Arts through integration. Most of the studies I have found involved

Literacy, Mathematics and Music. Art is a very under-researched content area and through this fact alone there are many questions left unanswered and many gaps to be filled.

It is my goal to start filling in the gaps that are relevant to my students and to my colleagues. This is where I developed my question: what are the learning benefits of interdisciplinary visual arts and English language arts projects. I decided that I wanted to find the specific learning benefits that my students receive from this process so I could better understand the way they learn and relate content-knowledge.

### **III. Methods**

The population targeted for my study was a group of 24 ninth grade students in my three Studio in Art One classes in a small and rural area in the Finger Lakes region of Central New York. The group consisted of four males and 20 females all ranging from ages 14 through 15. All participants were of Caucasian descent and fell in the range of middle class to lower middle class. My study also included the ninth grade English Language Arts teacher who has more than 10 years of teaching experience. This was a convenience sampling and so, generalization is limited.

In accordance to my school's opt out policy each student in the class received a letter of consent for their parent(s) or guardian. The nature of the form was such that it only needs to be returned if a parent or guardian objected to their child's participation in the study. I only had one parent object to their child participating in the study and since this student was in the tenth grade it did not affect my sample group. The consent letter informed parents and guardians of the nature of my study and that their child's grade would not be affected in any way by the study.

### **IV. Instruments Used**

Since this study was a form of quasi-experimental research there was a series of three stages. The first stage was the pre-test that established a base-line of existing knowledge within the group of students. The second stage was the treatment of the project itself. This is when students were creating their artwork and I observed them, no tests were given. The last stage was the post-test, or the assessment, to determine any new knowledge that arose.

The first instrument used was a pre-test survey that contained 18 statements. The statements ranged from questions asking if students were confident writers to if they thought art could help them be better writers. Students were only asked to include their grade on their surveys but not their names in order to maintain anonymity. The pre-test was given before any instruction and before any activities were started. The students were asked to circle a number on a scale of one to ten to express their belief in each statement with one being that they do not agree up to ten being that they fully agree. At this point many students were sick with the H1N1 flu and absent so I had to stall the actual project until I could get every pre-test survey completed.

After all of the pre-test surveys were completed I started the project. I chose to implement a collage project that included writing in two different forms.

The first form of writing directly combined art and writing. In this activity I asked students to mix a color that they associated with a word such as relaxation or freedom. After each painting I asked them to complete a statement with a prompt provided. One example of such statement was,

“In my perfect world.” These statements all related to the color that the student previously painted. My hope was that they could subconsciously relate color and belief and this could make writing easier or more freeing. This activity seemed to be success, from my observation. Each student completed their statements during the class period. The next day I asked students to use the paper they just painted and the statements they just created in their collages. I told them they did not need to be legible (they could cut or tear them) because it was personal and more about the experience.

Students continued to work on their collages and at this point we had gone over the hurdle of product versus process. All students were in process mode at this point and no longer so concerned about how their project “looked”. The next writing task I gave students was a haiku. I showed the students examples of haiku and I asked them to write three haiku poems that were biographical in nature. This way the writing related to their project but it did not directly involve art in the process. Upon observation I noted that students struggled more with this piece of writing. I asked them to include their favorite haiku somewhere on their collage and it had to be legible.

I also did one supplemental assignment where I wanted to combine an ELA assignment and an art assignment. I asked students to illustrate a scene from John Steinbeck’s *Of Mice and Men* that illustrated a major theme in the book. They did not like this assignment because I was mixing two of their worlds. Many students see my class as an escape and when I added a high-stress core class they resisted. I found, through observation and an informal survey that this type of activity is not really worthwhile. I do not want to harm the tone of my classroom or the rapport I have with my students.

At the end of the project I gave my students self critique activities and a self grading rubric as this is a normal procedure for this classroom when finishing a project. After this I gave them the same survey I gave them before they began the project. This post-test survey did not take as long to complete because not as many students were absent.

My last instrument was the use of formal interviews. I selected six students, four females and two males. I tried to choose six very different students. I asked them a series of four simple questions and I found there were similarities in their answers. I transcribed and color-coded these interviews.

## **V. Procedure**

After I explained my research to my building principals, I was granted permission to conduct my research. I also received permission from the Human Subject Committee at SUNY Oswego. I also received permission from the English Language Arts teacher I worked with to use material he was teaching for the sketchbook assignment, and he agreed to help whenever needed.

I administered all instruments in a manner to protect privacy and I often expressed to students that their grades would not be affected by their responses. When conducting observations I went about class as I normally would and while conducting interviews I asked all students for their permission and I did not pressure them to participate.

## VI. Data Analysis

### VI.a. Quantitative Data

The first set of data is illustrated in graphs that show the results of the pre-tests and post-tests. I made a chart using Excel to illustrate each question so I could highlight each question's specific result and compare and contrast them. Each graph corresponds with a question on the survey and shows the change in answers through bar graphs. For reference, each question can be found at the heading of the chart. The first chart shows the overall rate of change from the pre-test to the post-test. The charts that showed significant findings are included later in this paper.

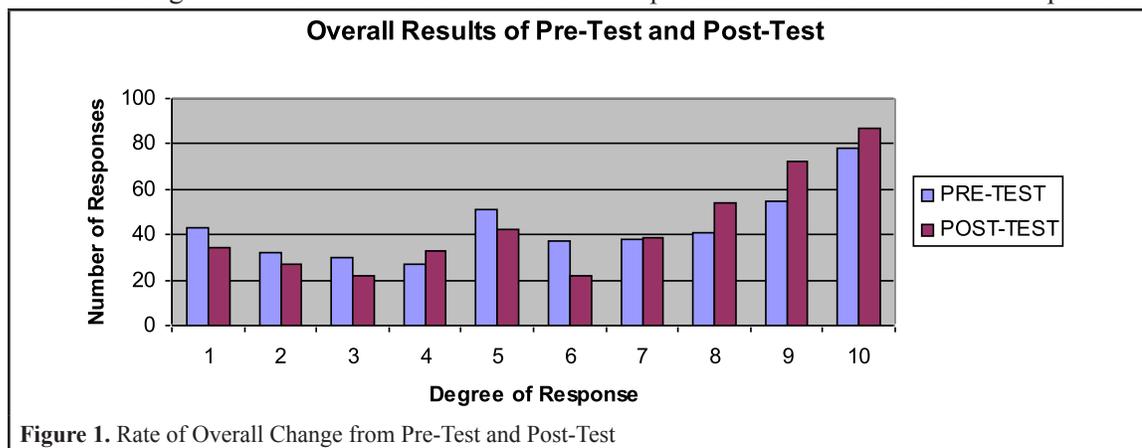
The second set of data is illustrated in pie charts and is a result of the informal survey done after the questionnaire was given in response to the Steinbeck (1937) *Of Mice and Men* sketch-book assignment. The pie charts were also made in Excel and they give the viewer the ability to compare and contrast the results while viewing the percentage of answers to each question. The questions can be found in appendix D.

### VI.b. Qualitative Data

I interviewed six very different ninth grade students at the end of the collage project. These students had different personalities, hobbies and ambitions. The following data illustrates themes that I found by color coding their transcribed interviews and a few select quotes that I find valuable. Color coding helped me find similarities and common key words that students used in their responses. The Interview questions can be found in Appendix D.

## VII. Findings and Results

The first set of data is illustrated in graphs that show the results of the pre-tests and post-tests. Each graph corresponds with a question on the survey and shows the change in answers. For reference, each question can be found at the heading of the chart. The first chart shows the rate of overall change from both the pre-test and the post-test.



**Figure 1.** Rate of Overall Change from Pre-Test and Post-Test

Figure 1 shows the average change from the pre-test and the post-test. This shows a slow and steady growth in knowledge and content area synthesis.

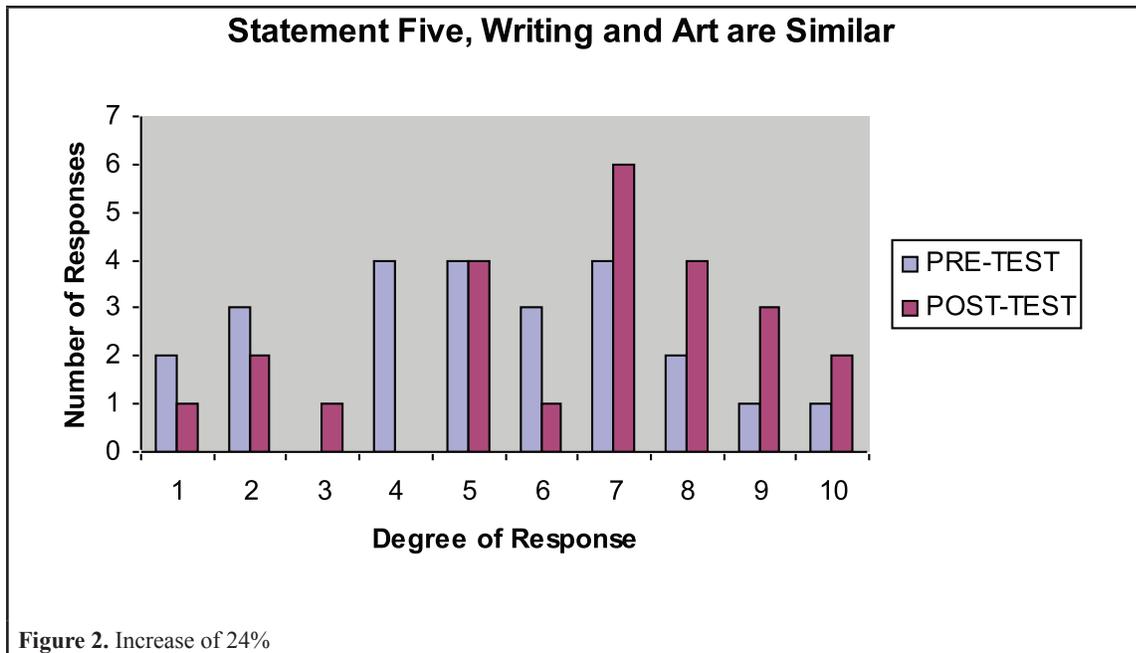
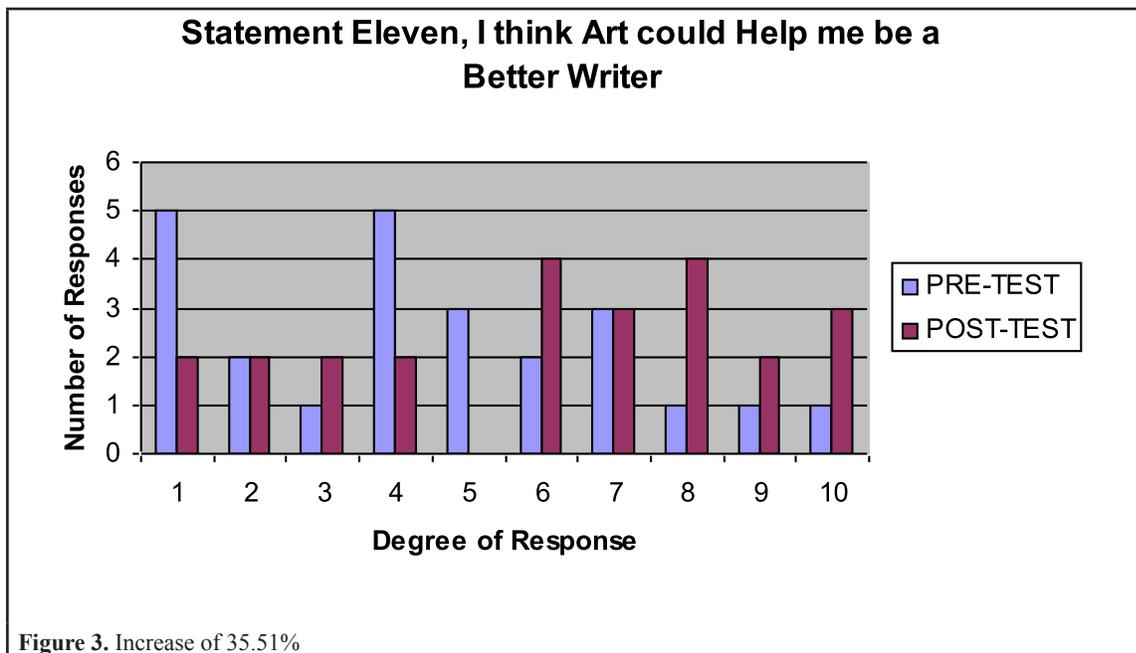


Figure 2 is an example of a question that garnered a high percentage of increase in awareness at 24 percent. The question asks students if they think that art and writing are similar. It was my hope that through this interdisciplinary project my students would start to make connections between content areas and realize that they have many similarities and this question and response shows that this is in fact the case.



In figure 3 students were asked if they felt that art could help them become better writers. This question's success is in direct correlation with figure one because for students to believe that art could help them write creatively they must first believe that the two can relate to one another. This

question had the highest rate of increase and proved to me that there are potential long-term benefits of interdisciplinary teaching.

### VIII. Informal Survey

The following pie charts are results of the informal survey done after the questionnaire was given in response to the *Of Mice and Men* sketchbook assignment. Each chart represents a question and had an explanation following the data.

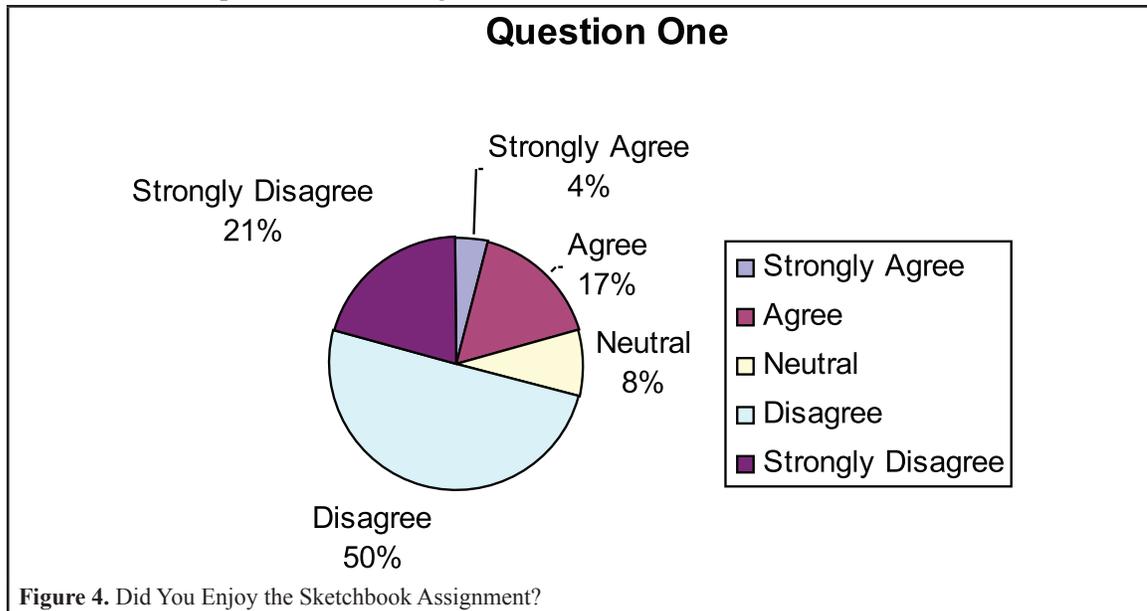


Figure 4 corresponds with the question: did you enjoy the sketchbook assignment? It shows that half of the students did not enjoy this assignment while 21 percent did. I took into account the fact that some students dislike homework in general, no matter what form.

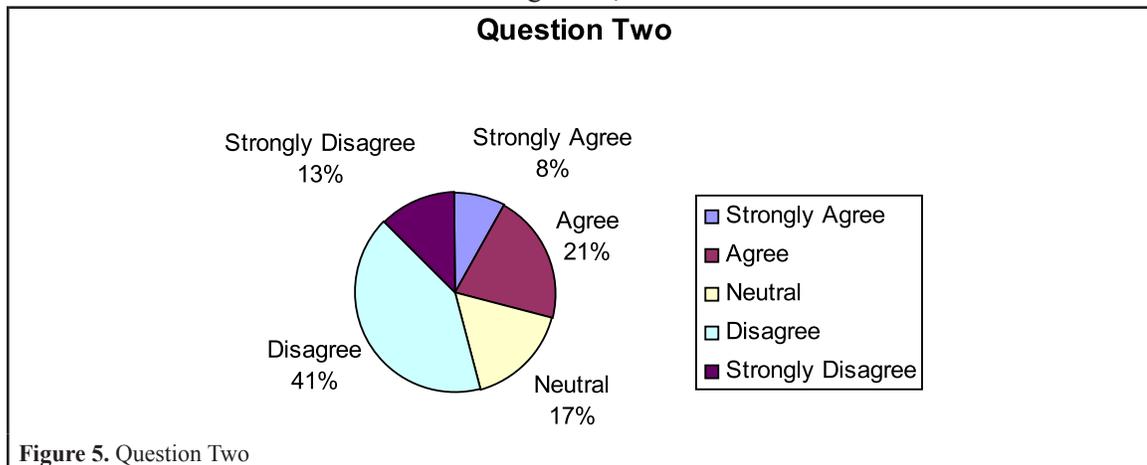


Figure 5 corresponds with the question: do you think that sketchbook assignments of this nature would help you retain information in ELA or other core classes? From the data it is clear that a

number of students are unsure while the majority disagrees. Over time this attitude may change if students saw positive results from the work.

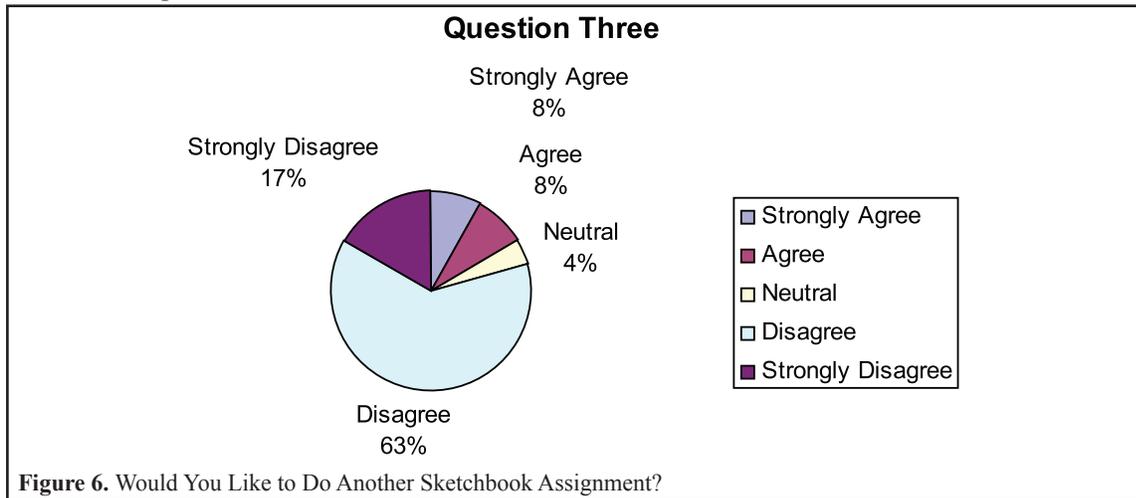


Figure 6 corresponds with the question: would you like to do another sketchbook assignment like this? Many students would not like to have another assignment like this. It would be interesting to see the results based on another subject area or book.

## VII. Formal Interviews

I interviewed six randomly selected ninth grade students at the end of the collage project. The following data illustrates themes that I found by color coding students' transcribed interviews and a few select quotes that I find valuable.

When asked if they thought art and writing were similar five out of six students responded that, yes they thought writing and art were similar. The most common reason behind this response was that both activities allowed you to express yourself. One young lady told me: "I think they're similar because they both bring out individual's personalities and talents" (participant four female, age 14).

The next question I asked was whether they thought art could make writing easier or more fun. Three out of six participants said that they thought art could make writing more fun mainly because it helps you visualize what you are writing and four of the students thought art made writing easier. One young man responded by stating: "Yes I think it will make writing more fun and easy because art explains things better than words." (Participant five male, age 15).

Next I asked the participants if when you combined art and writing they thought that over time this could make them more confident writers and five out of six students said yes, because they could visualize what they were writing and this helped them. One female student responded: "Yes because it allows you to go deeper into the writing and the art" (Participant six female, age 14)

My last question was: did you like the activity where we combined the art and writing or the haiku activity better and five of the students liked the combination project better because they could directly relate it to their projects while one said she liked the haiku activity better because she liked to express herself in writing. One male student responded: "I liked the one where we combined the writing and the painting because you can describe what you are thinking with col-

ors.” (Participant five male, age 15). One female student responded: “I liked the haiku activity because I could express the writing and relate it somehow to the painting.” (Participant six female, age 14).

## IX. Discussion and Interpretation

A high percentage of students, after completing the interdisciplinary project and set of creative writing activities could relate art and writing more than they had before the project started. This is a primary illustration of a learning benefit that comes about during interdisciplinary lessons. This showed that through combining an art project and an ELA project, students could make the connection that these two subjects have similarities and that they could relate to one another. Through this knowledge new learning becomes more relevant because they can connect information to other pieces and experiences of learning that is taking place throughout their day in other classrooms. Since we were working on projects to directly synthesize the two subject areas students were able to connect them fundamentally as well without my prompting and I believe this shows authentic learning.

My second significant finding had to do with how students felt about interdisciplinary projects and combining core classes with their art class directly. Although this data may seem negative at first glance it is actually very helpful in determining what kinds of interdisciplinary projects are actually effective.

I did one supplemental assignment where I wanted to combine an ELA assignment and an art assignment. I asked students to illustrate a scene from *Of Mice and Men* that illustrated a major theme in the book. They did not like this assignment because I was mixing two of their worlds. Many students see my class as an escape and when I added a high-stress core class they put their walls up automatically. I found, through observation and an informal survey that this type of activity is not really worth it to me because a high rate of learning is not present. I do not want to ruin the tone of my classroom or the rapport I have with my students and I have determined that more creative cross-curricular work is much more effective and well-received. (See appendix B)

Through further reflection on these findings I have realized that it is mainly the student’s interpretation of the application of the interdisciplinary project that determines its effectiveness and consequently the learning benefits that ensue. If I were to implement the writing into their in-class art project and meld the two together I am faced with very little resistance and I found significant learning and synthesis of subject areas. On the other hand, if I were to implement the writing in a direct way through a sketchbook assignment that directly relates to a core class or unit I am faced with much resistance and many negative feelings to the point that no real learning can take place. By putting these two sets of data together I have found not only specific learning benefits but also more effective methodology for future interdisciplinary projects.

When students connect classes and material they increase their sense of responsibility and motivation to understand and retain material. Motivation also increases because the learning directly involves them and they are no longer uninvolved observers. This idea is best stated by Nathan (2008), who states:

Our young people need to be immersed in artistic experiences. They must also develop strong intellectual skills. This is what we call being artist scholars. We believe that young people come to appreciate and understand

beauty. They use that same application to be creative, mature thinkers in society. (Nathan, 2008, p.2)

Nathan's ideas concur with my own findings that by making connections between the arts and other subject areas students we are able to fundamentally connect ideas and fuse creative thinking skills into learning as a whole.

I have found specific ways that interdisciplinary projects benefit the students in my district and specific groups. I have also found what does not work while combining subject matter, an issue that was not discussed in any of the literature I read. This information supports the belief that interdisciplinary projects are beneficial to student learning and provides practical ideas to implement this learning effectively.

## **X. Limitations**

During the course of my research the main limitations that I faced were the short time period and an outbreak of the H1N1 flu that spread among the sample group I was working with. Since we had a short amount of time any absences were serious because I did not want students to fall behind in their production of the project. Although these situations were frustrating at times they were beyond my control and I did my best to be flexible and work around them. I do not feel that either of these factors negatively affected my results in the end.

## **XI. Summary**

Overall I have found two significant pieces of data that answer the question I posed from the very beginning: how do interdisciplinary Art and English Language Art projects benefit student learning? Through this discovery process I have singled out the largest benefits for my students: the fusion of subject matter and creative thinking and I have found the methods that work and do not work. It has been a long journey but nevertheless a rewarding one that will assist me and my students as I plan lessons and curriculum for years to come.

I would like to expand further upon the direct integration project based on the book *Of Mice and Men*. This project was not successful because students resisted the intrusion of a core class into their "fun" class, art. I realize that this is a stigma "special area classes" carry. After reflecting upon the results of my study I believe that through further interdisciplinary work I will be able to break down these perceived boundaries and work through these stigmas as students see that art really can relate to their core classes.

## **XII. Implications**

If I were to continue this research in the future I would like to study the long-term effects and benefits of interdisciplinary projects. It would be beneficial to have results over a six month period and then a year-long study. It would also be interesting to study the results with other subject areas such as science, mathematics, music, physical education, social studies or foreign language. The last piece of further research I could see stemming from this data is a study on different age groups, both younger and older, to find if the results change in any way by diversifying the sample group.

This information could be valuable to administrators and teachers and may encourage them to collaborate more in the future. Conference days would be the ideal time to work together to form ideas and projects in small groups.

I will continue to integrate interdisciplinary work into my teaching and I will encourage my colleagues to do the same. Through this research I have been inspired to create a new curriculum and have proposed and developed two new courses that I will teach next year that are based on the integration of world cultures into the art classroom. I have presented these course offerings to the Board of Education and to all of the Administrative staff in my district and have been granted approval to start teaching them starting in the Fall of 2010.

I hope that this research may inspire other educators to try an interdisciplinary project in their classrooms, to reach out to their colleagues and to open the eyes of their students by fusing learning and subject matter. I hope that they can see and absorb the learning benefits that I found for my students and how they can apply to their own classrooms and that this may inspire them to seek out their own students' needs and strengths. In the end my goal has always been and will always be to educate my students in a way that is authentic, that causes them to stumble upon creativity and that inspires them to find beauty in their everyday lives.

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# STRATEGIES FOR REDUCING DROPOUTS AND ASSISTING AT RISK STUDENTS IN HIGH SCHOOL

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*Sponsor: Dr. Faith Maina, Department of Curriculum and Instruction*

Students at risk of failure have been dropping out of school at alarming rates in schools around the country. This research focused on strategies for preventing “at risk” students from dropping out of high school. The focus was on 11th graders because it is at this level that students are seemingly “lost in the shuffle.” Instruments used in this study to determine the results of this research ranged from interviews to questionnaires. The significant findings and implications of this study are that students want to be successful. They also want to feel as though they belong to something bigger than themselves. Schools need to create an environment in which students could feel successful and therefore would not be a burden on society.

## **I. Introduction**

Every year since I began my teaching career in 2006, the 11th grade Social Studies classes I teach are packed from stem to stern with students. Sometimes the class gets so overbooked that I need to let a student sit at my desk. This is a far cry from what the class looks like at the end of the year. I will have at least five to six students every class not show up consistently. When checking attendance someday I usually see a LFT (left) or DRP (dropped) next to a name with no warning or explanation. My goal is to keep my classes full because I want to see students have success. The success starts with good grades on quizzes, then tests and then year-end assessments on the Regents exams. The success of any student is two-fold because in order for them to be successful, they have to want to be successful and subsequently do the work and invest the time to improve. The teacher can only take them so far. The purpose of this research was to investigate strategies for students becoming more responsible for their own lives. Once they achieve this level of responsibility for their grades, then this way of thinking would hopefully transfer over to other aspects of their lives, family, health and beyond. The responsibility they learn and the strategies they incorporate could be a part of the stepping-stones they need to grow into mature, capable society-enhancing adults.

## **II. Literature Review**

In reviewing literature for this study, a few themes emerged: a) student assessment, b) students/motivation and finally c) action plans.

### ***II.a. Student Assessment***

Testing is a substantial portion of the modern day school system because we as a nation constantly compare ourselves to ourselves, as well as other countries. We seemingly do this at times to compete with each other. The inherent problem with this is that education should not be a competition, but rather an environment for authentic learning. The students know and realize that their best work must be reserved for testing because that is what they are gauged on, for college and beyond.

The other tests that are given in class from day to day have this same stigma. The problem comes down to a couple of highlights in the research and the biggest factor is stress associated with these tests. Many children in my classes get nervous when it comes time to take test in the class. Even the difference between a quiz and a test can be the marker of a huge temperament change. According to Scott, (2005) students are too stressed when it comes to dealing with tests and the simple strategies when assisting the students are often overlooked. So the majority of this research was conducted via observation, which for her was not a bad method, but could be problematic. The research is significant because it does bring issues to the forefront.

### *II.a. Students/Motivation*

Most of the research analyzed throughout this process has focused on the students ranging from stress to social acceptance. To give points of time to these pieces of research is important because it shows the relativity of the findings. The earliest research that was used in this study was 1998 and the most recent research that was done from 2008. The process of a student's formation begins at the start of their educational careers that stems from their home life. The students begin at a very early age to define what type of student they will be: failure or success. This is according to many different things that affect the children's lives. The varying things are parents, other students, teachers and others that come into the children's lives at different stages. Eventually, the students work their way up through the school years and then I get the students near the end of their basic education, this is both good and bad. It is good because they are near the end so they can see the light at the end of the tunnel, but bad because of the same reason. It is bad because they can see the light, but they have a lot of work to do in order to finish. The students also know that their junior year is very important because they have been told for many years that this is the year that can determine whether they get into the college of their choice. They can blossom during this year and rise to the challenge of multiple state tests and a difficult course load of work. A small yet significant group of other students can be overwhelmed and simply give up. In fact, from my experience I have had students that say to me the work is too hard and it (graduation) is not worth the trouble. The process of the students giving up is not something that just happens, but rather the buildup of many years. This is also the year where the students can drop out. According to New York State law, students are only obliged to stay in school until they are sixteen, which coincidentally is their arguably most difficult year. So what pushes them to this point? Perhaps it is determined by how well the students fit into the school they are going to, difficulty of work and the lack of viable options. Motivation may well be a significant factor in this process. Students need to want to do the work; there are a few categories of students in school. The first category would be the students who do work regardless of conditions or load; they will do the work well every time. Then the next grouping are the students, who despite not liking the work or simply have a low interest in doing the work, will work simply because they have to. The last set is the focus group of the research who are the students who need the incentive and interest to do the work, let alone do it well. The other point of information is the lack of certain aspects of research.

The community of a school is determined again by how well the teachers and administrators run the school. Is the school accepting for all or at least most? Does the school unintentionally exclude students? These are things that a school must question to determine how much and to what degree success is achieved. The school must have the ability to offer many things because then all students can feel success. Students who oftentimes drop out, according to French and Conrad

(2001), are those who display distaste for school or even an antisocial behavior and have not found their place. This study was done again through observations and interviews both of the students and by the students. They can also be rejected by their peers because they stand out. The antisocial behavior can have ranges, one simply to be withdrawn or to possess a quiet manner, all the way to violently acting out. The withdrawn behavior can be from dressing extremely beyond the normal teenage standards to complete social withdrawal. The other end of this spectrum is where students act out and are rejected by peers because they do not fit into any groups. Students can also act out violently at times too because since they do not fit into any specific group, they may cause fights, swear excessively, or take drugs. I have seen all of these behaviors throughout my experience. A student who is having a difficult time in school will push through if they feel accepted by some group, teacher or other means; it is simply belonging to something bigger than them. This idea was reinforced by Harris and Princiotta (2009) who state that opportunities are key to success because with limits will be failure because variety for students is their connection to doing well. I have found this is my school where I have some students that love history and then others who hate it, but they find success in other areas. They have that certain piece to hold on to and they can withstand the bad parts of school for the good. The research indicates that success is determined by two simple things, variety and acceptance. So the problem I have is that, why have the schools on the whole not changed practices to accommodate the at risk/dropout students? Another factor that determines success of students is the student's background and how much they have going on everywhere else. Research outside of this topic which has become common knowledge is that students are more stressed when it comes to work, than they have ever been. This is from testing, work, home life, college hopes, sports, boys, girls, so on and so forth.

### **III. Action Plans**

Fulk (2003) applied a plan early enough to make sure that the students were "caught" early enough and followed to ensure their success. The study took one school's action plan to reduce the number of dropouts for their school. Fulk's study was very similar to my research in that it surveyed students and interviewed people. The research, however, stopped there because it was too specific. It identified the plan the school was going to take, but did not have follow through. The reader was left to assume the program worked well. This is problematic because a school like mine may take this plan and implement because it was "researched." After they begin to implement this plan they realize that it does not work for them. Then what our school would have is wasted time and students who are lost in the shuffle, without an improvement or help. Fulk's research called for things like shorter days, or days that started later and then smaller class sizes. There are also some flaws in Fulk's article as some other articles that I found that focused on action plans. They were all deficient in the follow through of the plans. To introduce the plans in the articles was a good thing, but the articles need to have followed through from that grade to secondary completion, which would have been more useful. Understandably, the research parameters must have time restrictions much like mine had, where there was a time limit. The research would have been much more thorough if there was a significant time lapse. The good side is that is where this research fits because it focused on eleventh grade, making the crucial connection from the beginning of the research to near the end. Action plans are important and some of the findings were smaller class

sizes, more money, student mentors and social networking. To understand those better, they need to be analyzed more.

To begin with, the ideal situation would call for smaller class sizes based on reality and the assumptions drawn from all the research because the relationship that the students could have with their teacher would be stronger. The students would build a better sense of belonging to their academic communities. One of the problems with this is, in order for the classes to be smaller there needs to be more money in the system to hire more teachers and have more resources in place to accommodate these needs. The problem is the current economic situation, where everyone is trimming their budgets and reducing staff. The odds are stacked against the “at risk” students because they may have more troubles at home and school may not be as conducive for them as it could be according to Pierce (2001). The economics of a school are always going to be an issue because if we have a surplus, there are always ways to spend more, according to economic reality. If there is not enough, then it is obvious why more would be needed. The next solution is having student mentors where they are paired up with a student who might be “at risk” to ensure they have a peer to work with and assist them when needed. This can be another person where the student can feel where they are a part of something albeit small; it can be a person to rely on in case the “at risk” student feels as though there is no one else. A school in Los Angeles tried to lure and help their students who had or were close to dropping out by making them feel as though they belong somewhere (Maxwell, 2007). Technology is another aspect that schools have been trying to catch up with the rest of society for a while. The schools in Los Angeles used social networking sites to try to build the “sense of community” and lure students to get back into school and improve their lives (Maxwell, 2007). The study was done a couple of years ago, so it is another one where the true effects and not just the immediate “honeymoon” effects will be felt. It will be seen if the work is truly effectual over a longer period of time.

There are many sources of information that have helped me with my research paper because when this research was first started, it was felt as though perhaps information on the specific topic would be found. Much to my apprehension I was able to find enough information to guide me in my own research, but not enough to completely rule out any chances that I had of developing a niche within the work. The topics to review that were found in the literature review were the relationship of stress and tests, as well as antisocial behavior. Another idea that was not thoroughly analyzed was what the students’ home life is like; this is where there are faults in this study. The hopes now are that I can, along with the other research done, begin to have an idea of how to try and solve the problem of having a high number of “at risk” students and subsequent dropouts. The goal is to not only help those students, but our schools and the communities in which they serve on the greater whole.

The gaps in the research are most marked in the upper grades of the high school level because there is no current research. It is important because those students are just as significant and seemingly need the most guidance. There are also gaps in suburban schools because most of the schools in the studies found were done in urban areas. I also incorporate the students, teachers and administrators in the study, giving the study multiple levels of significance and research. The research hopefully will also give simple steps for schools to utilize, that can be applied with little money, few resources, but still have a solid impact. The solid impact will focus on things like having smaller class sizes, mentoring programs, improved and accessible technology, while establishing

a strong student focused community. Hopefully, this study will give light to some of these suggestions and as a result this study may in fact fill those gaps.

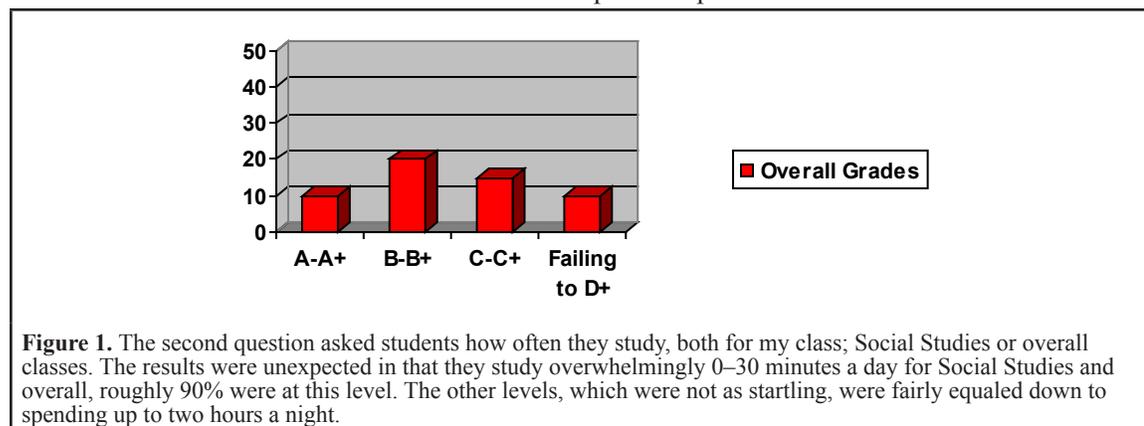
#### IV. Participants (Sample Population)

The sample for the research was a set of students in my 11th grade United States History and Government classes. There were 129 students, with abilities ranging from very high to very low. Their placement in my class was determined by random selection, which works well for the study because there was no effort put into establishing a pre-determined group. The students were also randomly placed into my classes, with no bias from race, ethnicity, religion, sex or any other distinguishing difference. This was also a convenience sample and generalizations were not assumed. However, the sample was adequate for the aforementioned descriptors that allow for balance and equity. The school in which the study took place was a large suburban school with many elementary schools, feeding into two middle schools. From there the students feed into one junior high school for 8th and 9th grade. 10th–12th grade is in the high school, with an estimated population of 2,300 students. The school is in Central New York. The area has many different industries, technology parks and job opportunities at various levels of necessary education.

#### V. Questionnaire

##### *V.a. Demographics*

The first question of the survey was intended to find out what type of students were taking the survey: it asked what their overall averages were last year. This way the students could be judged with some sense of scale against each other. The students displayed the classic bell curve style for the spread of their grades. There were a lot of students that had high C's and B's for their overall averages. This would also indicate that if a lot were in the middle, a few would be on the fringes, i.e. low grades (D's or lower) and high grades (A to A+'s). This is important because it shows the amount of students that are both at risk and subsequent dropouts.



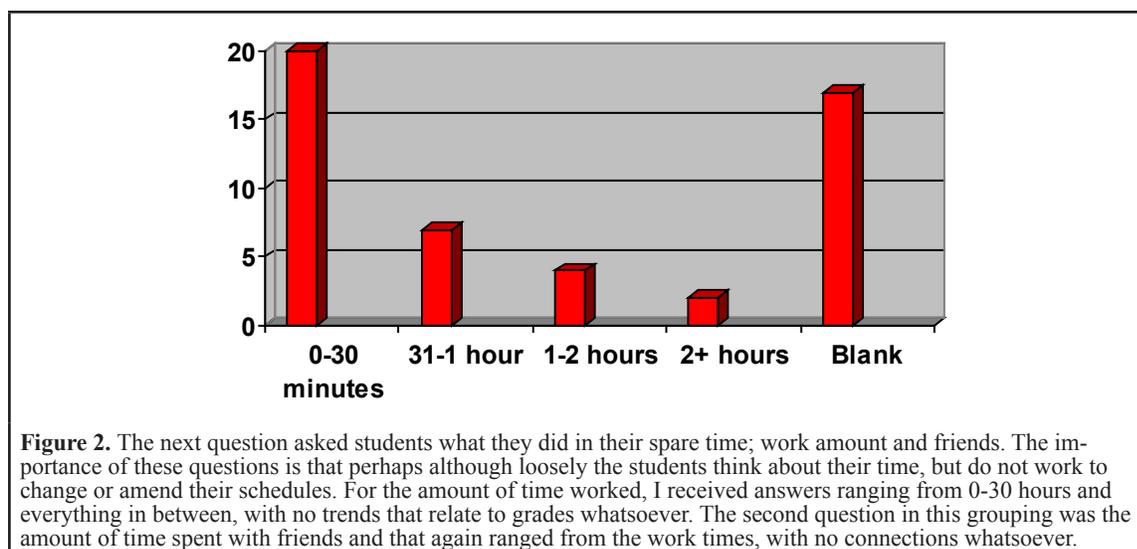


Table 1 shows that the majority of the students either stay after school, or simply write their work down in a planner.

**Table 1.** The next question deals with how students react to bad grades and what they did to ensure that it does not happen again. The question was worded as follows: Which of the following have you done to improve your grades? (Feel free to choose more than one.)

Stayed after school	Written down work	Studied more	Read from textbook	Taken time to know teacher	None
26	24	9	17	10	2

The next area dealt with my own personal teaching and what I could do to improve the environment for my students. The students think I should: *show more movies, take more time, use different techniques, simple homework, nothing, hands-on, group discussions, seminars and more talking*. The same question was asked on a broader scale and these are some of the answers the students gave me: *shorter class, not so strict, less cell phone rules, more opportunities, less homework, teachers stay late more, easier work, taking more time with students, movies, get rid of math and slowing down and explaining things more clearly*.

The next question deals with whether or not the students feel supported in school and overwhelmingly many students said yes, with a few exceptions. 4 out of 50 (8%) students that took this survey said that they did not feel supported. These numbers are a little bit higher than the dropout rate in our school, but close enough to be relative. This shows that if we could “get” those students then they may not dropout and they may find success. Two of the most frequent reasons for selecting “no” were insensitive teachers, as well as teachers not willing to help out.

Finally, the last question focused on what would be a good class for you (student) in three words. I received a lot of different answers for this question, which are listed. Perhaps again if teachers would do some of these things listed, along with the support of the administration, then we could reduce our dropout/at risk students. The list is as follows: *interesting, reasonable, fun, calm, easy, cooperative, well-constructed, good mood, good notes, teaching one thing until everyone learns and entertaining*. The result of the students’ survey shines light on many things. Mostly, maybe, we are not hearing what the students are saying and most of the students could be all right with that. Then again, not all students are dropping out (just a few, relatively speaking), but that

lack of voice could be all they need to give up. Perhaps one way to solve this would be peer evaluations, intended not to criticize, but to assist.

### ***V.b. Interviews***

The teachers included in the study both teach the majority of their classes in United States History and Government, which is 11th grade. The first question asked them if they have had students drop out before and both teachers answered yes, in fact they smiled as though I was asking the most obvious question.

The next question looked at teacher assessments and how they use them. Both of them use a variety of teaching assessments and methods, such as quizzes, projects, seminars, notes, presentations and tests. The only difference was the level they teach at affected difficulty, advanced placement or Regents depending on which class they are teaching. The students, according to the teachers, prefer group learning or student centered teaching. The teachers also try to teach to different levels of ability in their classes, with their intentions of challenging all students, as well as teaching to a higher level of thinking. Admittedly, they both said this was a difficult and challenging task, but it is necessary for success. This relates to another question I asked and that was: is there enough time to address the needs of all students? Since the teachers both teach to the Regent's exam at the end of year they feel as though that test contrary to popular belief does not challenge the students enough. With that in mind, they both teach beyond the necessary requirements, which are teaching for appreciation and knowledge of history. They try hard to do this and they mentioned that those who say the test gets in the way, simple are not doing it (teaching) the right way. It should also be noted that these interviews were done at different times and in different locations. They also went on to conclude that those teachers who have a large amount of concern for the test do not teach enough of what needs to be taught.

The next topic asked if they are able to tell what level their students are at in the beginning of the year and one teacher said "Oh yeah. Oh yeah, within the first two weeks!" This is both good and bad in that they assume initially and admittedly preemptively. The teachers also recognized the fact that it could be a fatal flaw in judging so quickly, but most students fall eventually within their initial size-up. The point is that again not all students are dropping out; perhaps the ones that are wrongly judged are. The result is the feeling of no connection or respect and they simply give up. This goes along with the next question and that was whether or not the majority of students are self-directed learners and they change from the AP level to the Regents level. The Advanced Placement students are mostly self-directed, where the teachers assumed 80%, but expect 90 to 95%, which may be too high an expectation. The AP students are also a lot of "mom directed" learners because the teachers both say that it is not necessarily the students, but the parents pushing their son or daughter. The Regents level (as opposed to the AP) for one of the teachers says that students are not motivated because of home life, content, current educational system, poor assessments, not invested nor responsible, to highlight a few. This goes back to the theme pointed out earlier and that was that as a system students are expected to be mediocre and as a results become what is expected. Perhaps the students on the fringe are there because they need to be. They are expected to be there and they rise to those expectations. This relates to a side conversation with one of the teachers about tracking and whether or not they feel as though our school de-tracking is good thing for the students. A teacher I interviewed said, flat out, "No!" Not all students according to him could learn together because some students are not simply cut out for school. Some students need

to be challenged to excel, some need repetition and if they are thrown into the same class, then half of the class, would go “Absolutely fucking batty” because it would move too “slow.”

The next section of questions dealt with strategies for setting up interventions to have success. The first question asked the teachers if they challenge their students, which were yes, with some hesitation, but hopefully they feel as though they do. They also are constantly trying new things to be up to date. The teachers both have different ways of getting to know their students in the beginning of the year, which was one of the most important things for the students. One teacher, however, was a little more vested in that process. That teacher does things like knowing names quickly and having constant dialogue to ensure, even at the cost of falling behind with the course to ensure community is established. The other teacher was not as vested in building classroom community because they stated they make the “good effort” to know the names, but admitted building community was not of the absolute importance. The differences are subtle, but can grow exponentially as time goes on, which is where teachers and schools could or could not see better scores. The last question asked was about discipline policy and what theirs was. Both stated that they follow the school’s established policy, but have expectations beyond that. The teachers both reinforce the fact that these students are almost adults and try to treat them accordingly. It is a fine line they have and work hard to ensure that students are pushed and respected. Both also went on to say that there is not enough positive recognition for students as a whole in our school; we focus mostly on extremes; good and bad. This can lead to students in the middle feeling unappreciated, not working as hard, or even faltering and dropping out.

The last group of people were the administrators and the department chair for our department; I grouped the department chair here for a couple of reasons. The first is that they did not have markedly different answers as to the teachers, perhaps due to the fact that the department chair still teaches. I did not include her as much because she teaches mostly 10th and 12th graders. She is out of the scope of range for this study, but the answers were taken under consideration of the administrators due to the proximity of contact.

The first question asked for the principals was about data and how it is used to get students “across the stage.” The data is used in this way, but they both said the data is only as good as its simplicity, some measurements of data are too complex, and so the district has invested in a person whose sole job is to work the data. This is information that every level can check the progress of students, teachers and even buildings at every level. Both administrators felt as though the data was good because it had been revamped both out of necessity and desire to see where we could as not only a building could improve, but a district. The data leads to the adoption of new things to ultimately help out the students and their success. This also leads to asking ourselves the question of what good is holding back a student. The first issue was the introduction of new programs, at least in our school of programs that could benefit the students “at risk.” The first was the Academic Intervention services, which target students that failed the end of the year assessments or were not successful in the course itself. This program directly targets those in need. The second is called Nova Net which is a program that students can take that tells the teachers where they need to focus or where the teachers need to teach or not. We also have a program within our school that is called the STAR program, which is a group of teachers and administrators that come up with strategies for helping “at risk” students. The program on the surface seems very good, but having talked to other sources has said remains “stuck in the mud” with little to nothing being accomplished in its

two years. This shows good steps made, but points to where we may lack as well. If we do begin to analyze this with a good diverse group then the results would be beneficial for many people.

The next question for the principals dealt with they types of students dropping out. Their answers were that there was not just one type, but all types of students that are affected by outside influences, in other words, everyone. The one thing that did stick with them are the students who do not pass classes or are held back, which would seem obvious if they were the only ones who were failing out, they are not.

The next issue was that of recognition and community. The problem as was mirrored by the teachers was the lack of recognition of a large amount of students for what they do, this is left up to the teachers. The problem is that if the teachers are not doing this, then no one is. The idea of community is difficult because we have such a large school, but both administrators offered solutions, eerily enough, which was a true house system. This is where instead of teachers being broken down into departments they would be broken down by teams. Each student would be assigned to a team of teachers that would work collaboratively to create and foster a strong community of learning and acceptance. The problem, however, is what would happen if the students were stuck with poor teachers, perhaps which could be more easily recognized through that system, but a possible solution nonetheless.

After that the questions focused on class sizes and money, which even though I knew were impossible to control, were at least asked about. The answers received were that they would like to have smaller sizes and more money, wouldn't that be nice.

The rest of the questions focused on teachers and what else our school does well. The importance of teacher satisfaction is key because as the house principal put it comparatively to the old saying "If momma ain't happy, no one is..." she replaced it as "If the teacher ain't happy no one is." The administrators despite all of their preconceptions do want to support the teachers, but they play with the double-edged sword and that is upper management on the administrators and then teachers from the other side. They both recognized they are only as good as the teachers, which they said are pretty good. The last things they touched on were the need for having a good BOCES system for vocation (200 students) and a good career center. Students are more likely to succeed if they have a goal, work and the future does just that, without goals and chances for success the students, particularly "at risk" students are more prone to fail.

## **VI. Interpretation**

### ***VI.b. Assessments***

One of the first points that need to be mentioned is that if the students according to the survey spent more time on their homework, rather than studying their grades would be higher. The results arguably are inconsistent because they are spread across the spectrum of possible answers and therefore may not be worth mentioning. On the contrary, I think the questions are because there was enough similarities to show the basic idea of time devotion and if there was more, then the scores may be higher. The other side of this point is that if the students are challenged more, then they may take it upon themselves to do better. In order for students to do better, perhaps excellence needs to be expected. So if students are given higher standards then they will work harder and if

they work harder that means that they have higher standards. The double edged sword only gets this name from having two sharp sides.

Other considerations that a teacher needs to make are that they cannot assume anything about a student. Another point that I found about was during the research that students are oftentimes portrayed in a particular way. This way they are portrayed is not always where they should be. Assumptions are something that can harm relationships irrevocably. As was seen in the interview and the questionnaire assumptions are continually made, the only this will end is that if both sides stop? The point is that as people we make assumptions about our students, if we do not do this the students will have a fairer chance in our classes.

Along with assumptions being made, perhaps we as a school simply do not give the students enough time to be successful, both studying successfully and staying after school for extra help. Studying successfully is important, but the results show that students simply do not study. Are they not studying because they are lazy or complacent or perhaps it is something more? Studying must also be done in a setting where studying is conducive, the environment is an important thing. Perhaps the environment as well as other issues must be considered. The students assumedly are not always lazy. The solution to this is that the realization of this possibility exists that there is more to the story than what is known. It is like a student acting out; 9 out of 10 times it is not the result of the teacher or the class, but something else.

Staying after school is a whole other entity because in order for students to make up work or correct work they need to stay after. When those students are not able to stay after they are at a disadvantage because their grades stay the same without being able to raise them due to that being the time to improve them. Students cannot or do not stay after for different reasons, such as baby-sitting, other jobs, parents, extended family or simply not having a ride. These things are problems because those students who at risk can have more of these “happenings” going on and the effects are more real. Staying after is also at least from personal experience a valuable tool to understanding a student. This one on one time can be crucial to “saving” a student that perhaps is in trouble because we as teachers can know them and perhaps empathize with their situations better.

If we understand students’ situations then we can understand more where the students come from in that we can give them more satisfaction at school. This is important because the students spend a lot of time at school and if they are feeling unsatisfied or detracted then that effect can snowball. If the students know that we respect them and their lives then we can have a connection. That will in turn help these students work harder for us.

Another roadblock to student success from the research that was found was that the teachers in a class may “think” they are doing the best possible thing for their students when actually they are not. It is very important to listen to the students most of the time. The reason it is said most of the time because the results of the surveys said things like “no classes” and “cell phones all the time” these would simply not be feasible. There is a fine line between wants and needs when it comes to getting an education for these students. Are there things that we as a system could do better? Yes, without doubt because like it has been stated earlier if the students feel some sense of belonging then they will be more likely to not just succeed, but they will have the want to be better. If they have no voice then they will be more prone to dropping out and perhaps actually drop out.

## VII. Implications

The implications of this study are that many things could be done to make students who are simply staying in school. In order for any of these things to work students, teachers, administrators, directors and the general public have to and want to improve the education system. The first would be for the school to have increased graduation rates, this would mean more money coming in from the state and federal levels of government. This could mean access to more programs, better teachers, continually increasing chances for not only school, but student success on all levels. The next implication of the study is for the students themselves, the ones who are actually at risk and subsequently drop out of school. Those students have the chance to be successful and they can pass that on to other portions of their families and those around them. Success can be very contagious. The students within the rest of school can also benefit as well because they would have additional resources that they could have not had before. They could have resources that actually work, from increased technology to smaller more intimate classes. The rest of the population will take back the resources that were being spent on students that are no longer at risk of dropping out.

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# MOTIVATING MIDDLE SCHOOL ART STUDENTS TO LEARN: INCORPORATING TECHNOLOGY AND CAREER OPPORTUNITY AWARENESS TO PROMOTE STUDENT ENGAGEMENT

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*This study explores how to create an overall understanding of the importance of art to student learning and why participating in the arts is a vital part of a student's education. Art plays a significant role in everyone's life but somehow the stature of art has been diminished and programs are easily cut from school district budgets across the nation. My research examines how art is perceived by 32 seventh grade students and five art teachers. It also explores different motivational strategies that intrinsically motivate students to become excited about art. Using a variety of research instruments including surveys and questionnaires, I have found that by incorporating technology and creating awareness regarding career opportunities in the field of art I can increase motivation in the art classroom.*

## 1. Introduction

“Why do I need to take art?” and “Art is not important” are a few comments I have heard students repeat throughout my teaching career. “What role does art play in peoples' lives?” has been a big question to many people and often times, they lack any understanding of the importance of art. During my research I have found many studies that support the lack of understanding there is pertaining to what role the arts play in a school system. Hetland and Winner (2008) discuss that students learn a variety of art techniques, an example is drawing and painting, but they also mention the fact that students are taught many “mental habits” that they do not acquire in other classes. The skills that students learn in the art room are important in numerous careers today, such as visual and spatial awareness, the ability to reflect and critique oneself, and being able to make and learn from one's own mistakes; however, these skills are ignored by the state testing today (Hetland and Winner, 2008). It is clear that the arts are very important because without art, students will probably miss out on these very important life skills.

Many students believe that art is only about drawing and painting. There is an obvious misunderstanding of the fundamentals behind art. They fail to realize they are learning these important life skills that Hetland and Winner (2008) discuss in their article. Many adults do not realize these important points either and this is probably the reason why they often allow the fine art programs to be cut out of schools' curriculums when budgets are tight. Art in education is important because it allows students to think independently and promotes creativity and critical thinking, skills that are important in the core classes as well as the real world.

As a third-year art teacher, I find the importance of art has been diminished, leading people like my students to question the reasoning behind the inclusion of the arts in the education system. Education programs are faced with tight budgets and strict standardized tests, which leaves the arts to be seen as a needless expense, leading to art programs being cut across the country (Hetland and Winner, 2008). I have felt the impact of art positions being cut.

The purpose of this study was to investigate how incorporating technology and career opportunity awareness in art would affect student learning. I also wanted to find strategies that would

increase students' engagement as well as provide an understanding of why art is important. Lastly, I wanted to find out whether students' perceptions about art would change and whether they would understand the importance of the inclusion of the arts in their daily lives.

Just as Hetland and Winner (2008) point out, the arts play a huge role in student learning and cutting back fine art programs will potentially have a damaging effect on students' learning as they will lose some important life skills crucial for today's job market. My school district continues to cut down our fine arts department to save money and therefore, this study will show why cutting the arts is detrimental to our students and our community. I need to find a way to promote and gain support for fine art programs in our rural community.

## **2. Literature Review**

During the review of the literature for this study, three major themes emerged about how I could motivate my students to succeed in the art room: 1.) Giving students the ability to choose, 2.) Making the material relevant, and 3.) Finding motivational skills and meeting the needs of multiple intelligences.

### ***2.1 Giving the students the ability to choose***

Karen Kloplic (1998) conducted a study to find motivational techniques that would improve student involvement at the secondary level. Kloplic (1998) experienced students who engaged in off-task behavior, had low assessments on art projects and were not aware of the importance of art skills in the job market. These factors resulted in her using a class of 24 students to find motivational strategies that would reverse these problems (Kloplic, 1998). Kloplic (1998) offered some motivational strategies when it comes to choice as she suggests that students should be active participants in the learning process. To do this, Kloplic (1998) suggests creating an assignment list where students could choose from the assignments, allowing students to choose flexible due dates, and give students the ability to self-score and correct before turning in a final product. Kloplic (1998) had many positive results and found that engaging students in their own learning allowed students to take an ownership over their learning, thus becoming interested in the subject as well as its content. Gamwell also supports choice and found that students became "personally engaged in their work through exploration, active involvement, and engagement..." (2005, p. 360). Kloplic and Gamwell found that students could understand the material if they put the effort into their learning.

### ***2.2 Making the material relevant***

Nancy Rich (2005) conducted a study involving *Motivating At-Risk Middle School Students to Positive Classroom Performance*. While her study did not focus on the art room, she offered some vital information for reaching "at-risk" middle school students. She suggests that students can become intrinsically motivated individuals if they can find a personal connection to the material they are learning about (Rich, 2005). Just as Kloplic (1998) suggests, Rich (2005) also proposes including student choice as a way to motivate students. By including choice, Rich (2005) states that students can take ownership over their work; making it important to them and their learning. Rich (2005) encountered positive outcomes with her study finding that even her most "at-risk" stu-

dents were able to succeed when they were allowed to make their learning relevant to their lives. Rich (2005) found success with student relevancy in a non-art classroom and I used this to explore in the art classroom.

### ***2.3 Motivational skills and multiple intelligences***

Gamwell (2005) discusses how students make personal and meaningful connections when they engage in art which leads to students realizing the potential they have. He also mentions that researchers have found that students are able to self manage themselves by being able to set goals for themselves as well as taking ownership of their actions when they pursue art (Gamwell, 2005). Gamwell (2005) conducted a study in a non-art room; however, he included an arts-based unit to help motivate his students. He based his study on the inclusion of the arts in his classroom because it provided positive motivational skills and met the students' needs by acknowledging that all students learn differently (Gamwell, 2005). He also found that his students were able to connect to their work if the work was meaningful to them (Gamwell, 2005).

An art room generally runs differently than the core classroom and thus results in meeting the needs of the many different multiple intelligences. This made me determined to attempt to include a project that included material not normally associated with the arts, at least with my students. Computers and technology are not seen as art materials in my school. For this reason, I decided to include them in my study as I was trying to reach other multiple intelligence needs in my classroom. By doing this I was trying to assess the impact technology had in the art classroom. I did not find any information about this while doing my research and I want to know what impact it could have in the art room.

While the implications of Kloplic's (1998), Rich's (2005) and Gamwell's (2005) studies were very useful to me, I found a few gaps in the existing literature. First, Kloplic's material is over ten years old, as well as other information I found. Also, much of the information I found discussed elementary or higher secondary students, not middle school students. Lastly, a lot of information I found incorporated the arts in a core classroom, not the actual art room. This helped fuel my investigation and to conduct a study featuring the information I found with my middle school students.

## **3. Methodology**

### ***3.1 Sampling***

The targeted population for my research was my two 7th grade, first quarter classes of the 2009-2010 school year, and a few art teachers from the Central New York area. The sample of my research consists of 32 students, ranging in ages 11-13 years. Students from the rural school district vary in socioeconomic backgrounds with a majority of them from Caucasian descent. I gathered information from five art teachers in the Central New York area ranging in age from 23-55, with three of them from my own school district. I used the convenience sampling method because I was already working with these students and I have continued interaction with the art teachers, therefore, generalization is limited.

I chose the 7th graders because I had two classes with them and had the opportunity to conduct the research with the two different classes. One of the classes had 18 students, with 10 females and

eight males. The other class was made up of 14 students and included nine females and five males. For the purpose of the research, I have combined all the data from these two classes instead of comparing the two classes. I felt that comparing the two classes against one another would not be adequate or accurate because of the difference in class size.

### ***3.2 Instruments***

For the experimental research I used various instruments over a four week period. The research I conducted involved students taking a pre-survey, engaging in a project while I observed them, followed by students taking a post-survey as well as completing a Final Thoughts Sheet. I also conducted a survey with five art teachers from the Central New York area.

One instrument I used was a checklist for my observations. The checklist contained each student's name with a box for every day of the week where I would mark a dash if they were engaging in off-task behavior. Off-task behavior included any time the student was not working on their project or getting material. I started observing my classes using this predefined checklist on October 13, 2009. My students did not know I had started to observe their daily activities; therefore, they were conducting their normal behavior. Because I teach in an art room, the students are working on their own a majority of the time as I guide them, which allowed me to observe my classes instead of bringing in an outside observer.

The day before I started the new project that the study was focused on I gave out a pre-survey. The pre-survey was given to the students on October 27th and 28th because of absences due to sickness, mostly the H1N1 flu. The pre-survey was given to each student before I introduced a lesson on careers. This pre-survey included having students list up to 10 art related careers they could think of, rating 10 different things they thought they should learn in an art classroom, and rating 12 different projects they might encounter in an art room. Students also had to answer an open-ended question about how they thought art related to their everyday life. The students also had to circle and rate whether or not they thought art was an important subject in their school's curriculum and they also had to rate how confident they felt about their abilities in art. There was one last section where they could supply information on whether or not other teachers use art in their classrooms.

My next instrument was the post-survey which the students completed after they had concluded their projects. This survey was given to the students on their last day of class on November 6th, 2009. The post-survey was the same exact survey they had done in the pre-survey because I wanted to access the knowledge that I hoped they gained and any changes that had occurred during this process. Once I had information from both of these surveys I was able to put the information into graphs and charts using Microsoft Excel and Word so I could analyze and interpret the information the students presented to me.

Another instrument that I used was a "Final Thoughts Sheet" otherwise known as a final evaluation, which was given to the students on November 6th, 2009. I use this open-ended questionnaire at the conclusion of my classes to assess my teaching and I thought it would be a vital component for this research as it would assess what students might have thought about this last project that they completed for my research. Some of the questions asked included students writing about their favorite thing and least favorite thing about the class while providing reasons for their answers. Also, students were asked what they would have done differently and what they would keep the same. In addition, I had two questions that assessed some of the knowledge that they gained this year. These questions included asking them what they thought was the most important thing they

learned that year as well as writing five things they learned during the year's art class. Again, all of these questions were open-ended.

One other instrument that I used was a survey I did with other local art teachers. This questionnaire was sent out to these teachers on November 6th, 2009 included open-ended questions as well as a cover letter explaining my research. I did not want to prompt any response out of these teachers and I wanted them to write what first came to their minds. The questionnaire was composed of six questions with a comments section. The questions asked were: "how do you think art is perceived in your community," "how do you feel about your administration and their relationship to the art programs in your school district," "what are some of the most effective motivational strategies you use," "what art units/projects do you feel students most connect with," and lastly, "how would you help other teachers to use art in their classrooms?" All of these questions prompted some good responses.

### **3.3 Procedure**

Once I received approval from SUNY Oswego's Human Subject Committee and my school's building principal, I sent out consent letters to all participants involved in the research. This included both parent and student consent forms. Students from both classes were invited to participate in the study and if the student chose not to participate, they still had to take part in the activities because the study became a part of their regular curriculum. Students filled out their consent forms in class on October 26th, 2009 where I introduced the research and read through the consent form, explaining what would be happening in class. I also informed the students that their parents would be receiving a letter from me that they would have to return with the parents' signature. It was made very clear that the research would not affect the student's grade and they would not be penalized if they did not participate in the research process; however, they would still have to participate in the project because it was part of the class. Most of the students were either eager or excited to participate, although I did have one student who was very hesitant to sign up.

I made students aware of the research before the parent/guardian consent form was sent home. I wanted the students to be able to explain the process to their parents/guardians if they had a question about what was occurring in class. I received consent for 31 of my students, with only one not consenting. I received 23 consent forms back from the students, after reminding a few students about trying to get their forms returned to me.

Lastly, I reached out to a few other art teachers in the Central New York Region. I emailed 10 art teachers with whom I have had contact with in the past. Participants were given a cover letter and questionnaire that informed them that personal information was to remain completely confidential. I had five participants respond, ranging in schools from mainly white, rural to suburban school districts. The art teachers have some diversity in their socioeconomic status as well as their ethnicity and age.

Once I had approval from all parties, the study began. First the students completed the pre-survey where I assessed student knowledge. Students then engaged in their own research project about art careers and while they began working on their presentations, I recorded their daily behaviors in the predefined checklist. On this checklist I wrote notes that helped me remember what occurred on that day. By the end of the study I had observed the students over 19 days.

The project that I had students do was a presentation that involved researching an art-related career and presenting it to the class. Students had the opportunity to work with a partner or in-

dividually. Packets about various art careers were handed out and students used the internet to research an assortment of art-related careers. Once students selected their art job, they were instructed to determine how they would want to present the career. Students were able to present using PowerPoint presentation or present their career on a poster, like an advertisement for their chosen job. Most of the female students decided to work in pairs while the male students worked predominately on their own. Out of the 31 students, there were only two who chose to create a poster board, one male and one female, each in a different class. Students were given a few days to complete their presentation and presented the material to class. After the presentations, students completed the post-survey followed by completing the “Final Thoughts Sheet”.

### ***3.4 Data Analysis***

Data was collected through these instruments: the predefined checklist; the pre- and post-survey; the “Final Thoughts Sheet”; and the teacher survey. All of the data was collected and was input in charts and graphs using Microsoft Excel and Word. Qualitative data was included in graphs as well, listing student thoughts.

## **4. Results**

### ***4.1 Using the predefined checklist***

Using the predefined checklist I was able to record students who were engaging in off-task behaviors. During the first two weeks of the study I observed many off-task behaviors; however, once the students began the projects, there was a large decrease in off-task behaviors (See Fig. 1). During the study I incorporated computers into the classroom and noticed a few students who normally acted out in class who became surprisingly focused. Normally students are required to come in to class and get their portfolios out and then get to work. However, a lot of time is wasted due to all of the students trying to get their portfolios at the same time. They will also start talking to their friends, thus wasting more class time. When students had to get the laptops out everyday, they came in motivated to get right to work and there was less conversation occurring between classmates.

Based on what some of the students said on their “Final Thoughts Sheet”, which consisted of open-ended questions, I’m not sure how many students really liked creating their PowerPoint presentations. One student said “The PowerPoint was my least favorite thing because it didn’t really let me show my artistic abilities.” Another student said that “My least favorite thing would be doing the presentation because I like to draw and paint and I didn’t care for doing the presentations.” While these two reflections were negative, another student said “I liked choosing a job and sharing because it was fun.” Looking through all of my data, I did not have any students that reflected negatively on researching about careers, they were only negative on the computer aspect and that it hindered some of their creative abilities. I was a little perplexed by this because I stressed to the students on several occasions that they did not have to use the computers and they could create a poster. Another thing that I found very interesting was that all of the males wanted to work on their own. At first some of the males started to work together during the research part of the project, however, when they had to start creating the presentation they all wanted to work on their own.

There was one exception, but he worked in a female group. He was also absent a lot and became dependent on his group and contributed very little. As for the females, most of them worked in pairs. Out of the 19 females, only 7 worked alone as opposed to all but one of the males.

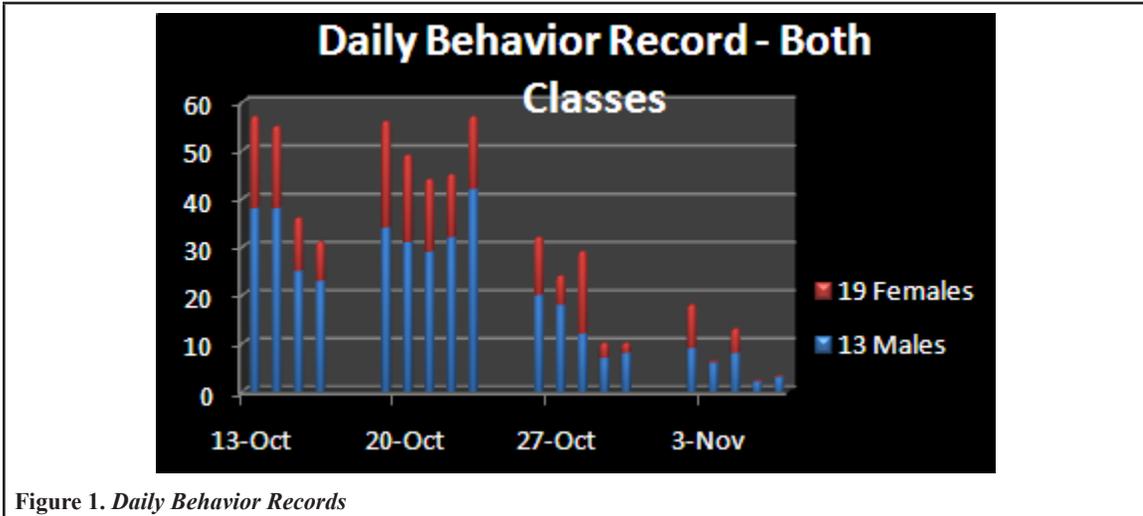


Figure 1. Daily Behavior Records

#### 4.2 Pre-survey and Post-survey

The students filled out a pre-survey and a post-survey for me during the study. One of the questions on the surveys asked the students to list 10 art-related careers. Many of the students could not think of a lot of art-related jobs (See Fig. 2). The most popular jobs listed were architect, sculptor and photographer. I had two students who were eager and determined to fill in all of the spaces, however, the other students did not take much time and wrote only a few answers down, if any. From Fig. 2, one can see that seven students did not put any art jobs down on the first survey.

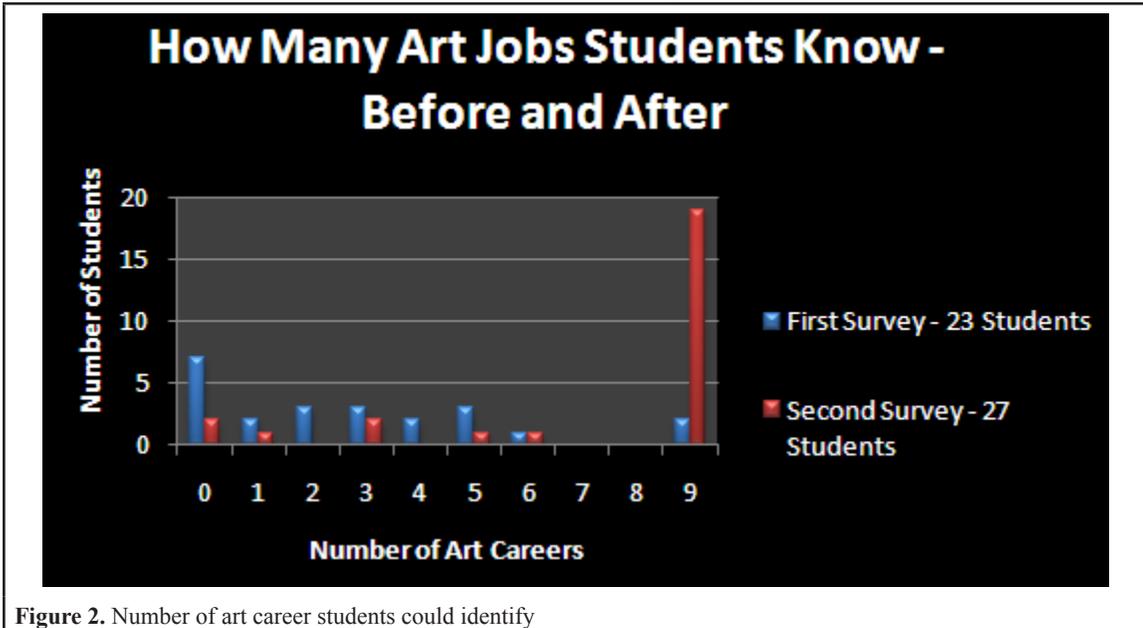


Figure 2. Number of art career students could identify

After the students participated in the research project on careers, a majority of the students were able to identify at least nine art-related careers. This was 19 out of 27 students. This time the most popular art jobs listed were airbrush artist, cake designer, tattoo artist, fashion designer, sculptor and taxidermist. There were still two students who did not put in the energy to completely fill out the survey and left that section empty, which gave the impression that they still did not know any art-related careers. Overall, this was a success because I was able to see that students gained some knowledge by participating in this project.

Another question on surveys asked students if they felt that art was an important subject in the school curriculum. On their surveys they had to circle: strongly agree, agree, disagree, and strongly disagree. On the pre-survey I had five students strongly agree and 15 students agree that art was important to the school curriculum. However, I had one student disagree and two students strongly disagree. When students responded to the post-survey question, I had 11 students strongly agree and 12 students agree. Opposed to that I had three students disagree and one student strongly disagree. The data is affected here because on the pre-survey I had 23 students participate in answering this question and on the post-survey I had 27 students participate. I'm not sure where those three students would have answered on the pre-survey so it is unclear if more students changed their opinions to disagree. While that information is unclear, it is clear that many students who agreed changed their opinions to strongly agree. On the pre-survey I had five students strongly agree and on the post-survey I had 11 students strongly agree. Overall, on the pretest I had 20 students agree or strongly agree that art was important to the school's curriculum and on the posttest I had 23 students agree or strongly agree that art was important to the school's curriculum.

#### ***4.3 Final Thoughts Sheet***

At the end of the research I had the students answer six open-ended questions on their "Final Thoughts Sheet." The students were able to freely write their thoughts anonymously. The questions included: what was your favorite thing about this art class and why, what was your least favorite thing and why, what would you have wanted to see done differently, what would you keep the same, what do you think was the most important thing you learned this year in the art room and lastly, the students had to list five things that they learned this year. From this question I can see what had the biggest impact on the students during this ten-week art class. I was happy to see that eight students wrote how they learned about how many different art-related careers are available and that art is important. Many students wrote about different projects they did in class. I can see from the chart that five students thought that they gained confidence in themselves and gained pride in their work. I can also see from this chart that at least 10 students really enjoyed the grid project which happened to be the project before the research project. There were many positive comments about the grid project for the question that asked what the students favorite thing was. There were also many positive comments about the class itself and as stated before, any negative comments that had to do with the research project related to the computers and not learning about the art careers. There were only three negative comments, 11% of the students surveyed, and the comments related to using the computers and having to participate in a presentation.

#### ***4.4 Art Teacher Questionnaire***

Lastly, I collected some data from five art teachers. Three of the art teachers were 48 years or older with 18 or more years teaching experience, while the other two were 25 and 26 and have been teaching for less than three years. All of the teachers had very similar responses to most of the questions. When asked about how they think art is perceived in the community, most said that while it is not a top priority, it is still appreciated by many. One teacher said that it's "somewhere below sports and math, but I know it's top with the kids. It's a lot of the reason they come to school." Another teacher said "While my school district would never be mistaken for an 'artsy' community, I have found the support from parents to be very good, especially those who have children that excel at art." When asked about what art units/projects they felt students most connected with, most of the teachers said finding lessons that students can connect a personal meaning to were good ones to use. One teacher said that their high school students typically "love the more open-ended, hands-on projects like wood sculpture, wire sculpture, or clay. It gives them a chance to both create successfully and socialize." I think all the information that the teachers provided me with is vital information that discusses how to keep students motivated to learn in the arts and thus showing them how important the arts are to our communities.

### **5. Discussion**

The purpose of this study was to find ways to motivate students in the art room. Many of my students do not understand why the arts are an integral part to their student learning often leaving them unmotivated to succeed in the art room. Incorporating technology and promoting career opportunity awareness became the focus of study to see if these two proposed motivators would have a positive effect on my students and encourage my students to succeed in our classroom.

#### ***5.1 Highlights***

Overall I found this study to be very successful. I noted some very strong changes in my students when technology and student choice were involved in the classroom. Students who were normally off-task became focused when laptop use was introduced. Only two students chose to create a poster and while these students worked independently, I feel that their presentation of the material was not as strong. Also, students were surprised at how many art-related career opportunities were available and seemed excited to learn about a job of their choice.

#### ***5.2 Limitations***

With many successes, there were a few limitations or factors that could have affected the research. The first major limitation was time. I only have my students for ten weeks per quarter and the research fell at the end of a quarter, only allowing three weeks to conduct the research. Another factor that could have impacted the research was sickness, the H1N1 flu outbreak that ran throughout the school. I am not sure what the results would have been if students were present every day. Another limitation was the size of my sample. I conducted the research using only 27 students in a very rural community. It would be interesting to see the results of such a study in a much larger setting.

### ***5.3 Discussion***

Overall, the research was successful even with the limitations. I encountered a dramatic positive change in student behavior and had more students focused and ready to learn in the art room.

### ***5.4 Student Engagement***

I observed many off-task behaviors during until the students began the art career research project. A few pieces of information can be interpreted from this information. Students may have been motivated to learn because they were interested in learning about art careers. They were exposed to a lot of unfamiliar information and were excited to find some jobs they could actually see themselves doing someday. During the first two and a half weeks of observing students were working on a symbolism self-portrait. During this time I witnessed many off-task behaviors; however, there were two days where the off-task behavior fell because there was a flu outbreak and many students were absent. On October 29th, students started learning about the art careers and off-task behaviors dropped significantly. This could mean that students became engaged because the material they were learning about was relevant to them. They also could have become interested in the material because they were allowed to choose what they were learning as well as given the choice as to how to present the material. Choice could have played a huge role in why the students became engaged. Klopčič's (1998) information about giving students the ability to choose about what and how they go about learning definitely made an impact in the classroom.

### ***5.5 Use of Technology***

Students could have become engaged due to the use of laptops in the classroom. I decided to use technology based on the information from Rich (2005) who discussed finding ways to make what the students were learning relevant and meaningful which would help motivate the students to learn. Once the students started using the laptops, their off task behavior noticeably dropped, especially in the male students. Using the laptops could have been meeting the male students' motivational needs. They also liked using PowerPoint and created unique presentations. I think the male students felt successful with this project because there was less pressure for them artistically. In my opinion, I think they felt they were in their comfort zone. While students were offered the choice to work in pairs, most of the boys worked independently while most of the girls worked in pairs. Out of the 19 females, only seven worked alone as opposed to the 11 males. I think the girls felt less confident about their computer skills but worked well in pairs. Overall, most students were actively engaged everyday while using the laptops.

### ***5.6 Deepened Knowledge***

After the students participated in the research project on careers, a majority of the students were able to identify at least nine art-related careers. This was 19 students out of 27 students, with two students choosing not to complete this section. Overall, this was a success because I was able to see that students gained some knowledge by participating in this project. This information can be interpreted as students being motivated to learn because the information was relevant to them and they were interested to learn. It also shows that they retained the information. Unfortunately, this was the last project I conducted with them and do not know if it would have motivated them in the art room.

Based on the study I realized that students did not understand what opportunities are available to them in the art world. I also became aware that there are many art related jobs that the students did not consider to be art related until we discussed what the job entailed and the relationship to art. Learning about careers seemed to be a big motivator as well as incorporating technology. It would be interesting to do a future study that focused only on integrating technology in the art room and another study that only focused on included art careers into the curriculum to see what impact each one had on student learning.

### **5.7 Implications**

This study was very successful even with the limitations and provides the art world with some very useful information. Students who were not actively engaged in class became focused and ready to participate during the duration of the study, which demonstrates significant, positive outcomes.

As mentioned before, including art careers and technology in the classroom allowed for significant change in the art room. However, I am unsure which one had the most impact. It would be beneficial to do another study to see the implication of each one individually. Do we need to incorporate both into the art room in order to see positive change or is only one necessary?

Careers seemed to play an important role and trying to incorporate art careers into the everyday routine would have a positive effect. Students would be able to see on a daily basis how art impacts their life and would be willing to participate in the arts on a daily basis.

This study has taught me that relevance and choice are very important. Technology and computers are very relevant to these students because they use them almost on a daily basis, plus they live in a highly evolved computer world. Also, using the laptops made the students feel like they were important. This could be seen in the way they came right into class every day, signed out their laptop and got right to work, it was very professional atmosphere.

Allowing the students to choose what they wanted to learn about was also very important. In the future I would try to conduct projects that allow more student choice. This could involve having the students chose between projects, subject matter, or medium they need to use.

All of the information that I collected is not only important to me but also to other art teachers and people in the community as well. From this point on, I will try to create lessons that involve technology and careers, as well as try to allow students to make choices whenever possible to help make those personal and meaningful connections. By students creating these connections and seeing what types of careers are available to them, it will hopefully filter through to their families and community to help support the arts.

If I were to conduct this study again I would do an art project that focused on a computer based art program that the students could use. I would then conduct another study that involved including careers; however, I would not involve computers. I would already have information readily available for students to refer to and they could create a collage that represented this career. It would be interesting to see if both of these still had the same effect.

As stated earlier, this study involved a small sample over a short period of time. I think a longer study should be conducted with a larger sample in a more diverse population. It would be interesting to see what types of information could be discovered. I think this information is needed to help support why arts are important to student learning and thus vital to a student's curriculum.

I definitely will be thinking about this information as I restructure my curriculum from year to year and hopefully other art teachers can use this information to adjust their teaching styles as well. Overall this study had several positive outcomes that I hope others will use in their classrooms.

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# THE IMPORTANCE OF INCLUDING PHONOLOGICAL AWARENESS THROUGH SMALL GROUP INSTRUCTION IN A PRE-KINDERGARTEN CLASSROOM

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This research focused on the effects of direct instruction in phonemic and phonological awareness in a small group setting within a Pre-K classroom. The Pre-K students were all taught phonemic and phonological awareness instruction. One group of children received instruction in a small group setting while the other group received phonemic and phonological awareness instruction in a more informal large group setting. The results show that students who received phonemic and phonological awareness in a small group setting were able to retain the knowledge better than the students taught in the large group.

## I. Introduction

I have been a pre-kindergarten teacher for the past six years. I have always felt, given the different learning styles as well as ability levels of my students, when teaching specific skills to my four year olds the use of small group instruction was the most effective teaching strategy. With the use of small groups I could focus instruction on individual needs as well as differentiate my instruction as much as possible. Though I always thought that small group instruction was the most effective method of teaching in pre-kindergarten I had never done any significant studies to back up my ideas. The use of small groups in pre-K is not common practice. Most of the teaching throughout the day took place during large group or carpet time. I do agree that there are significant skills being taught during this time such as patterns, counting, number recognition, songs and rhyming. However, a teacher cannot differentiate instruction when he/she is working with 18 children at one time all of whom are at different levels. For this reason, small group instruction is a crucial piece of the pre-kindergarten curriculum.

I decided to pick one significant skill on which to focus my research. I chose to focus my research on teaching phonemic and phonological awareness through small group instruction as opposed to teaching phonemic and phonological awareness during large group carpet time. My research was to find out if teaching phonemic and phonological awareness within small groups made up of five to seven children was a more effective method of teaching than in a large group with 16 to 18 children.

## II. Literature Review

When discussing the importance of small groups, Wasik (2008) states, “children receive the individualized attention and instruction that may not be possible in large group activities. Teachers can also better observe how individual children perform on tasks and how they interact with other children” (Wasik, p. 515). Wasik (2008) discussed the fact that during small group instruction individual children’s comments can be heard and responded to. The teacher can provide meaningful feedback to each comment. Wasik (2008) also discussed the importance of the children’s support

of each other during small group instruction. “The children who know the names of many letters, for example, can provide a model for children who are still learning them”(p. 515).

Adams, Foorman, Lundberg and Beeler (1999) agree that teaching early literacy concepts are most effective if done in small groups. Their research showed that children learned more vocabulary words and comprehended the story better when the reading was done in small groups compared to large groups and to one-to-one instruction. They agree that phonemic awareness activities are best taught in small groups.

In many of these activities in which it is important that the teacher hear the sound that a child can produce or listen to the way the child says rhyming words, the teacher can attend to the nuances of the child’s speech in a small group. (Adams et al. 1999, p. 147.)

One of the greatest benefits of small group instruction is the benefit of meeting the individual needs of all of the students in the classroom. Wasik (2008) discusses how teachers tailor instruction to meet the specific needs of each child. Grouping children to work on specific concepts is helpful.

For example, children who are having difficulty with learning letters may be included in a small group that reads alphabet books daily. Also, if some children are showing readiness for learning sounds in words, a small group activity can engage children in clapping and tapping phonological processing activities that demonstrate syllable segmentation. (Wasik, 2008 p. 518.)

One of the key reasons small group instruction is so successful in pre-kindergarten classrooms is because of the distractibility of students of this age. Pre-kindergarten teachers spend much of their day re-directing students and trying to keep them on task. Having students perform tasks in smaller groups help them to remain on task. Cooke, Kretlow and Helf (2010), state that:

Teaching students how to attend and engage during group instruction is important for school success. Small-group instruction allows the teacher to monitor fewer students, so it becomes more obvious when a student is not attending to the task. In small groups a teacher is able to make and maintain eye contact to consistently monitor student attention. (Cooke, Kretlow and Helf, 2010 p. 142.)

Wasik (2008) concludes by saying, “In small groups, less energy is spent on managing children and more attention is focused on teaching. No matter how good a teacher’s behavior management strategies are, it is difficult to capture the undivided attention of 15–18 preschoolers in a group. “(p. 520).

My research was conducted in my pre-kindergarten classroom. The students in my classroom are four year olds. I taught phonemic and phonological awareness instruction with all children. One group of children received instruction in a small group setting while the other group of children received phonemic and phonological awareness instruction in a more informal large group setting. In completing this research, I could gain evidence supporting my belief that teaching phonemic and phonological awareness within small groups was a more effective method of teaching than in a large group setting. This research will help to fill the gap that currently exists.

### **III. Methodology**

#### ***III.a. Sampling***

The sample for my research consisted of 17 students in my pre-kindergarten afternoon session. I meet with these students five days a week from 12:30 pm to 3:00pm. I have nine boys and eight girls in the class. All of the students in my class were four years old at the time of research.

I performed experimental research to investigate the importance of teaching phonemic and phonological awareness in a small group setting as opposed to a large group setting. The students in both groups come from a wide range of demographics and social class. The groups were heterogeneously mixed. My study consisted of a randomly selected control group made up of 11 students; five of which were boys and six were girls. My experimental group consisted of six randomly selected students; four of which were boys and two were girls.

All students in both the experimental and control groups were pre-tested on a range of phonological awareness and pre-reading skills.

#### ***III.b. Procedure***

Before beginning my research I received permission from the SUNY Oswego Human Subject Committee and permission from the Principal of the school, where I am employed and received permission from all of the parents/guardians of the students in my class involved in the research.

After receiving all of the appropriate permission forms I began collecting data. All students in both the experimental and control group were pre-tested on a range of phonological awareness and pre-reading skills. The test consisted of 20 questions. Two questions were focused on concepts of print, six questions focused on pre-reading readiness, while the remaining 12 questions focused on phonemic awareness. These questions focused on letter names and sounds, rhyming, beginning sounds and blending. The tests were scored and the students were randomly placed in an experimental and control group.

My research took place within my classroom in a span of four weeks. I had an experimental group of children that I would meet with in a small room next to my classroom for 20 minutes twice a week. Each small group meeting I focused on a phonemic and phonological awareness skill by playing a game and getting the kids involved all while in a small group setting. During this time I was able to differentiate my instruction to meet the individual student's needs. When the time was up I would move into the classroom and teach a similar skill in a large group setting while my assistant would move to the small group and work on a math skill. I had the groups in two separate locations as to not give any student the advantage of hearing the same lesson more than once. The days I was not focusing on my research the students received the same instruction in phonemic and phonological awareness in a large group setting focusing on picture cards, songs and charts.

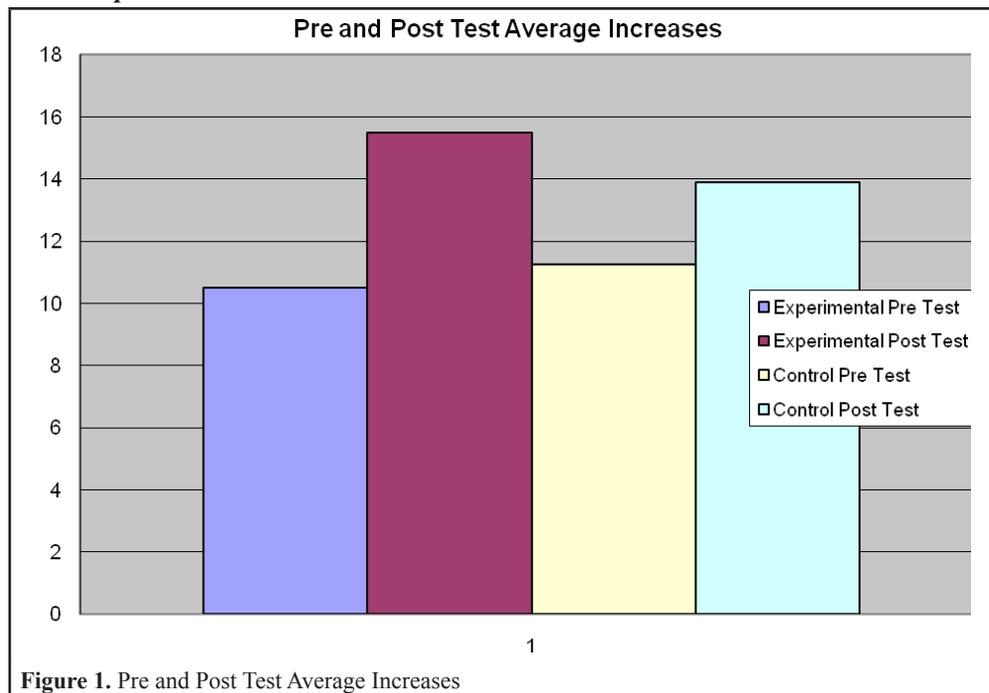
I used a variety of manipulatives during my small group instruction in order to keep the students involved and engaged.

At the end of the four weeks of research I administered the post-test. The post-test was the same test I administered at the beginning of the research. I administered the test within two days using a small room off of my classroom to eliminate any distractions. I administered both the pre and post tests in exactly the same manner to each student. After administering the post-test I

scored the assessment and analyzed the data. I was looking for any changes in scores within the two groups of students.

## IV. Analysis and Results

### IV.a. Pre and post test scores



The quantitative data that I obtained from this experiment showed the Experimental group had an average increase of five points from the pre to the post-test. They scored an average of 10.5 on the pre-test and jumped to an average of 15.5 on the post-test. The control group scored an average of 11.3 on the pre-test and jumped to an average of 14 on the post test which is an increase of 2.7 points. All of the students with the exception of two showed some growth from the pre to the post-test. This information proves that the students retained their knowledge better when taught in a small group setting as opposed to a large group.

### IV.b. Observations

I obtained some qualitative data in the form of anecdotal notes during my group instruction. The way I obtained this data was through brief notes on the students during instruction. I was able to keep limited notes during the large group instruction due to the number of students in the group and trying to remain on task with the students. I would write down a few notes after large group as to not forget how the students responded. Much of the notes I took during the small group were positive and very specific. I was able to monitor progress and keep notes as to aide in my planning for future groups. I had time to take notes on each of the student's progress during the small groups while only very vague and generic notes geared toward the whole group during the large group.

At the end of each day I would look over some of the notes I took during my small group sessions and decide what phonemic and phonological awareness skill I would focus on for the following small group.

As I analyzed my notes a number of themes became obvious in the small group setting: more specialized attention to individual students, a more efficient use of time as well as differentiated instruction geared to individual learning styles.

- *More specialized attention to individual students:* While I was teaching the small group I was able to work with the students and gauge my teaching based on each student's immediate level of comprehension. I could immediately check for understanding and make adjustments to my teaching in order to promote more learning.
- *More efficient use of time:* While I was working with my students in the small group setting I was not wasting time trying to keep the students on task. Because I was working with such a small group of students I was able to hold their attention. I was also able to keep each of the students directly involved throughout the entire lesson as to promote more focus and in turn more learning.
- *Differentiated instruction geared to individual learning styles:* While teaching in the small groups I was able to tailor each of my lessons to the students I was working with. I could change each lesson a little bit to make it appropriate for their individual ability and learning style.

As I analyzed my notes a number of themes became obvious in the large group setting: student distraction, low comprehension, and the inability to monitor progress.

- *Student distraction:* While I was teaching in the large group setting I found that I spent a majority of the time working on behaviors and trying to keep the students focused on the lesson. I felt that I was wasting much of the teaching and learning time trying to keep the students on task.
- *Low comprehension:* Due to the many interruptions during large group time the students were not able to have time to process the skills being taught. I did not have the time to re-teach the skills or check for comprehension due to the lack of focus and time.
- *Inability to monitor progress:* During the large group instruction I found it difficult to check for understanding and comprehension with all students. The number of students as well as the time constraint and the interruptions made it difficult for me to monitor the progress of the students during their large group instruction.

## V. Conclusion

This research was crucial to me as well as the teachers in my school and all other pre-kindergarten teachers. Phonological Awareness is the building block and foundation for establishing reading readiness for pre-kindergarten students. I researched this topic because I felt that if I did

not know the best practices for teaching Phonological Awareness to young children then I was not meeting the needs of all of the children in my classroom as well as in my future classes.

My research showed significant results to prove that teaching phonological awareness in small groups is more effective. The students that were in a small group setting showed an average increase from the pre to the post test of 5 points while the students receiving the same instruction in a large group setting only showed an average increase of 2.7 points. This is almost two times the average increase. My research shows the difference in the increase between the two groups is directly related to the size of the group. The students in the small group were able to focus their attention without the distraction of having so many other students with them. Also, I was able to monitor their understanding much easier due to the amount of students I was working with. If students did not understand a certain skill I was able to pick up on that through their faces and their body language. When this happened I would go back and immediately re-teach the skill in the same or sometimes different way to insure understanding and comprehension. I was able to do many checks for understanding throughout my lesson, which in turn enabled me to stay on top of the student's progress. While I was teaching in the large group I felt that I was trying to keep the students focused and engaged more than teaching the lesson. When teaching such a lesson with a bigger group it is important that you have the attention of all of the students and it was difficult for me to keep the focus of all of the students. With a bigger group of students there are so many more distractions and interruptions that the students tend to lose their focus and concentration. These are the reasons that I feel there was such a significant increase in scores of the children in the small groups as opposed to the children in the larger group.

#### ***V.a. Limitations***

I do feel there were a few limitations on my study and some things I would like to study further. Six weeks was not enough time to fully conduct this study, and I would like to use the school year next year and do the same study and see if my results are as significant. Another limitation on my study was that I do not know how much (if any) work on phonological awareness was being done at home or outside of the classroom. This extra work could have direct impact on my results. During this study I did have several students miss school due to the H1N1 flu so this was also a limitation I encountered.

#### ***V.b. Implications***

I am hopeful the teachers in my building will try teaching phonological awareness in small groups as well as teaching in large groups. We are equipped with a teaching assistant in every classroom so we have the extra person to help with the other students in the classroom. As for other teachers, I realize this study implies districts might have to hire more staff to help with more small groups and I do feel that this is a problem with the budget cuts happening in most school districts. However, I do feel there is a way to implement small group instruction with only one teacher in the room. If a teacher sets up independent learning centers in the room or peer helper work stations the students can be working on independent things while the teacher works with small groups.

***V.c. Future research***

I am planning on doing this research in my classroom next year for the entire year so I can contribute to the validity of my results.

Hopefully this study will be used to help some early childhood educators answer the same question I have been asking for the last several years. Teaching phonemic and phonological awareness instruction is most effective when taught in a small group setting in pre-kindergarten.

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# EFFECTIVE CLASSROOM MANAGEMENT TIPS FOR NEW TEACHERS

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Good classroom management skills are essential to maintaining a smooth running classroom. New teachers with little to no teaching experience need solid building blocks in classroom management. This study investigates strategies that new teachers in grades first through sixth could use for classroom management. With the help of both experienced and novice teachers, I have found some effective techniques that would create a stepping stone for new teachers to use. Implications of the study include a need for the use of more classroom management education for new teachers and a community wide concern for enforcing effective classroom management styles.

## **I. Introduction**

Classroom management can be defined as requiring,

A comprehensive approach that includes the following: structuring the school and classroom environment, actively supervising student engagement, implementing classroom rules and routines, enacting procedures that encourage appropriate behavior, using behavior reduction strategies, collecting and using data to monitor student behavior, and modifying classroom management procedures as needed. (Oliver & Reschly, 2007, p. 6)

New teachers are lacking these essential keys in their classrooms. Experienced teachers pick up strategies that are effective in gathering students' attention that new teachers do not learn in college. Experienced teachers maintain routines with students that they carry with them year after year, making minor adjustments, building on their previous mistakes. Reinke et. al. (2008) argues, "Effective classroom management can help to decrease disruptive classroom behaviors and increase student engagement in academic tasks. Further, poor classroom management has been linked to long-term negative academic, behavioral, and social outcomes from students" (p.315). It is clear that effective classroom management techniques are essential to a smooth running classroom and without structure the lack of learning can and will be detrimental to students.

As a pre-service teacher, I often wonder about how I want to create my classroom management system when I get a job. I have had the privilege of being in many different classrooms as a substitute teacher and have seen many different classroom management systems in place. This has led me to start thinking, "Which management style would be most effective to use in my classroom?"

Classroom management is the process of how a teacher sets up his or her classroom to run smoothly. Teachers with great classroom management skills have little interruptions and are effective educators. More learning will take place in a classroom with good management because of fewer distractions. This will lead to maximizing teaching and student engagement time. It is important for teachers to set up an effective classroom management system early so that students understand their expectations.

### *1.a Literature review*

In reviewing literature for this study, two themes related to classroom management emerged: classroom management failures, and classroom management in regards to new teachers. Classroom management failures can also be described in other words as teachers who do not sustain a suitable classroom management system. According to the National Education Association (NEA), “over 40% of new teachers leave the profession within the first five years” (2010, p.1). This number is alarmingly high. According to the Massachusetts Teachers Association, “new teachers feel overwhelmed by the expectations and scope of the job” (massteacher.org, 2009, p.1). New teachers leaving the profession are overwhelmed by what they have to do because of all of the duties placed on them in a short amount of time. They are expected to meet community needs, school needs, administrator needs, parent needs, and especially the student’s needs. A good classroom management system is a student need that will eventually benefit the teacher. With good classroom management skills, teachers will feel less overwhelmed by students and the flow of the class. It is not only the new teachers either, “A nationwide survey of teachers across all grade levels indicated that teachers feel a strong need for additional training and support in classroom management” (Reinke, Lewis, Palmer, Merrell, 2008, p.315). This study was an online survey done in 2005-2006, using 2334 participants from 49 different states in which the study sought to find where teacher’s needs are (Coalition for Psychology in Schools and Education, 2006).

Another theme that emerged in the literature was classroom management and its effects on new teachers. New teachers are at the greatest disadvantage when it comes to classroom management. According to Oliver and Reschly (2007),

New teachers typically express concerns about lacking effective means to handle the significant disruptive behavior of students. Teachers who have problems with behavior management and classroom discipline are frequently ineffective in the classroom, and they often report high levels of stress and symptoms of burnout. Disruptive classroom behavior is a significant reason why teachers leave the profession. (pg. 1)

This makes classroom management a major concern. It takes four years to get an undergraduate degree and only a few states require a Masters degree in education. This means that we are spending this preparation time on teachers that have a 40% chance of quitting the profession within the first 5 years.

As the research shows, although pre-service and new teachers are the most susceptible to failing at classroom management techniques, they are not the only ones. Fudge, Skinner, Williams, Clark, Bliss, & Cowden (2008) explains, “Even experienced educators often have difficulty managing student behavior during transitions” (p.576). It has also been found that,

Both recent graduate teachers and more experienced teachers find that managing classroom behavior problems is a major cause of stress, as problem behaviors divert the teacher’s attention from instructing the class and cause excess time to be spent engaged in disciplinary action. (Clunies-Ross and Penny, 2008, pg 695)

Since stress and expectations were mentioned in previous studies as a reason for teacher drop outs, new teachers need to develop their effective classroom management techniques quickly in order to deal with other expectations placed on new teachers. Too much time is spent in a new teacher’s classroom on problem behaviors instead of teaching students pertinent information.

Pre-service and new teachers should not fear classroom management dilemmas, because it is a problem that is faced by the majority of teachers that enter the profession. New teachers should

all be concerned with their preparation when starting out with their classroom management systems. “Disruptive student behaviors have implications beyond the learning environment; they can inhibit how and what teachers feel they can teach. Student behavior can also frame the degree of latitude in what teachers are willing to teach” (Freiberg Huzinec, Templeton, 2009, pg. 64). When this problem is solved, new teachers will become less stressed and focus on the main goal, educating students. Stoughton inspires, “The challenge of teaching is to decide who you want to be as a teacher, what you care about and what you value, and how you will conduct yourself in classrooms with students” (2007, pg. 1035).

Studies, like Oliver and Reschley, Clunies-Ross and Penny, and The Coalition for Psychology in Schools and Education, show that there is a problem in the field of classroom management. Unfortunately none of the studies describe what should be done in order to fix this problem. None of these studies alludes to the effectiveness of current classroom management systems that are used by experienced teachers. What classroom management techniques can be used to make it less stressful for beginning teachers? My goal is to find effective ways that teachers could manage their classroom so that more of them can remain in the profession.

## **II. Methods**

### ***II.a. Sample***

Six teachers, one male and five females participated in this study. The age range was from 24 to 56, with an average age of 41. The number of years teaching experience ranged from 2 to 25. The average number of years teaching experience was 15.5 years. Three participants were Caucasian and the others race is unknown. All of the participants were from two rural districts in Central New York. All of my data collection was done over a four week time period. The use of volunteers as participants in this study greatly limits the generalizability of the results.

#### ***II.a.i. Case study***

Ms. Anita Baker (not real name), is in her second year of teaching and is 24 years of age. Ms. Baker is Caucasian. She graduated from a university in Central New York and is pursuing her master’s degree at a university in Northern New York part time while teaching. She teaches 5th grade, in a school system that switches for two subjects with another 5th grade class. Ms. Baker teaches Science and Math to two different 5th grade classes. I must note that she looped with her class, so Ms. Baker taught her homeroom class in 4th grade and looped with them in 5th grade. This might have given her an advantage in instilling her classroom management plan.

### ***II.b. Instruments***

#### ***II.b.i. Questionnaire***

The questionnaire was in short answer format. There were seven questions in all. The questions pertained to current classroom management system and some basic tips and techniques used. I gathered information regarding the management styles teachers have put in place.

### *II.b.ii. Interview*

The interview was another form of data collection. In the interview I wanted to find out how the teacher created their system, what difficulties they encountered while doing so. It was also important to find out what strengths and weaknesses were from their system. Since I am also re-searching the topic of effective techniques I wanted to know from the teacher's point of view if it was effective or not, and what they would change if it was not effective or completely ineffective.

In the observation part of data collection is where the classroom management system comes to life. I was looking for how the students and teachers interacted in the set system and tried to establish my own form of effectiveness essentially based on a snapshot of their setup. I was looking at how many times the students disrupted the teacher, misbehaved or broke a rule, and how the teacher responded to it based on their said system. I also looked at methods of getting the students' attention, because I feel that this is important in calculating what control or authority a teacher has over the students. These factors helped me establish how well the teacher had followed their classroom management system. I am able to see what techniques they use in action, and overall establish if their classroom management system is effective or not.

### *II.c. Procedure*

After gaining approval from the SUNY Oswego Human Subjects Committee, I asked 10 administrators for permission to hand out questionnaire packets in their school to all teachers who were in grades one through six. Of these ten administrators, three of them granted me permission to distribute packets containing the questionnaire, 76 in total.

In the packets was a Letter of Introduction explaining all about what the participant needed to do, a little bit about me and my research topic, and about how I was conducting my research. In this packet were also two copies of the Informed Consent sheets. One was for their own personal records, the other was for the participant to sign and return to me, which was stated in the Letter of Introduction. The next piece of paper in the packet was a slip that asked if they were in their first five years of teaching if they would be willing to participate in an interview and observation for further research. The last article in the packet was an addressed envelope. I gave the teachers a choice of two methods to return it to me, they could mail it directly to me, or they could leave it in a folder that I had left in the school office that I would check after the due date. Both forms of returning their questionnaire would be completely anonymous.

From these questionnaire packets, I received six of them back. Unfortunately only one of them was within their first five years of teaching and could partake in the interview and observation parts of the data collection. I contacted this participant and did an informal interview and, after gaining administrator consent, conducted a four hour observation of her classroom management system.

## **III. Findings**

When asked what rules each teacher had established with their students, each teacher had a different set of rules. One teacher used rules that were based on respect, while another teacher worded the rules around how the students would act positively in the classroom. One common thread throughout the rules shared was the idea that students should respect themselves and each

other. Five out of the six teachers also thought that it was important for the students to have a say in creating the classroom rules at the beginning of the school year. The one teacher who did not share this theory had only two rules he went by in his classroom because he believed in simplicity.

When asked if there were consequences for breaking the rules, all participants answered that there were consequences. A consequence for breaking a rule is something that is necessary in the school institution, one thing that varied in this aspect was the severity of the consequences. Some teachers went from two verbal warnings straight to a written referral. Two teachers used the traffic light system where there were consequences for each card change (ex. each student starts out on green, first warning move card to yellow and lose five minutes of playtime, second card change to a darker yellow and lose ten minutes of playtime, third card change was to red and they lose all of playtime).

Teachers were then asked to share some of the techniques they used for classroom management. The teachers shared little bits of information of actual techniques that they use in their classroom to get students attention, to organize a classroom, nonverbal ways to remind a student to follow the rules, and just ways good teachers operate. The verbal techniques that were used were “Give me 5,” or phrases like “Boys and Girls,” and “Okay.” Nonverbal reminders included: eye contact, proximity, touch on shoulder, clapping rhythms and bell ringer problems. Some other classroom techniques that the teachers suggested were talking-not yelling, clear and concise directions, use humor, develop trust, daily binders, organize students by numbers and have classroom jobs. “What is one thing that you could tell a pre-service or new teacher to help them perfect their classroom management or behavior management system?” I compiled the information and found that a new teacher should:

- Be tough and firm early on
- Earn respect first
- Remember that students may have a tough home life
- Keep all documents
- Take time to teach the routines/don’t assume the students know them
- Most importantly, be consistent from day one

### ***III.a. Case study***

I visited Ms. Baker in her 5th grade classroom. She told me that she gathered information to create her classroom management system from her student teaching, mentor teacher, substitute teaching, her own experiences, trial and error, and a little bit from her college courses. Ms. Baker discussed her strength in her classroom management system being that she went into depth with the classroom routines in the beginning of the year. She used teacher examples, students performed good examples of behavior, and then as a class a good example of proper behavior. Ms. Baker also admitted her weakness as being inconsistent and firm in following through with the consequences. Lastly, she stated that the most challenging part of creating her classroom management system was

coming up with what she wanted to use. Other challenges for her were what she expected from her students, carrying her plan out, being consistent and how exactly she wanted her classroom to run.

After chatting with Ms. Baker and learning more about her classroom management system, I observed her for 4 hours and 40 minutes. Throughout this time only four students called out. All four of the students were told to wait their turn by the teacher. Four rules were broken by the students during this time and Ms. Baker followed all of them up with a verbal warning. This concurred with her classroom management system of consequences. No students did any major misbehavior which is a positive sign of the success of her system. Ms. Baker respected the students and the students in turn respected her. Six times Ms. Baker used verbal methods and two times she used nonverbal ways of gathering students' attention. The two nonverbal ways Ms. Baker used were raising her hand which other students followed the teacher's example, another name for this is called "Give Me Five." The other nonverbal form of getting the students' attention was through the bell ringer. The students quietly talked while working on their problem, but as soon as the bell went off they knew it was time to be quiet. The majority of verbal attention statements started with, "All right, class," or "Okay." The verbal attention getters were more effective because they took less time for the class to quiet down.

#### **IV. Discussion/Conclusion**

##### ***IV.a. Research purpose***

Classroom management is the ability to run a classroom smoothly with little distractions. Teachers need to design a classroom management system skillfully, in order to foster a well managed classroom that is optimized for learning. In my opinion, being an effective teacher using proper classroom management techniques, a positive learning environment will emerge. With this being said, how does a new teacher know which classroom management system to use? Is there only one system that works better than another?

The purpose of this study was to find effective classroom management techniques to help novice as well as experienced teachers who are not satisfied with their current classroom management styles. Student behavior problems have been an issue for years, and it would be helpful for all teachers to have a working system.

##### ***IV.b. Highlights of results***

I found that no two teachers are exactly alike in their classroom management styles. Each teacher finds different things important to their own idea of how a student should act in their classroom. One common thread I did find was that students should respect themselves and each other. Four out of five teachers also thought that it was important for the students to have a say in creating the classroom rules at the beginning of the school year. All participants believe that consequences for student's actions are needed in the classroom and school. Although the teachers varied in their severity of the consequences taken, some students would get many warnings with gradual consequences; some were very limited and used more severe consequences.

Consistency is key in the classroom. The participants stated that a teacher must be consistent in the classroom and demand the student's respect. One teacher talked about developing her class-

room management system by using her student teaching, her own experiences, trial and error, and a little bit from her college courses as sources. Although she stated that the most important influence on her current classroom management system came from her mentor teacher and other teachers in her building.

#### ***IV.c. Limitations***

##### *IV.c.i. Lack of access*

It was difficult to convince administrators to let me into their schools when I have no teaching connection or experience with them. Once I was able to administer some of the questionnaires, not too many teachers were willing to take time out of their day to fill out a paper for someone they do not know. Since I am not a teacher yet, it is difficult to convince strangers to help with my research, nor do I have the connections I might have if I were in a school district.

##### *IV.c.ii. Time*

As a part of a research class, I was only allotted four weeks for research in the schools. This is an extremely short amount of time for the extensive amount of data I was looking to collect. I also had health complications, which hindered me from entering schools to administer and gather questionnaires. With a short time limit, and health complications, it was extremely stressful to distribute and collect the amount of information to make this research valid.

##### *IV.c.iii. Small sample*

The amount of participation gained resulted in a small sample size. This limits generalizability. However, even with the limitations, there was important finding that were yielded throughout the study.

##### *IV.d. Consistency with literature*

Classroom management is not only an important issue for new teachers, but for experienced teachers as well. Classroom management is a big concern in today's classrooms, "A nationwide survey of teachers across all grade levels indicated that teachers feel a strong need for additional training and support in classroom management" (Reinke, et. al, 2008, p. 315). Oliver and Reschly (2007), talk about teachers setting up their classroom differently. This finding concurs with my own research in which I found that teachers are all different in terms of their classroom environment. We both agree that classroom management is something that is constantly changing and must be altered for the different students each year brings. Further, Oliver and Reschly (2007) state that many new teachers gain stress and burn out from an ineffective classroom management system. One new teacher in my study shared that many of her techniques were from trial and error which was key to finding out what works in her classroom. It is clear from this finding that new teachers need mentors in order to share what does and does not work to limit the amount of unneeded stress placed on them.

### ***IV.e. Interpretation***

#### *IV.e.i. Differentiated management styles*

All classroom management systems are different. There are some elements that may stay the same throughout each system, but no two systems are exactly alike. There is not a set plan that will be most effective for all teachers. A new teacher must be consistent. Rules should reflect how teachers want the students to act, and how they want to act in the classroom. By working with students to develop the rules, teachers will gain respect. The type of consequences may vary depending on how lenient the teaching style is or how strict it is. One thing is always the same: every classroom management system needs consequences for broken rules, although each teacher varies in severity. Teachers must be consistent from one day and also be strict; as teachers cannot be the students' friend.

There is no one blueprint for the perfect and flawless classroom management system. I learned through my research that a new teacher's personal system must come with experience and trial and error. A classroom management system is always changing as well. Each year different students come into classrooms with different needs, and the times are always changing as well. There is always new research coming out with different techniques. A teacher must take in mind the students, society, the school, and the teachers own personal teaching style when creating a classroom management system for the school year.

#### *IV.e.ii. Mentoring programs*

New teachers need to take these tips and hints from more experienced teachers and develop a classroom management system that fits their own personality and teaching style. Further, the more knowledge that is handed down in ways of trial and error by more experienced teachers, the quicker the new teachers can develop their own systems. Schools should learn from this and provide more mentor teachers for the new teachers. This will give them more options to pick and choose from to create a more personal and essentially effective management program. This comes from the idea that the more tools you have for classroom management, the better off you will be. Schools might also find it effective if they held a professional development forum where teachers shared their classroom management systems with each other. In this way, teachers who are struggling in one area can gather information from other teachers who excel in that area. Classroom management systems should not be hidden, but embraced and shared to keep more teachers in the profession and foster learning environments where all students learn.

#### *IV.f. Implications from research*

The purpose of this study was to find effective classroom management techniques to help new teachers. The study will obviously help new teachers develop their own system within the first couple of years they are teaching, but may have further implications. This study can also be used by experienced teachers who are not satisfied with their current management styles.

The more knowledge that is handed down in the ways of trial and error by experienced teachers, the quicker the new teachers can develop their own systems. This might be a problem that should be addressed in teacher preparation on the undergraduate level. Universities should offer a mandatory classroom management course teaching the many different tips and techniques that

are used in the classrooms today and how to effectively implement them. Schools should be supporting new teachers in developing their classroom management systems by giving them more than one mentor to observe teaching to pick up tips or techniques and use which ones they find effective. Schools should have multiple staff development days on classroom management with lots of proven tips and techniques. This will give teachers of all experience levels the chance to try new things in their classroom. Especially since teachers should be customizing their systems to best fit their current class. Teachers will then be able to pick and choose and share some of their own tricks. This collaboration of information will benefit the teachers, but more importantly it will benefit the students learning environment. This in turn will make a better community of learners and a safer school district, because limiting behavior issues is important for the safety of all people in a community.

#### ***IV.g. Recommendations***

##### *IV.g.i. Replicate this study with additional time*

It takes a great deal of time to do just the questionnaire portion with getting into schools handing out the copies. Further research can include a simplified questionnaire with multiple choice items, or check list instead of some of the short answers.

##### *IV.g.ii. Increase sample group*

One way of doing this might be to obtain a list of school e-mail addresses for the teachers in grades 1-6 of the school from the administrator. This way instead of wasting paper, you could e-mail the teachers the questionnaire. It might also be a more personable form of contacting them. This might also give more access to the new teachers who are more from the e-mail generation.

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# **IMPROVING STUDENTS' CONTENT VOCABULARY KNOWLEDGE: A COMPARISON OF DEFINITIONAL AND CONCEPTUAL INSTRUCTIONAL APPROACHES**

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Content vocabulary knowledge is an integral part of any high school academic course. Too many students simply parrot back textbook terms and definitions without having a true comprehension of the terms they are using. The purpose of this research study was to determine which vocabulary instructional approach, definitional or conceptual, was more effective in building students' content vocabulary knowledge and retention. The participants in this study were 61 high school freshmen taking Global History and Geography 9 with the same teacher. Participants were divided into two groups, one receiving definitional vocabulary instruction and one receiving conceptual vocabulary instruction. After two weeks of instruction, both recall and application/analysis assessments were given, as well as a retention assessment given two weeks after the first round of assessments. Cross comparisons of data gathered from the various assessment results indicate that (a) both definitional and conceptual vocabulary instruction are equally effective in building basic recall of content vocabulary terms (b) conceptual vocabulary instruction better builds students' application and analysis of content vocabulary terms and (c) conceptual vocabulary instruction increases retention rates of content vocabulary terms.

## **I. Introduction**

### ***I.a. Area of Study***

Vocabulary instruction is an integral part of any content area subject. It is vitally important since vocabulary is the foundation of all content courses. Without understanding the basic content vocabulary of a given course, the overall understanding of the material itself is lost. There are two basic approaches to teaching vocabulary: definitional and conceptual. With the definitional approach, memorizing the term and given definition in isolation are emphasized. Students learn one way to express the meaning of the word, and the focus of instruction is on repetition of that given definition with that term. Usually, the vocabulary terms are learned first in isolation and then are integrated into the content of the course. With the conceptual approach, students learn vocabulary terms within the context of its given meaning, and focus on connecting that new word with pre-existing knowledge. Students build up a concept of the word and find multiple ways to express its meaning, rather than just having one acceptable definition. The words are taught as they appear within the context of the course, rather than trying to integrate them after first teaching them in isolation.

While most teachers believe that a conceptual teaching approach toward vocabulary is most effective, very few middle and high school teachers use such methods. They lack knowledge of effective conceptual vocabulary instructional strategies, and so they revert back to using the strategy of memorizing definitions. When this happens, many students never fully learn the meanings of these important content vocabulary terms.

### ***I.b. Experiential Knowledge***

In many high school classrooms today, students view vocabulary as simply memorizing a list of terms and definitions. They believe that if they can match a given term with a given definition, then they have mastered that given term. However, I have found in my 9th grade Global History course that even though students may memorize a textbook definition, it does not mean that they comprehend the meaning of the given term. If on a test I use different words for a given term's definition than the exact words the students have memorized, then they have difficulty matching the term with this newly worded definition. This has proven to me that my students are not truly comprehending the meanings of these new vocabulary terms, but simply learning how to match certain words together by sight and rote memorization. For this reason, I wanted to find a new way to approach teaching vocabulary, so that my students could truly comprehend and retain the meanings of the words we learn throughout the year.

### ***I.c Research Intent and Purpose***

This research focuses on evaluating two different approaches to teaching content vocabulary in a high school setting. These two approaches are the definitional approach and the conceptual approach. My goal was to determine which overall approach would better improve students' content vocabulary knowledge and retention.

## **II. Literature Review**

In reviewing literature for this study, three major themes emerged regarding vocabulary instruction: repeated exposure, contextual instruction, and conceptual instruction.

### ***II.a Repeated Exposure***

In order to improve content vocabulary knowledge, students need to be given repeated exposure to these new terms. In a survey study of 73 Social Studies teachers from grades four through eight conducted by Hedrick, Harmon, and Linerode (2004), 47.9% of teachers stated that, "a new word is acquired through many encounters with its definition" (p. 111). Forty-six percent of the teachers polled in this survey said that they gave three to five exposures to a word in order to practice its meaning, while 40% gave six to nine exposures (Hedrick et al., 2004).

However, further research has shown that a clear distinction must be made that "many encounters with a new word must reflect a meaningful use of the word, not just repetition of definitions (Harmon, Hedrick, & Fox, 2000, p. 254)." While repetition of definitions will allow students to match terms by sight, it does not build comprehensive knowledge of that term for the students. An additional study completed by Nash and Snowling (2005) suggests that while repeated exposure to definitions in isolation may allow students to gain an understanding of a word in the present, that when students are asked again about that same word in the future, they have forgotten its meaning.

### ***II.b. Contextual Instruction***

Research has also shown that students need to learn the meanings of words within their appropriate contextual use rather than in isolated definitions which cannot be connected to anything. Nash and Snowling (2005) completed a specific study in order to determine if the definition or

context method of instruction was more beneficial in teaching vocabulary for seven and eight year olds. The results from this study showed that immediately after teaching, both groups improved their vocabulary equally but that three months after instruction, the context group had significantly better expressive vocabulary knowledge than the definition group (Nash, et al., 2005).

Unfortunately, research has shown a gap in teacher practices and expectations in the fact that teachers do not have students use the targeted terms in context during instructional time but expect them to correctly use the words in context during assessments (Hedrick et al., 2004). In Hedrick's survey study (2004), 48% of teachers reported seldom requiring students to write their own sentences using the target vocabulary term during instruction and 31.5% of teachers reported seldom having their students use the targeted term in any other kinds of writing such as reports and essays in order to practice the meaning of the word. However, 42.5% of teachers reported requiring their students to complete written explanations of a target term on their vocabulary tests.

### ***II.c. Conceptual Instruction***

Students appear to learn vocabulary more effectively when they can connect new words with their previous knowledge and with other words and concepts, rather than simply repeating a single definition in isolation. In a vocabulary instructional survey given to 72 teachers ranging from pre-kindergarten to college, the number one response was focusing on relationships between words (Berne & Blachowicz, 2008).

In a case study of enhancing vocabulary skills through a literature based classroom, Harmon (1998) found that, "students [cannot] increase their vocabulary effectively from contrived lists of unrelated words. Rather...words are more readily learned when students make connections to related ideas and other words" (p.5). For example, when teaching the word 'gnarled,' instead of using a textbook definition, the teacher in this study said to the students; "Have you ever seen an elderly person who has arthritis and their hands are all twisted? That's gnarled. Or have you ever seen a tree trunk that the trunk itself is twisted? That's gnarled" (Harmon, 1998, p. 5).

Harmon found that this conceptual approach was effective for students in that:

overall they demonstrated engagement in activating prior knowledge when they used words recently discussed in class. They made connections by defining terms in their own words, using examples to define words, relating words to other languages, and engaging in word play (1998, p. 6).

Further research has corroborated this belief that conceptual vocabulary instruction will build students' content vocabulary knowledge. Hedrick's survey study (2004) found that 70% of teachers believe that vocabulary instruction needs to include conceptual understanding. More specifically, 78.1% agreed that a new word is acquired through learning about a topic and information about that topic, and 76.7% agreed that having knowledge about a subject helps children learn new and related words. Finally, 72.6% agreed that learning a new word means developing a concept of ideas related to that word (Hedrick, et al., 2004).

Where the gap in this research lies is with high school vocabulary instruction. All of the studies mentioned have been vocabulary studies completed with elementary or intermediate level students. Additionally, they have been with basic vocabulary terms and not with content specific vocabulary terms. My study focused on high school level students and with specific content vocabulary terms that are essential to the understanding of a specific academic high school course. The purpose of this research study was therefore to determine which vocabulary instructional ap-

proach, definitional or conceptual, was more effective in building students' content vocabulary knowledge at the high school level.

### **III. Methodology**

#### ***III.a. Sample Population***

The student sample consisted of four freshmen classes of Global History and Geography 9, the first year of a two year consecutive history course. A total of 61 students participated in the study. These students included both general education and special education students. All participating students had the same teacher and therefore they were divided by class so that two classes became the definitional group and two classes became the conceptual group. The definitional group was composed of 28 students, 15 of them being general education students and 13 of them being special education students. The conceptual group was composed of 33 students, 26 of them being general education students and seven being special education students. The participants all came from a predominantly Caucasian, working class, suburban school district in Onondaga County. This sample was of convenience and so generalizability of the findings is limited.

#### ***III.b. Instruments***

During this study, several assessment instruments were used to collect data on the participants' content vocabulary knowledge. The first instrument used in this study was a vocabulary recall assessment, given immediately after two weeks of instruction on the targeted vocabulary terms, in which participants were asked to match the ten targeted vocabulary terms with their appropriate definitions. The words were listed on one side of the paper, while on the other side of the paper definitions were listed in random order. Participants had to write the letter of the correct definition in the blank next to its respective vocabulary term.

The second instrument used was an application/analysis vocabulary assessment. On this assessment, participants were given the ten targeted vocabulary terms along with their respective textbook definitions. The terms were written on one line, with their definitions directly underneath them. Participants were asked to generate their own uniquely worded definition for each term, in which they were not allowed to use any of the words from the textbook definition (proper names excluded). For example, if the textbook definition of the word *pharaoh* was "the title given to an Egyptian king," the participants would have to generate their own written definition of pharaoh without using the words "title given to king." Participants were given two lines underneath the textbook definition in which to write their responses.

A third instrument used was a retention assessment. Two weeks after the first round of assessments were given, during which participants received no direct instruction on the targeted vocabulary terms; participants were given a sheet of paper with only the ten targeted vocabulary terms listed on it. They were asked to generate their own definitions for each of the words based solely on their recollection of each term. Each definition was then evaluated to determine whether or not the student remembered the meaning of the word. A simple correct/incorrect was marked next to the participant generated definition, depending on whether or not the participant conveyed the appropriate meaning of the word.

### ***III.c. Procedure***

This research study was started by first preparing a detailed proposal and submitting it to the SUNY Oswego Human Research Subject Committee. After obtaining permission from the Human Research Subject Committee, a proposal was then outlined and approved by the building principal of the high school where this study was conducted. Parents and guardians of eligible participants were then sent a consent form outlining the research study and asked to sign and return if they gave consent for their child to participate. The students were also given a consent form outlining the terms and conditions of the study and were asked to sign if they agreed to participate. Sixty-one students had the necessary paperwork completed to become a part of the study.

When this research study began, the students in the four participating classes were divided up into two instructional groups. Two of the classes received definitional vocabulary instruction and the other two received conceptual vocabulary instruction. Both groups received two weeks of instruction on the same set of targeted vocabulary terms which included: cuneiform, ziggurat, mummification, pyramid, pharaoh, hieroglyphics, monsoon, polytheistic, dynasty, and oracle bones.

For the definitional group, instruction on the first day of the unit began by introducing them to the ten targeted vocabulary terms. Students copied down the ten terms and their respective definitions onto their own paper. The teacher and students then discussed the meanings of the words and the teacher clarified any words in the definitions that the students did not know. On the lines underneath where the students wrote the textbook definition, the class also wrote down a simplified version of that definition. All participants wrote down the same definitions. Next, participants made flashcards of the terms, writing the word on one side of the card, with the textbook definition on the other. Students were given time to study the words, and then practiced memorizing the definitions with a partner. For homework that night, participants were required to write five sentences of their own making, using five of the vocabulary terms learned in class that day.

On the second day of instruction, class was started by having participants come up to the board and write down the sentences they had created the night before. Sentences were written in columns underneath each vocabulary term so that multiple sentences written by different participants could be discussed. Sentences were then compared and analyzed to see if the correct meaning was given.

The second half of class then went on to start the teaching of the content of the chapter. As the content was taught and the vocabulary terms came up again, only the textbook definition was used to express the meaning of the word. The rest of the two weeks continued in much the same fashion, with the teaching of the content and the repetition of the textbook worded definition for each term. The last five minutes of every class period was always set aside for vocabulary review. Students completed flashcard activities, vocabulary review games, and repetition exercises. The emphasis was always on repeating the textbook definitions.

For the conceptual group, instruction was given in a completely different way. Rather than beginning with an isolated list of vocabulary terms, instruction began by simply starting the content and addressing each vocabulary term as it came up in context with the content. When learning the meaning of each term, participants in this group were not given a textbook definition to memorize. Instead they completed an activity called a semantic map. With the semantic map, students wrote the targeted vocabulary term in the middle of a piece of paper and drew a circle around it. As they came across that word in various reading selections, they wrote down clues from the reading on

their semantic map. These clues were written as branches that branch out from the circled word. When putting all these clues together, participants could then infer the meaning of the word.

Instruction was carried on in similar ways, never separating content instruction from vocabulary instruction, and never isolating vocabulary instruction as an entity in itself. Other conceptual activities that participants took part in were grouping and classifying activities such as word sorts. Participants were asked to categorize terms into groups with shared commonalities. There was no one correct way to categorize them and the participants shared their categories and reasoning for putting each word in each category with the whole group.

Lastly, these participants also took part in compare/contrast activities in which they were given two vocabulary terms and had to decide how those terms were both similar and different. Throughout the two weeks of direct instruction, participants were exposed to these targeted vocabulary terms in many differing ways through reading, writing, dialogue, and discussion.

After the two weeks of direct instruction was finished, both groups completed two rounds of vocabulary assessments. The first assessment was testing basic recall skills and required participants to match the targeted vocabulary term with its textbook definition. The second assessment was an application and analysis assessment in which participants had to devise their own uniquely worded definitions without using any of the words from the textbook definition (proper names excluded).

For the next two weeks, direct instruction was given on the next chapter of content and the ten targeted vocabulary terms were not specifically brought up by the teacher during instruction. At the end of those two weeks, participants were asked to complete a retention assessment for the ten targeted vocabulary terms from the previous chapter (They had received no direct instruction on the terms for two weeks). Participants were given a blank sheet of paper with only the ten targeted vocabulary terms on them. They were then asked to generate their own definitions for the words completely from memory. No help or prompts were given to them. Once participants finished this assessment test, the data collection for this study was finished.

#### **IV. Data Analysis**

This was an experimental design in which participants were divided into two instructional groups. One group received definitional vocabulary instruction and the other received conceptual vocabulary instruction. All participants received two weeks of instruction on the same list of ten targeted vocabulary terms and at the end of the instructional period, the two groups of participants completed three rounds of assessments in order to compare the effectiveness of each type of vocabulary instruction in terms of complex comprehension and retention rates. In this study, data was collected through three major instruments: (a) the recall assessment, (b) the application/analysis assessment, and (c) the retention assessment. Data was analyzed in quantitative form and bar graphs were created to give a visual representation of the data

##### ***IV.a. Recall Assessment***

In this assessment, participants were required to match the given vocabulary terms with their correct definitions. There were ten targeted vocabulary terms and so each term was given a value of ten points. A numerical score from between zero and 100 was given to each participant's assess-

ment based on the number of terms they were able to correctly match with the appropriate definition. The scores of the definitional and conceptual instructional groups were then compared and a bar graph was created to give a visual representation of this comparison.

#### ***IV.b. Application/Analysis Assessment***

A five point rating scale was used to evaluate participant responses. A score of zero meant that the participant did not even attempt to write their own definition for the word. A score of one meant the participant attempted to write a definition for the word, but the meaning of the word was not correctly conveyed. A score of two meant that a partial meaning of the word was conveyed in the written definition. A score of three meant that the participant successfully put the definition into their own words and conveyed the meaning of the word, but that they substituted word for word in their new definition on a very literal level. A score of four meant that the participant took it one step further, demonstrating higher levels of comprehension by not having to substitute word for word. A maximum score of five meant that the participant was able to come up with a uniquely worded definition that was not substituted word for word from the original definition, and demonstrated higher level application and analysis by still conveying the nuances of the word in their newly created and uniquely worded definition.

Each of the participant's ten uniquely worded definitions was given its own individual score of between zero and five. Then those ten individual scores were averaged together to calculate one overall score for each participant. Those scores were then compared between the definitional and conceptual instruction groups.

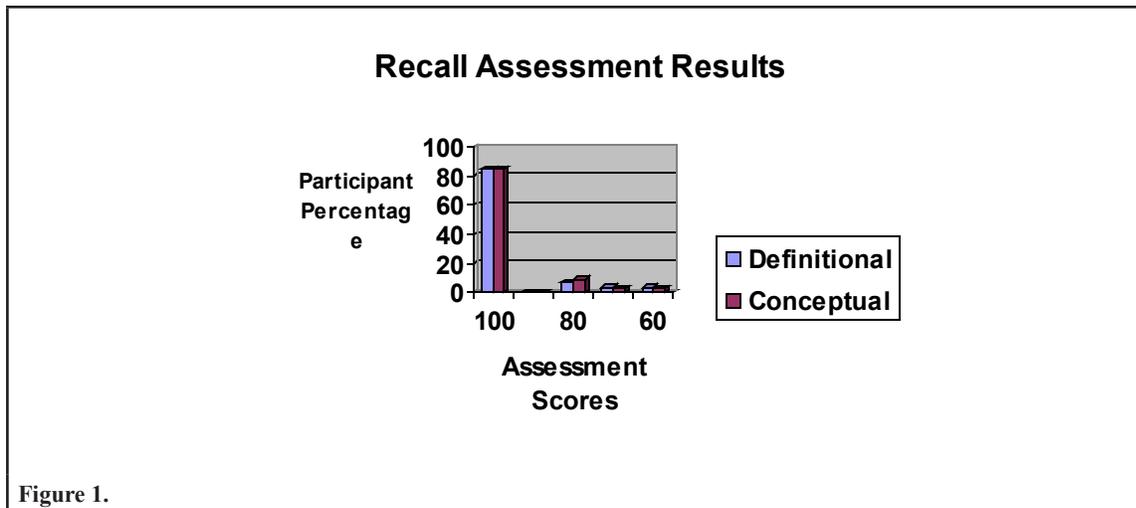
#### ***IV.c. Retention Assessment***

In the retention assessment, participants generated their own definition from memory for each targeted vocabulary term. Each definition was marked either correct or incorrect by the researcher and then the number of correct responses was tallied. The total number of correct responses became the participant's score for the retention assessment. If the participant generated six correct definitions from memory, then that participant received a score of six on the assessment. The assessment scores between the definitional and conceptual instruction groups were then compared and a bar graph was created to give a visual representation of that comparison.

### **5. Results**

#### ***V.a. Recall Results***

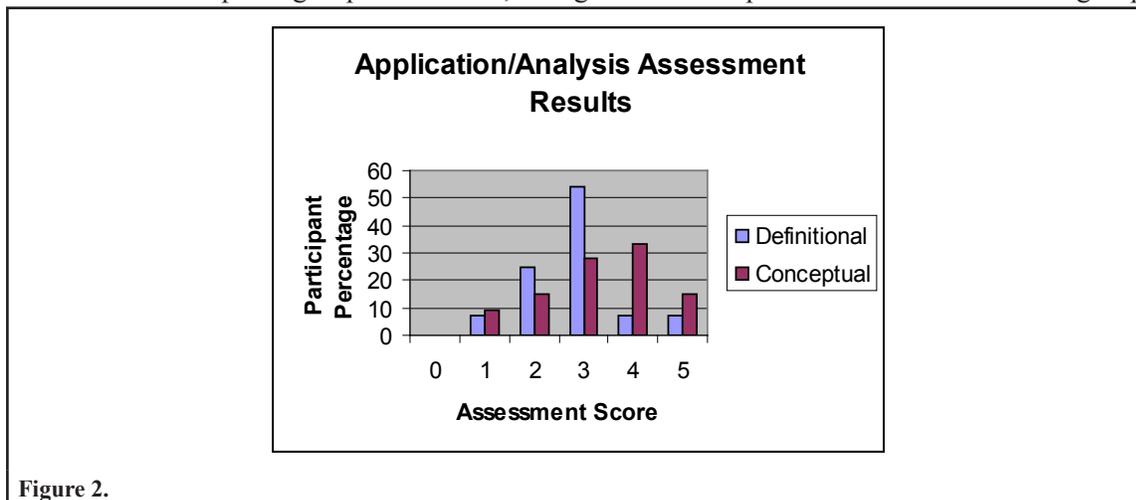
In terms of the recall assessment scores, there was little variation between the definitional and conceptual groups. Both groups earned high scores on the recall assessment and the majority of both groups received perfect scores. Eighty-five percent of both groups scored a 100 on the assessment. Seven percent of the definitional group scored an 80, four percent scored a 70 and four percent scored a 60. For the conceptual group, nine percent scored an 80, three percent scored a 70 and three percent scored a 60. No participants in the study scored less than a 60 on the recall assessment.



### *V.b. Application/Analysis Assessment Results*

The application/analysis assessment results were much more varied than the recall assessment results. Overall, the conceptual group obtained higher scores on the assessment than the definitional group. For the definitional group, the highest percentage of students scored a 3, whereas the highest percentage of the conceptual group scored a 4. Mastery level for this assessment would be a score of 4 or 5 since those scores indicate that the participant was able to generate their own definition without substituting word for word. Forty-eight percent of the conceptual group was able to reach mastery level, whereas only 14% of the definitional group was able to reach mastery. The following paragraph breaks down the specific scores for each of the groups.

Fifteen percent of the conceptual group scored a 5 (the highest score) on the assessment, whereas only seven percent of the definitional group scored a 5. Thirty-three percent of the conceptual group scored a 4, and only seven percent of the definitional group scored a 4. Fifty-four percent of the definitional group scored a 3, along with 28% of the conceptual group. Twenty-five percent of the definitional group scored a 2, and 15% of the conceptual group scored a 2. Nine percent of the conceptual group scored a 1, along with seven percent of the definitional group.



### *V.c. Retention Assessment Results*

The retention assessment scores were also varying between the two instructional groups. Overall, the conceptual group was able to remember more terms than the definitional group. Fifty-eight percent of the conceptual participants were able to remember eight or more of the terms, whereas only 43% of definitional participants were able to remember eight or more of the terms.

In terms of the conceptual group, 22% of participants were able to remember all ten terms. Six percent remembered nine terms, and 30% remembered eight terms. Twenty-four percent remembered seven terms, and nine percent remembered six terms. Three percent remembered five terms, and six percent remembered two terms.

For the definitional group, the results were much more spread out than in the conceptual group. Fourteen percent of participants remembered all ten terms as shown in Figure 3.

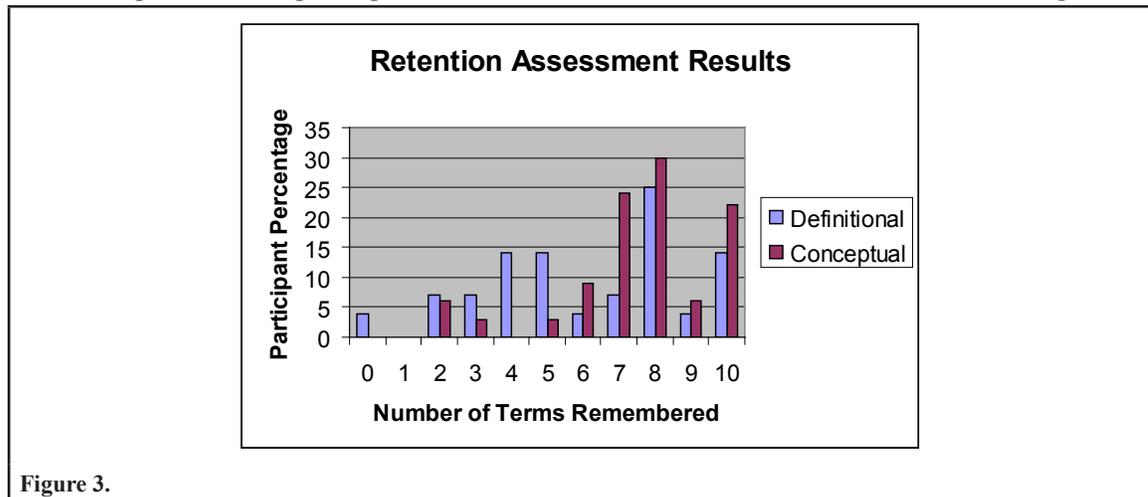


Figure 3.

## **VI. Discussion and Interpretation**

### *VI.a. Summary*

The purpose of this study was to investigate which type of vocabulary instruction, definitional or conceptual, would better enhance students' complex understanding and retention of vocabulary terms. Based upon my research data, I was able to make several conclusions. The three forms of assessment used during this study demonstrate that: (a) both definitional and conceptual vocabulary instruction are equally effective in building basic recall of content vocabulary terms, (b) conceptual vocabulary instruction is more effective in building students' application and analysis of content vocabulary terms, and (c) conceptual vocabulary instruction increases retention rates of content vocabulary in the long term.

### *VI.b. Discussion*

My research data shows that while both the definitional and conceptual approaches to teaching vocabulary are equally effective in terms of basic recall skills, the conceptual approach is more effective in terms of complex understanding and retention rates. It is arguable that the defi-

ditional approach lends itself to allowing the students to simply match up words and definitions by sight without having a true grasp of the meanings of the given terms. This would explain why the definitional group was able to score so high on the basic recall test, but not as high on the application/analysis assessment. Eighty-five percent of the definitional participants scored a 100% on the recall assessment. This could be because during the two weeks of instruction given prior to the assessment, definitional participants focused on drilling and memorizing one specific textbook definition. These same definitions were used on the assessment so participants only had to remember what they had memorized, while not actually having to comprehend what those definitions were saying.

The definitional approach lending itself to allow students to simply match terms and definitions by sight also could explain why the definitional group had a more difficult time generating their own uniquely worded definitions for their given vocabulary terms during the application/analysis assessment. The participants may have had difficulty with this in part because they were accustomed to only expressing the meaning of that word in one way. They became so fixated on simply memorizing that given definition that they did not cognitively realize that there are other ways of expressing that same meaning. This finding concurs with research done by Harmon, Hedrick, & Fox (2000) which stated that even though students need to have multiple exposures to vocabulary terms, that; “many encounters with a new word must reflect a meaningful use of the word, not just repetition of definitions” (p. 254). Because the participants were so accustomed to simply repeating definitions, they had a difficult time generating their own definition for the terms.

Many of the students in the definitional group tried to generate their own definitions by substituting word for word from the original definition to their new definition on a very literal level. When they did this, many of them lost nuances of the meaning of the terms, and sometimes even the overall meaning of the terms. They did not have a full enough understanding of each of the targeted terms in order to find alternate ways of expressing the terms’ meanings. This may explain why 86% of the definitional group scored a 3 or less on the application/analysis assessment. They could not move beyond substituting word for word in their new definitions on a very literal level.

Conversely, the instructional approach given to the students in the conceptual group allowed for them to find multiple ways of expressing the meaning of each given term. Those students had to use context clues to help them determine the meanings of the targeted terms during the initial instruction, and so different students were able to articulate differently worded meanings for the terms. When the students then put their ideas all together to determine the meaning of the terms, they realized from that first instructional period that there are multiple ways to express the meaning of the terms. This really helped them when it came to the application/analysis assessment where they had to generate their own uniquely worded definitions.

Another reason why the conceptual approach can be seen as more effective than the definitional approach is because the conceptual approach had better retention results. I believe this is because the conceptual approach allows for students to be more actively engaged in the learning process. While the definitional group simply had to memorize and parrot back information, the conceptual group had to deduce meanings from contextual clues, had to group words together based on their own self-devised categories, and had to actively compare and contrast the targeted terms. They had to focus on relationships between words and between words and content as Berne and Blachowicz, (2008) and Harmon (1998) suggested as being effective. I would further argue that since the students were more actively involved in the learning process, that the information

was better processed and therefore better retained as well. This is demonstrated by the fact that the conceptual group also scored better on the retention assessment than the definitional group, with 58% of the conceptual group remembering eight or more terms, whereas only 43% of the definitional group was able to do the same.

My research findings were consistent with other research that has been done on vocabulary instruction. In the survey given to 73 Social Studies teachers from the intermediate grades which expressed teachers' beliefs in the effectiveness of conceptual vocabulary instruction, 76.7% agreed that having knowledge about a subject helps children learn new and related words. Also, 72.6% agreed that learning a new word means developing a concept of ideas related to that word (Hedrick, Harmon, & Linerode, 2004). These survey results were consistent with my findings since my students in the conceptual group scored higher on the assessments than my students in the definitional group.

My students in the conceptual group were taught the vocabulary words within the context and subject matter of the chapter rather than through a list of isolated words given to them to memorize at the beginning of the chapter. Because the students in the conceptual group were able to learn the context and background for the specific vocabulary terms first, when the targeted vocabulary term was given to them, they already had pre-existing background knowledge with which to connect this new knowledge. The fact that they were able to connect their pre-existing knowledge with this new knowledge and build up a concept of the word, rather than a mere definition, allowed them to have a deeper and more complex understanding of the term. As a result, they were able to score higher on the application/analysis and retention assessments. The teachers' beliefs that having knowledge about a subject helps students learn new and related words and that learning a new word means developing a concept of ideas related to that word (Hedrick, Harmon, & Linerode, 2004) was shown to be true through my assessment results.

My assessment results were also similar to the Nash and Snowling (2005) in which 24 seven and eight year olds were taught a group of targeted vocabulary in terms in which half were given a definitional approach and half were given a conceptual approach. In their findings, the conceptual group scored higher on the retention assessment given three months after the initial instruction (Nash and Snowling, 2005). In the same way, my conceptual group also scored higher on my retention assessments. This shows that conceptual vocabulary instruction is not only effective for elementary students learning basic vocabulary, but also for high school students taking content courses filled with content vocabulary.

### ***VI.c. Limitations***

One of the greatest limitations I had was time. A four week time period of data collection is very limiting, especially when one of my instruments of data collection was a retention assessment. I was only able to wait a period of two weeks between instruction and assessment, and so that shorter time span must be taken into consideration when analyzing the retention assessment results. A retention assessment given after three months, such as completed in the Nash and Snowling (2005) study, would have greater validity than my two week retention assessment.

The other limitation to this study would be my sample of convenience. Because I used only my own Global History classes, I did not have a true cross-section of ninth grade students. Additionally, I teach two inclusion classes and not the honors class, so my sample consisted more of students with lower aptitudes than higher ones. I did attempt to balance my samples by putting one

inclusion class and one general education class in each sample group. However, it is still a sample of convenience and therefore generalizability cannot be assumed.

#### ***VI.d. Implications***

My research implies that conceptual vocabulary instruction is more effective than definitional vocabulary instruction in terms of complex understanding of terms and retention rates. Unfortunately, while teachers tend to focus more on conceptual vocabulary instruction in the elementary levels, this approach seems to be lost on high school teachers. High school content classroom teachers need to be made aware of the research on vocabulary instruction and modify their instructional approaches to include more conceptual teaching with their content vocabulary words. Students will be able to have complex understanding of terms and retention of terms if they can take ownership of the learning process and be able to deduce meanings for themselves rather than simply parrot back information. When vocabulary is taught in a conceptual manner, students are more actively engaged in the learning process and are able to build their understanding of these given terms. This would in turn build better retention and understanding of course material in general. If more time could be given to building up students' content vocabulary skills, then the content knowledge would come more easily to them because they would be able to see the connections between the vocabulary terms and the rest of the given course content.

#### ***VI.e. Recommendation for Further Research***

To increased performance, more vocabulary instructional research needs to be done, especially at the high school level. High school teachers need to find ways to incorporate specific content vocabulary strategies that will work effectively in their specific content areas. Since most vocabulary research has been done at the elementary level, the strategies suggested are those which work well at the elementary level. If we want to move conceptual vocabulary instruction into the high school level then specific research needs to be done at the high school level so that specific and effective conceptual strategies can be found.

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# MUSIC LITERACY METHODOLOGIES

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Music Literacy instruction can be administered through several methods. As a music educator I have witnessed several teaching methods of musical notation in more than one school district. With several teaching methods there are inconsistencies between the learning at the elementary level, the middle school level, and the high school level. Transitions are not smooth, and music literacy is either re-taught and students struggle due to multiple methods that are not concrete and consistent. My study explores ways in which music teachers can promote music literacy in the early grades which would then be improved in the higher grades. I have used a variety of research methods including survey research, content analysis, and observational techniques. The music literacy teaching methods I have focused on are Suzuki, Gordon, Kodaly and lesson book instruction. I have reviewed these four music literacy teaching methodologies, in hopes of finding a legitimate and successful result for beginning instrumental students to prosper in music literacy.

## **I. Introduction**

The purpose of this research was to find an effective beginning music literacy method. There are too many music programs where students are struggling to identify notation and rhythm accuracy when studying an instrument. In most cases these students are pushed through an instrumental music program without learning music literacy characteristics. I have a passion for teaching instrumental music and want each and every student to grasp music literacy in the most successful way possible. Throughout my research I have looked at whether syllables or numbers are better to study when counting musical rhythms, (Kodaly music literacy method,) should music literacy be strictly modeled, (Suzuki music literacy method) should audiation occur throughout music literacy instruction, (Gordon music literacy method,) and is there a valid music literacy instructional lesson book. I have extensively reviewed two music literacy lesson books, "Standard of Excellence" and Rubank.

## **II. Literature review**

In reviewing literature for this study, a number of themes emerged: a) teaching rhythm b) intergration with other content areas c) modeling, d) practice, e) teaching audiation, f) teaching notation

### ***II. a. Teaching rhythm***

Rhythm is discussed as the most important component of music (Dalby, 2005). Consistency of instruction is problematic from classroom to classroom. Even in a band program through elementary school to high school students may learn differing methods to count. This is common everywhere. Methods are discussed focusing on rhythm instruction especially the Gordon Music literacy method. General principles for teaching rhythm can begin by using a good rhythm-syllable

system. Ester (2007) discusses whether syllables are a successful method when counting. He goes on to discuss the Takadimi system, focusing on rhythmic syllables.

### ***II.b. Integration with other content areas***

Geist (2007) explains how math is incorporated in music and how it is passed along throughout the educational classroom. Fractions are being taught in music education and those concepts can be utilized in the classroom when focusing on math. Addition is constantly being used, when counting throughout music, and students are adding in the classroom. This gives one more reason why numbers should be used over syllables when learning rhythm in music literacy. McIntire (2007) states that literacy is a component developed throughout music, and that there are many similarities between literacy and music literacy. McIntire (2007) goes on to say “literacy helps students acquire language; which helps students to communicate through things such as reading, speaking, listening and writing in an artistic way McIntire (2007.) McIntire (2007) also believes that music has an effect on students who have special needs.

### ***II.c. Modeling***

The discussion of modeling through extensive hands on demonstrations, playing music for students to hear before playing, and the showing of instrumental fingerings, and playing technique are discussed by Haston (2007). Hands on demonstrations are important for visual learners, and help improve mechanical skills applied to technique in instrumental playing.

### ***II.d. Practice***

Strouse (2007) discusses the importance of practice and how much time, daily and weekly should be spent at home practicing. Strouse (2007) also discusses what to specifically spend time on when practicing. One should practice in chunks or sections, not run through material.

### ***II.e. Teaching through audiation***

Dalby (2001) discusses whether students should hear musical pitches before producing them on their own. This is called audiation. The practice of audiating a pitch would have to be produced by the teacher, a student or recorded, then heard by the student wanting to play that pitch and then produce it after hearing it.

### ***II.f. Teaching notation***

Notation has been taught multiple ways. Learning notation through Kodaly’s music literacy method is discussed by McIntire (2007). Kodaly’s music literacy method focuses on “movable do” when addressing notation. “Movable do” is a syllable used to read music notation. What still needs to be known is if more than one music literacy methodology is successful in numerous schools or if a specific music literacy methodology stands out among all the others.

### **III. Methods**

#### ***III.a. Sampling***

The sample for my study consisted of 21 instrumental music teachers and 54 fourth grade beginning instrumental students divided into eighteen lesson groups. Students participating in my study are from a small rural school in central New York.

#### ***III.b. Instruments***

##### *III.b.i Experimental design: pre-test*

I developed a pre-test (my first instrument) to find where each student's musical ability was when they began an instrument and where it had progressed to after experimental instruction occurred. The pretest given consisted of identifying the lines and spaces of the musical staff and what the note length values were for quarter, half, whole and eighth notes/rests. The pre-test demonstrated whether students could read and identify notes on a five line music staff, and identify the letter names of the lines and spaces on a music staff, from retained knowledge in previous general music classes. Similar worksheets were given out as homework/practice after the pre-test.

##### *III.b.ii Treatment (each method)*

Observations throughout each lesson of my field study are one of my most important instruments used. After each lesson I would document what I had observed by writing down struggles, successes, and what could possibly be altered or changed for the following week. The process of how I determined note efficiency from each student was set up like a reading teacher would do with running records in her classroom to evaluate missed words, difficulty in presenting words and hesitation. I did the same process for each lesson, of the week, checking off missed or incorrect notes, along with difficulty in presenting or the hesitation of playing notes to later evaluate progress.

1. Kodaly music literacy method
2. Suzuki music literacy method
3. Gordon music literacy method
4. Standard of Excellence Method book

I administered practice record sheets to each student, on which they were to record the weekly assignment, record the minutes they practice, and have their parent sign that they did practice. I wanted parental involvement. I also needed to see evidence that students were practicing.

I conducted over the phone short survey/questionnaires interviews, as one of my instruments, with 21 music teachers in neighboring schools. I wanted to find out if there was a similarity between neighboring school music programs and whether what they were doing was/is successful. These interviews I conducted with neighboring music teachers, were helpful instruments to supplement my research.

For the post test (my final instrument) I had students sight read a piece of music in a large band setting, which consisted of combining each music literacy learning method, lesson group together and applying the musical characteristics learned to produce the product. The product was to be able to play a selected concert piece together as a whole, while counting rhythms carefully and individually playing accurate notes and demonstrating proper technique on their specific instrument through the teaching of their music literacy learning method.

#### IV. Procedure

Every fourth grade beginning instrumental student who participated signed a consent form understanding the specific music literacy learning method in which they would be studying on their new instrument. Each music literacy learning method was discussed how instrumental technique, note reading, and rhythm would be taught and addressed. Students had the opportunity to select from four music literacy learning methods to accompany beginning a new instrument. These music literacy methods were the Gordon method, the Kodaly method, the Suzuki method, and the book method *Standard of Excellence*. Each method was explained to Students and parents who were aware they could withdraw from the specific music literacy method they selected at any time and continue learning an instrument through the traditional method (the book, *Standard of Excellence*.) Students and parents were informed that grades would not be a factor during this process and confidentiality would be maintained throughout the entire process. Five lesson groups were created to learn through the Gordon method, four lesson groups through the Suzuki method, three lesson groups through the Kodaly method, and six lesson groups through the lesson book.

In the beginning of September, the research design of finding an effective music literacy learning method was approved by SUNY Oswego's Human Subject Committee. The following month, October, written permission was obtained from my school principals to conduct research on effective music literacy teaching. At this time I also contacted instrumental music teachers asking them for their participation in a short over the phone interview. Because I was working with 54 students, (18 lesson groups) I observed my students as a whole and not as specific individuals. Lesson groups were mixed in gender, met once a week for 30 minutes and once a week at the end of the day for a large band rehearsal setting.

The 18 lesson groups consisting of 54 fourth grade beginning band students took part in a pre-test, lessons, that were observed, and a post-test. The pre-test was given to each student during their scheduled lesson time, in the first week of lessons. Each student was given a worksheet to complete on their own which focused on musical characteristics in music literacy. I tried to make students feel as comfortable as possible when they took the pre-test, telling them there would be no grade given, guess on answers you may know but are not sure on, or leave answers blank if that is more comfortable. The pre – test was given to identify whether students could name the lines and spaces on a musical staff, identify specific notes on a piece of music. Students were told before taking the pre-test that I would teach them what the lines and spaces were along with identifying notes following the pre-test. Once the pre-test was administered I reviewed the results and taught and went over everything given on the pre-test so there were no questions, or missing gaps to begin teaching through my chosen music literacy learning methods. Once the pre-test was covered I

assigned a worksheet for homework focusing on knowing and understanding the lines and spaces of the musical staff, followed by identifying notes written on the lines and spaces.

The very same week of lessons, following the pre-test and lines and spaces, I taught students three notes within their music literacy learning method. Students who were part of the Gordon music literacy learning method learned their notes by audiation. After modeling, and demonstrating the techniques of where to position fingers for specific notes on their instruments, I introduced audiation. Audiation is hearing the specific note (out loud or in ones head) before playing it on an instrument. I specifically would sing/play pitches for students through the Gordon lesson groups and even had students try this action on their own. Students recorded what was taught in a personal notebook throughout class, to help remember fingerings rhythms, and where notes were placed on a staff.

Students in the Kodaly lesson groups received modeling and demonstration of where to position fingers for specific notes, and then learned the first three notes addressed through solfege. Notes corresponded to syllable names (do, re, mi, fa, so, la, and ti). Do, re, mi were the only syllables/notes addressed at this time. I also made students write in the syllables as we went over exercises before playing. Everything was written down, in a personal student notebook.

The Suzuki lesson group students learned the first three notes strictly through modeling and demonstration. This method uses a lot of hands on learning, and memorization. I ended up doing a lot of drilling on correct fingerings and proper instrumental technique.

Students who were learning through the traditional lesson book received visuals of how and where to place fingers for specific notes on their instruments, along with my demonstrations. In the book, students were able to follow what was written. At the beginning of every lesson students were given a routine. Students would put their instruments together in a timely fashion, have their notebooks/book open, and demonstrate good sitting posture.

I also administered practice records for every student in their first lesson. The practice record consisted of the assigned material to practice and have prepared for the following week, the times documented of when the student practiced, along with a valid parental signature verifying the student had practiced. When students came to their lesson the following week, they would get the opportunity to place a sticker on a practice chart if their take home practice record was filled out and signed. This became a competitive intrinsic motivator to some to take action and practice, for there was a reward for those individuals who practiced.

The exact same process continued for the following three weeks in each music literacy learning method taught when note learning was being addressed. The second week of data collection, I taught two new notes bringing the total of notes learned up to five. In addition, I incorporated rhythm into the learning for the first time. Whole notes and rests were addressed for the first time. For the Gordon, Suzuki, method I used numbers and made clear that a whole note and rest receives four beats of sound or four beats of silence. Students recorded this in their personal notebooks. For the students learning in the Kodaly learning method they learned rhythm (beginning with whole notes/rests for this week) on syllables. Ta's or Da's were used when explaining four beat whole notes/rests. When I taught rhythm through the book "Standard of Excellence" there were well illustrated diagrams to help accommodate my teaching in helping students learn the rhythm duration of whole notes/rests. Whole notes/rests were present in excerpts which were helpful too. In the other three learning methods I taught from the chalkboard where students documented whole note/rest drawings I wrote on the board. I told each student that they should be counting in their

heads when playing, along with tapping their toes in their shoe to keep time and a steady beat. I explained that when their foot went down then up that was one beat (1 &.) If their foot had tapped down, up, down, up, down up, then they had played for three beats (1 & 2 & 3 &.) I explained that the number is the down beat (foot goes down) and the & is the up beat (foot comes up.)

During the second week of data collection I also set up times in order to interview twenty-one out of twenty-four instrumental music directors within the county. I first emailed the instrumental music teachers of the county asking them if they would be willing to participate in an anonymous short interview over the phone focusing on questions relating toward music literacy teachings and methods. The interviews would later be conducted in the following week.

In week three the addition of three new notes were taught through the exact same process as the previous two weeks, consisting of half and quarter note/rest rhythms. Not only did I demonstrate counting like I did the previous weeks, I also began making students write in the counting whether it was syllables (Ta, Ta, Ta, Ta) or numbers (1, 2, 3, 4.) When reviewing the previous five notes in the Gordon learning method, I decided to record the pitches from me playing them, onto cassette tapes for each student so they could use it as a tool at home to help audiate pitches before playing them.

This was the week I also conducted twenty-one, short, over the phone interviews with neighboring district instrumental music teachers who previously signed up to participate. I scheduled the phone interviews between two days. Throughout each interview I asked the same seven questions focusing on music literacy learning and teaching methods. The questions I asked were the following: What music literacy teaching method do you use for instruction at your school? Can more than one method be taught to implement adequate success? What is the best method to teach rhythm and counting? At what grade level do you believe students should begin instrumental music instruction? When and how long do instrumental rehearsals meet? Are sectional group lessons successful at the elementary level? How do you enforce practicing along with making sure students comprehend what has been taught? When conducting each phone interview I documented response answers while checking each question off.

In concluding my procedure, the fourth week I reviewed whole, half and quarter note/rest values, along with note identification and playing technique. Students demonstrated their skills from examples written on the board and a checklist /worksheet each student received in their lesson the fourth week. In the final week of data collection I selected a concert band piece for students to sight read, apply the skills they had learned, and continue to work on for an upcoming concert. This was my post-test. The musical selection I chose consisted of notes, rhythms, and techniques I had taught throughout the past four weeks. Before even playing, I told students that they will make mistakes when sight reading (studying a piece of music for the first time) and that is perfectly fine. Secondly I gave students five minutes to write counting in places, along with note names if necessary, and then we sight read the piece.

## **V. Data Analysis**

I analyzed my data on the accuracy of notes played from assigned material each week in lessons, along with how much time and effort were put into practice (shown on practice records) and whether or not practice records were signed or not. The anticipated goal throughout the four weeks

of my research was to increase the success of music literacy. As you can see in Fig. 1, I had hypothesized success occurring week after week in note accuracy and rhythm accuracy.

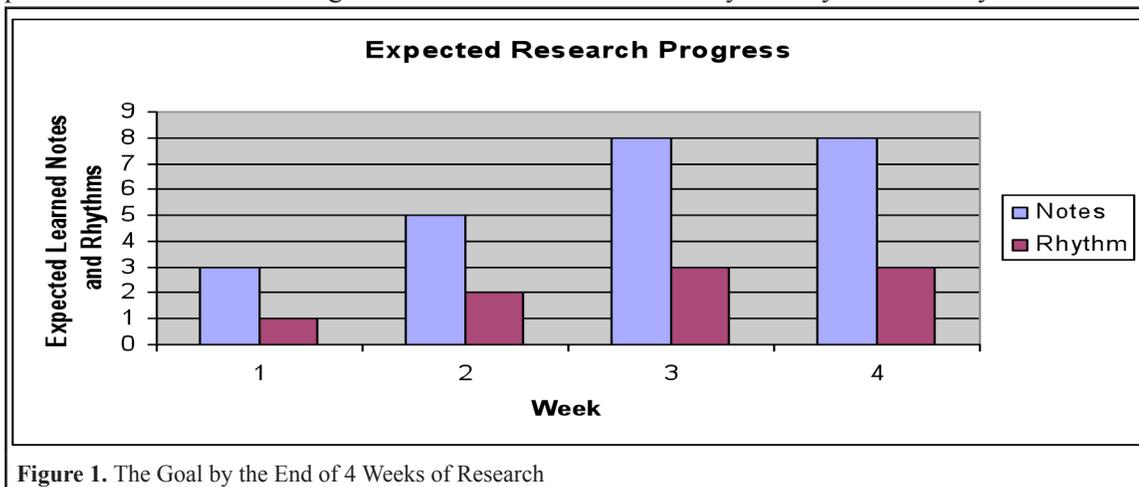


Figure 1. The Goal by the End of 4 Weeks of Research

### *V.a. Gordon Music Literacy Findings*

#### *V.a.i. The Gordon music literacy learning method lesson groups*

The four beginning instrumental lesson groups learning music literacy through the Gordon method worked very hard in the beginning stages of instrumental learning. In the first week of field study I documented, eight out of twelve students (66 %) capable of playing the first three notes on their instrument when audiating the notes first. I played the notes on the same instrument as they played and sang the notes, giving each student the opportunity to hear the note's pitch before playing it. By the second week, when I taught two new notes, note pitches remained the same at 66% accuracy when audiation occurred. It is a difficult task to hear pitches aloud or in your head before playing them. By giving students a tool to use at home to hear pitches students were able to produce straight from their head pitches they could not produce three weeks before. Students were given cassettes with each pitch they had learned, increasing their accuracy slightly to 75%. In the final week of field work, students struggled producing correct pitches during the post-test when we sight read as a whole band. Six of twelve students (50%) could produce correct pitches while audiating by themselves. The six students that struggled the most are learning a brass instrument and I ended up having to sing pitches on top of the band playing for them to be able to match and play correct pitches. Brass players have to develop a good ear and audiate because their instruments produce more than one pitch on a specific fingering, so it is very important for them to identify pitches. Rhythm was not a problem and by telling students to write in counting during lesson weeks, pre-test rhythms and note values were correct. Students came to lessons each week with the counting written in or they counted and clapped out the assigned exercises as a soloist.

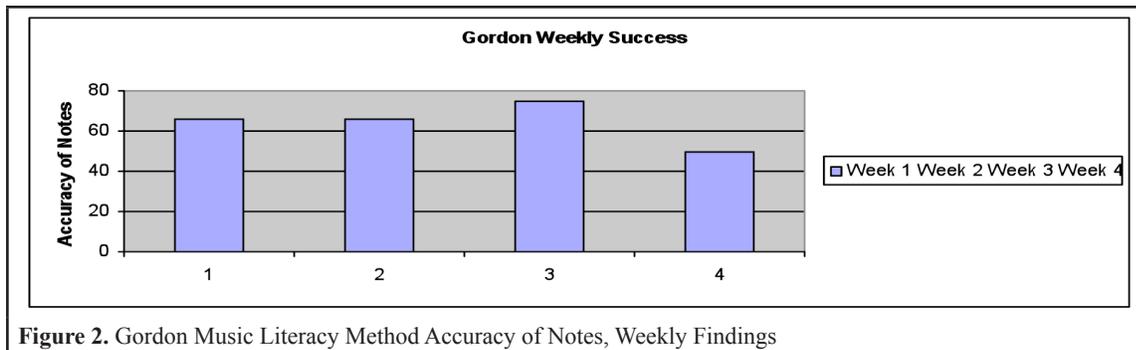


Figure 2. Gordon Music Literacy Method Accuracy of Notes, Weekly Findings

### *V.a.ii. The Kodaly Music Literacy Learning Method Lesson Groups*

Students in the three Kodaly lesson groups struggled with note reading from the beginning. All nine students did very well with the pre-test. Seven out of nine students already knew the lines and spaces from previous general music classes, but the place where students struggled was changing note names to syllables. Music is already a new language, and having to convert identified note names into solfege made matters worse. Solfege is when you identify notes and pitches on syllables. When five notes were to be learned six out of nine students (77 %) continuously confused the syllables up with note names, leading to the playing of incorrect notes. By the fourth week when reviewing all eight notes, I gave students the option to disregard solfege due to the 33% success rate. The Kodaly lesson groups also did not practice often due to frustration. When I taught syllables to introduce counting there were no problems whatsoever. Students wrote the syllables in (Ta, Ta, Ta, Ta) on exercises and assigned material. I do question whether syllables are effective once students advance to a higher difficulty and will need to eventually subdivide when counting.

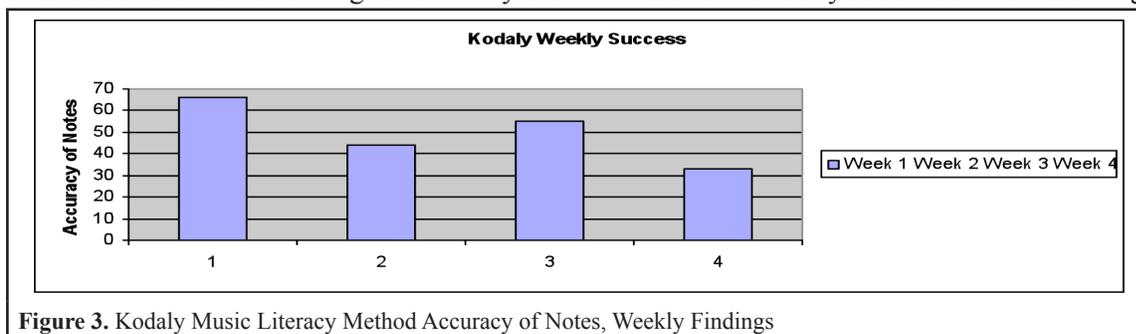


Figure 3. Kodaly Music Literacy Method Accuracy of Notes, Weekly Findings

### *V.a.iii. The Suzuki music literacy learning method lesson groups*

Learning through hands-on demonstration and modeling techniques are effective when teaching many things. Students who studied music literacy through the Suzuki method received a massive amount of demonstration and modeling instruction from me. Every week I would drill the twelve students on fingerings, where notes are placed on the musical staff, and accuracy of rhythm, and note durations. Memorization took a large role in the Suzuki process. Pre-test results were high. Ten out of twelve students (83 %) were able to identify the lines and spaces on a music staff. Even though students took notes in their personal music notebook (wrote fingerings in and counting) practice was weak. Eight out of the twelve students in the Suzuki method practiced every week during field study (a 66 % success rate.) The lack of practice resulted in frustration, inability

to memorize or remember taught demonstrations and modeling or loss of interest and effort. Correct fingerings and notes slowly became better throughout weeks two and three due to continuous modeling. By week three the accuracy of notes and rhythms being played increased from week two and jumped from 72% to 83%. In week three, accuracy of notes and rhythms decreased to 75% but surprisingly jumped to 83% accurate in the final week. Rhythm was not an issue as students could clearly identify note values and write counting in throughout excerpts. The post-test proved to me that students struggled reading notes and relied heavily on memorization and modeling. I had to remind and refresh students on fingerings for notes, and give those students a few extra minutes to identify

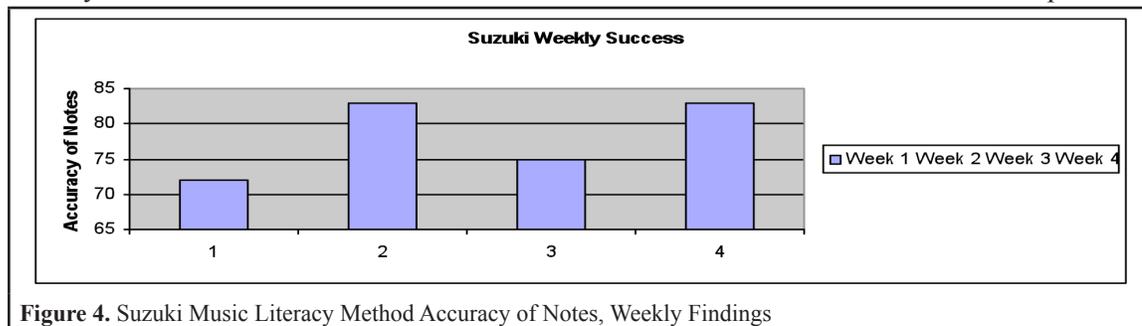


Figure 4. Suzuki Music Literacy Method Accuracy of Notes, Weekly Findings

*V.a.iv. The lesson book method Standard of Excellence lesson groups*

The lesson book method utilized structure for me and most importantly the 15 students learning from it. There was no note taking like the other three methods. If something was written down it was one of three things; a rhythm, a note/pitch name or an asterisk/star written next to an important teaching. Students had no trouble with the pre-test. Thirteen out of fifteen students in the lesson book method remembered the lines and spaces on a music staff. They also identified where notes were placed very well. When counting rhythm and note values students always wrote in the counting with numbers. After modeling fingerings and where notes were placed on the staff, practice was much easier to lesson book students. The lesson book literally complimented the post-test. In the first week students nailed the first three notes. The following week students struggled slightly on the addition of two notes but not nearly as bad as other learning methods dropping just to 80% accuracy with notes. The third week students dropped to 73 % with the addition of three more new notes, but surged to 86% accuracy in the final week of review.

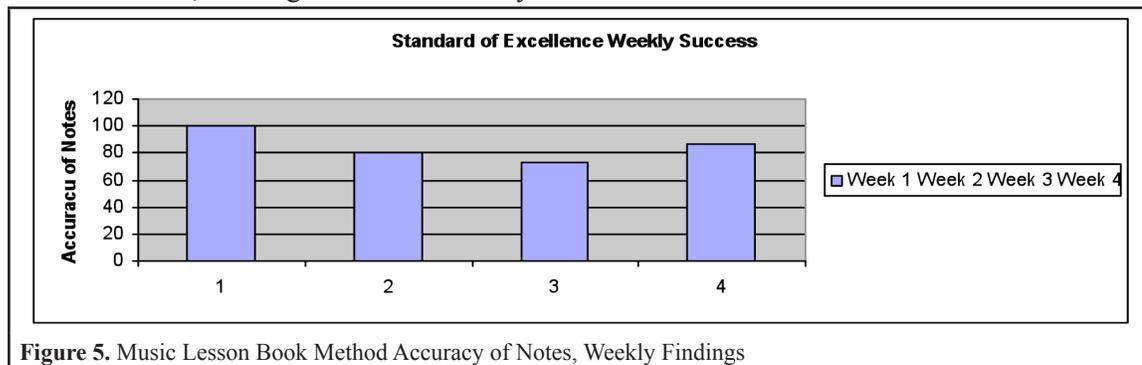


Figure 5. Music Lesson Book Method Accuracy of Notes, Weekly Findings

### *V.a.v. Journals and Practice*

Journals were for students in the Gordon, Kodaly, and Suzuki method to document notes they may find useful in aiding them with their instruction on learning a new instrument. Out of the 33 students who used a notebook, 24 students wrote detailed notes. That is a 72% efficiency. Practice records were given out each week at lessons to every student, and required to come back signed by a parent, and times documented of when they practiced. Practice fluctuated throughout the four weeks. The first week, 48 students brought a filled out and signed practice record back (88%.) The second week 42 students came to lessons with a prepared practice record (77%) a slight decline from week one. The third week of lesson instruction students brought the numbers back up slightly to 81%, and the final week of lesson instruction 87% of students came prepared with a filled out practice record. Students required motivation in order to practice. I created a tally chart of how many practice records were received from each student and with a specific amount, they were rewarded with ice cream from me.

### *V.a.vi. Instrumental Music Teacher Phone Interviews*

I was very pleased to have such a large number of participants participate in the phone interviews. The interviews were very formal and confidentiality was kept among every participant. Seven questions were asked in an order for each conducted interview.

The first question I asked varied from answer to answer. Every Instrumental music teacher uses a music lesson book for student instruction. The music lesson books vary by preference. Five music teachers use *Standard of Excellence* because of structure, six teachers use *Rubank* for technique, four teachers use *Breeze Easy*, and six use *Accent on Achievement* for pacing a program. Several music teachers mentioned music standards are still addressed, note reading is occurring, and rhythm is being practiced. From this, I had decided to research a few lesson books and decided to implement them through my Gordon, Kodaly, and Suzuki learning methodologies, and see where they stood with the standard of excellence book I was researching as one of my music literacy methods. The music lesson books I decided to incorporate were *Breeze Easy Method book I* by John Kinyon, *Accent On Achievement* by John Reilly and Mark Williams, and *Rubank* by J.E. Skornicka.

The second question I asked resulted in having a strong sided answer. From every interview conducted every music teacher said counting with syllables can be done in any method book over numbers, or vice versa.

Modeling and hands on demonstrations are necessary for students to visualize what is being taught. Audiating is useful for students to hear pitches before playing them.

Rhythm: When asked about what rhythm and counting method is best for beginning student's only three teachers opposed using numbers. One high school instrumental teacher stressed that "further down the road students will need to subdivide, break beats down in pieces, and by using numbers early will give students a smooth transition from elementary to high school band, along with the difficulty of music playing. Instrumental rehearsals varied upon each schools schedule. Seven met in the middle of the day, seven met before the beginning of school, and eight met after school, all varying from 30–60 minutes. There were mixed thoughts on my following question relating to sectional group lessons at the elementary level. High school instrumental teachers didn't believe they were a good idea or necessary. Four elementary instrumental teachers do not

do sectional lessons, but said that it would be something interesting to try in the future, and the remaining elementary instrumental music teachers thought small group lessons were best for beginning students, mainly because of scheduling. My final question focused on practice and making sure students have understood the taught material. Basically I was told the more practice from the student, the more the student becomes knowledgeable about music. Practice records are used at the elementary level from each elementary instrumental teacher I interviewed, and at the high school, I was told it's an observational decision whether the student practiced. They are either capable of playing material assigned with ease or come unprepared

## VI. Student Counting Rhythm Study

Students from each music literacy method group, participated in a survey explaining which they preferred and performed better with numbers or syllables. Below in Figure 6 it is shown that students prefer the use of counting with numbers over syllables. Numbers are more precise and effective when counting advanced rhythms.

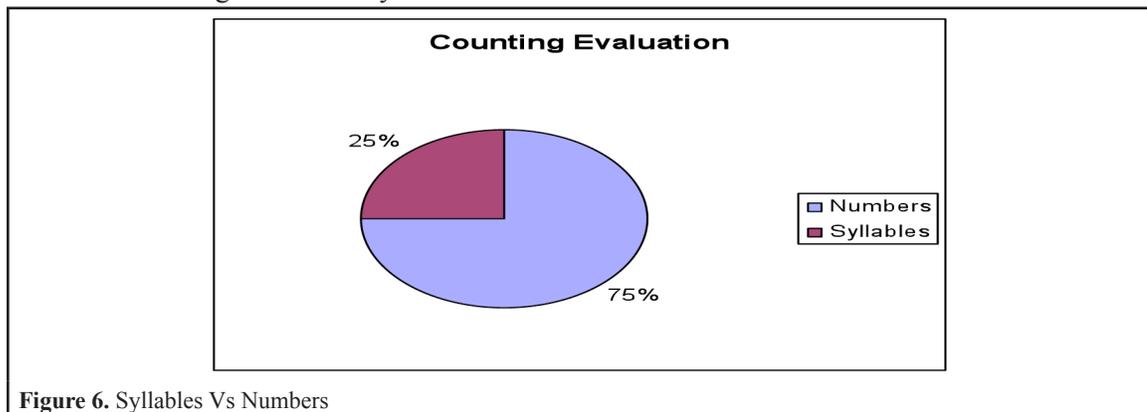
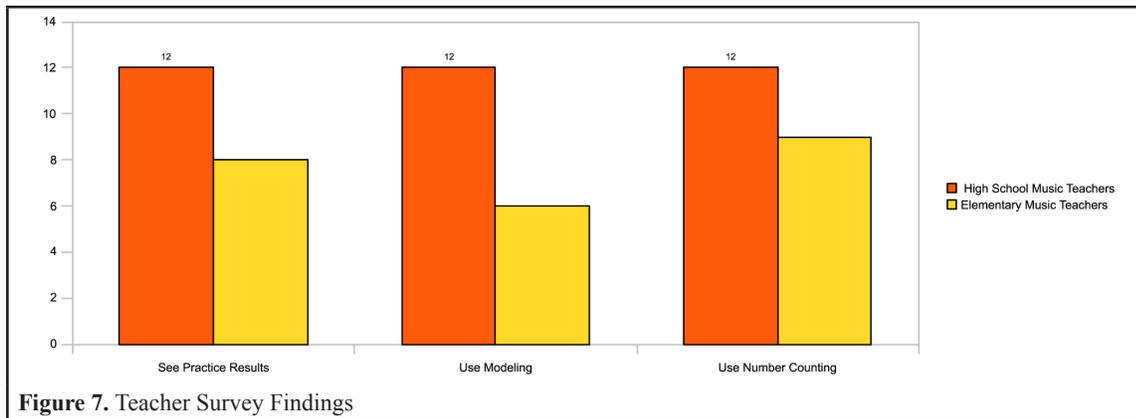


Figure 6. Syllables Vs Numbers

## VII. Teacher Survey Responses

After conducting twenty one short interview surveys over the phone with music teachers, music teachers see results and advancement when practice records are used, the use of modeling in instruction, and the use of number counting over syllables.



## VIII. Discussion and Conclusion

After studying four music literacy methods (Kodaly, Gordon, Suzuki, and the lesson book *Standard of Excellence*, I have found a strength from each music literacy method making four successful strengths from each to build and improve instrumental music literacy. Modeling is the first strength. Whether it is fingering a note on an instrument, playing a note on an instrument, or counting/clapping a rhythm and then having a student clap the rhythm back, is critical for instrumental music literacy development. The second successful strength is counting rhythms with numbers. Students should begin instrumental instruction at an early age so it can continue through High School to count with numbers. This means there is no transitional period between counting with syllables and complicated counting rhythm sections that can be addressed through numbers. Syllables may be preferred in choral instruction, however I feel strongly about using numbers when teaching instrumental music. The third successful strength is consistency or weekly practice, which is documented by the instrumentalist's parent or guardian, stating in a signed practice record that students have practiced. The final successful piece to the puzzle of creating effective music literacy is using a sufficient lesson book. Using *Standard of Excellence* is the right choice because new concepts are addressed at the top of each page and the book flows quickly to address instrumental selections. Once efficiency has been reached through the standard of excellence series students should focus on a book that incorporates technique and etude study. An etude is a musical study, practiced and later performed.

## IX. Limitations

Time was a factor throughout my research. In most cases, methods and concepts needed double the time (two weeks) to be grasped by students. Parental involvement was another factor. Journals, and practice records unsigned showed me the lack of outside instrumental practice. Once parent involvement began the percent of journals and practice records improved. Reminders were sent home to parents, if students weren't practicing. Fortunately, most parents responded positively once they were reminded.

## X. Discussion

By combining these four successful strengths through teaching, music literacy will improve and flourish throughout instrumental student learning. Ester (2007) explains that using a method book (such as *Standard of Excellence*) that flows and visualizes music literacy concepts, gives the learner building steps to eventually take what they learned and apply it to concert ensemble sheet music. An instrumental student simply cannot have a piece of sheet music put in front of them and be capable of playing it unless they learn the necessary step by step concepts of note reading, counting, and music symbols, all a part of music literacy. Through my four weeks of research, the students who began learning music literacy had a successful percentage rate each week of 75 percent or more.

Practice produces results. Practice takes practice in everything, and mastering music literacy is no different. Those that practiced throughout the four weeks of the study were successful. Each week, assigned lesson material was recorded on a practice record for the student's to take home so they knew what to practice. The student had to log the amount of time they practiced each day, and had a parent/guardian sign stating the student did indeed practice. Practice records were used to not only determine whether the student practiced, but to be factored into grading. Schools all around New York State have some form of practice record. It could be the inside of the front cover from the lesson book being used, or a developed practice record from the teacher.

Counting with numbers is the best explanation when teaching instrumental music literacy. It may be easy to count with syllables at the beginning instruction but once eighth notes are addressed, complication, and confusion begin. If there are four quarter notes they should be counted: One, two, three, four, rather than ta, ta, ta, ta. If there are eight eighth notes they should be counted: One & two & three & four &, rather than with syllables. If there are sixteenth notes they should be counted: 1 e & a, 2 e & a, 3 e & a, 4 e & a. The biggest reason why numbers should be used when counting is because note can fall on all different types of beats in just one measure. For example if I had a quarter note, followed by an eighth note connected to two sixteenth notes, another quarter note and four sixteenth notes it would be counted: 1, 2 & a, 3, 4 e & a. When counting, subdivision must occur. That is breaking down each measure, and each beat.

Finally, modeling must always occur throughout music literacy instruction. Produced pitches must be heard and demonstrated before student instrumentalists try, proper technique of how to play the instrument must be modeled (where hands are placed, where fingers are placed, posture must be correct, and correct embouchure.) Unless these are modeled, students are playing wrong pitches due to incorrect fingerings, incorrect embouchure, and poor posture. Every beginning instrumental director models proper playing technique, embouchure along with fingerings. Embouchure is how an instrumental mouth piece is placed and used at the player's mouth, along with how air is produced through the mouth piece.

## XI. Implications

The knowledge produced impacts music educators in how they address music literacy. Yes, not every single learning method is going to work with every student but the most efficient method should be used in any subject being taught. High School instrumental teachers can benefit by counting with numbers if it is begun at the elementary instrumental level. My research also helps

mathematics educators. Physical education teachers are impacted: Through modeling, proper air support, posture, hand and eye coordination all are taught when teaching a beginning instrument. My research impacts my classroom in a way that a step by step process must be conducted in order to produce a final product (a concert, solo festival, all county, jazz band, marching band etc.) Without a structured and flowing lesson book that moves in a step by step process, number counting system, and consistent modeling an instrumental concert would not happen or be poorly presented.

## **XII. Concluding Thoughts**

Continued research needs to be done throughout the music field to ensure music literacy is addressing positive results. Music teachers need further research and more time to continue finding successful music literacy teaching methods. More rehearsal time would be another research beginning. I see each of my instrumental students once every six days. If more time is given for instructional lessons, then maybe we would see higher music literacy results or have a chance to correct difficulties on an instrument. I think it would be interesting to research more on how to address instrumental practice. Another focus that could further be researched is a study on multiple lesson books. Is there a specific lesson book that helps accommodate music literacy teaching/learning? All these recommended issues can lead to further research in creating an effective instrumental music literacy method. Continued research is a needed. More participants are needed to compare school wide effectiveness along with more time to construct effective music literacy methodologies.

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# **A COMPARISON STUDY OF AUTHENTIC SCIENCE INSTRUCTION IN ADOLESCENT EDUCATION**

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*Sponsor: Faith Maina, Department of Curriculum and Instruction*

Recent research has shown that high-stakes assessments are making it increasingly harder for teachers to use hands-on authentic learning methods in the classroom. Exams such as New York State Regents apply pressure regarding how the content is to be taught in schools. Students are expected to pass these assessments, so teachers tend to focus on specific knowledge over holistic concepts. By memorizing details in content, retention in knowledge and interest in the sciences is diminished. This study found that utilizing hands-on instruction yields better retention and higher understanding of the content in a science classroom.

## **I. Introduction**

### ***I.a. Area of study***

Currently, the United States is struggling in science, technology, math, and engineering (STEM) education. There are many theories as to why these struggles are occurring, but a reoccurring theme is that students are lacking essential hands-on education in these concentrations. I chose to research authentic science instruction and compare how well students retain and use the knowledge obtained in hands-on active learning vs. passive individual learning. Active learning means getting involved in the curriculum; it utilizes techniques such as hands-on learning and investigative techniques. Passive learning puts the student in the role of a sponge. They don't investigate, and they just absorb what is projected or read. Passive learning is most commonly used in Regents or high-stakes assessment classes. Active hands-on learning is more commonly used in electives, service learning, or Career-Technical Education (CTE) classes that do not have high stakes assessments attached as part of the curriculum. With this knowledge, the question becomes "Who is receiving a more substantial education while retaining knowledge?"

### ***I.b. Experiential knowledge***

I decided to study authentic science instruction because in my own experience, students are being taught in the wrong way. When they are given labs, they don't carry out the experiments to find an answer; they do it to get it done. Students will copy other students, or they'll ask the teacher for answers. The students are not involved with the investigation. They have no curiosity and pose no questions for their own understanding. It is merely a process of "getting it done" as opposed to individual investigation. With attitudes like this, how will students become explorative and find motivation? Science careers are dwindling, and perhaps that wouldn't be the case if attitudes were changed. The reason for this attitude may be due to the high stakes assessment that accompanies the science curriculum.

David Hursh's study (2008) states that a main concern in education is that students are not receiving proper instruction. This is due to high-stakes assessment, which takes away from the hands-on authentic learning. They expect the assessment grades to take the form of a bell curve when graphed. The bell curve shows that the majority of the students score is in the middle; and number of students scoring in the higher end and lower end are around the same number. There is a rise of high-stakes testing occurring at the state and federal levels, specifically seen in New York and Texas and with *No Child Left Behind*. Many critics posit that use of high-stakes testing is to assist with the reassertion of ruling-class power, since the structure supports that some students do not "succeed" (Hursh, pg 2, 2008).

According to Christina Puentes (pg. 1, 2007), the high-stakes assessments make teachers who are more likely to "teach to the test." Students are required to learn specifics as opposed to holistic concepts or the "big picture" in science. Because of this kind of assessment, there is less formative assessment occurring in the classroom. Formative assessments are self-reflective and intend to promote student attainment.

### ***I.c. Research intent and purpose***

My research was focused on studying the most effective ways to teach science. Currently, in the classroom, there is a need to move quickly through science content which places students in the role as receivers, rather than conductors of knowledge (Murphy, 2006). The reason for failure to thrive is because the curriculum is undifferentiated and extremely straight and narrow. I took a closer look at comparing the benefits and drawbacks of AP (Advanced Placement)/Regents science classes versus CTE (Career Technical Education) or MST (Math, Science, Technology) electives. To scale this down, a simple comparison study was conducted to represent each of these formats. AP/Regents electives are mainly based on lecture and worksheets while CTE/MST employs more hands-on and holistic techniques. Using these diverse learning styles, we can compare effectiveness, retention and engagement among the students.

## **II. Literature Review**

### ***II.a. Research context***

Students looked at comparing active learning vs. passive learning. Based on research, I narrowed the active learning to hands-on activities and the passive learning to independent learning where the questions mimic the Regents assessments.

According to Glod (2007), when comparing American success in the fields of math and science around the world, American teenagers fall drastically short:

The scores from the 2006 Program for International Student Assessment showed that U.S. 15-year-olds trailed their peers from many industrialized countries. The average science score of U.S. students lagged behind in 16 of 30 countries in the Organization for Economic Cooperation and Development, a Paris-based group that represents the world's richest countries. The U.S. students were further behind in math, trailing counterparts in 23 countries. (Glod, 2007, p.A1)

The issue that needs to be addressed by educators entails solving this problem of failure in the STEM classrooms. To help solve the problem, we must look at how students are being educated.

According to Hoachlander (2008), vocational schools or trade schools are popular for those students who want to excel in the working world without the extensive general knowledge of a college education.

The purpose of education is to prepare students for life outside of school. We want students to be critical thinkers and to contribute in society through the workforce or other means. Literature adapted from *Making Standards Work! Science. A Teacher's Guide to Contextual Learning* (McAlonan, 2000) highlights some of the goals in high school teaching.

- Present general workplace competencies, which describe the skills and knowledge needed for school and career success and which are organized into the following categories: *communication; organization; thinking; technology; and worker qualities*.
- Offer guidelines for helping special populations of students meet academic content standards while participating in school-to-career opportunities.
- Feature various integration matrices and classroom activities for integrating *science* standards with workplace competencies.

Since 2005, it has been documented that high school graduates enrolled in vocational training are highly involved in career and technical education, second only to English careers. Although CTE courses are not required for vocational training, virtually all students take one. More than 60% of vocational students chose to take at least three CTE courses which are electives (Hoachlander, 2008). This shows that hands-on activities and real-world connections in the STEM field allows for greater individual motivation.

Ucak, Huseyin, and Usak (2006) bring up the theory of multiple intelligences. Traditionally, Linguistic-Intelligence and Logical-Mathematical intelligence are seen as being dominant in the classroom. This is because these students are being taught in a manner that fits their learning process. High-stakes assessment pushes more linguistic and logic based instruction as opposed to other intelligences. Howard Gardner's (2006) multiple intelligences theory states that "...not every child is the same and children do not learn in the same way" (p. 10). The multiple intelligence theory identifies seven intelligences: Linguistic-intelligence, Logical-Mathematical intelligence, Musical intelligence, Bodily-Kinesthetic intelligence, Spatial intelligence, Interpersonal intelligence, and Intrapersonal intelligence. The teacher needs to present the content using many of the different intelligences, not just a select few.

### ***II.b. Professional theory***

A study conducted by Christina Puentes (2007) encompasses the general idea of my research, that hands-on instruction is preferential:

Studies show that hands-on science instruction allows success beyond the classroom, hands-on activities excite students about learning and science in general, and that the hands-on activities create confidence in the children. Research also indicates that students who receive textbook based lessons earn scores similar to students who learn through hands-on lessons... Findings indicated that teachers felt science is taught only in limited fashion, as a result of **high stakes** testing with its focus on language arts and mathematics improvement. Teachers, even with limited instructional time for science instruction, reported that hands-on and

inquiry based science methods had positive effects on child engagement in learning. (Puentes, 2007)

Puentes' research is substantial because it deals with the effects of authentic science instruction and interest in the content at the elementary level. While my sample deals with adolescents, students must still feel the same motivation and engagement in the content because it could potentially open doors to careers in the STEM fields. Students will lack motivation if the education primarily consists of rote memorization and knowing facts as opposed to holistic concepts. When the curriculum has a positive effect and increases motivation in students, it can help open doors for future inquires.

### **III. Methodology**

#### ***III.a. Sample population***

The population targeted in my study were 10th grade high-school students enrolled in Regents Living Environment class. The students were from a high school of around 700 students. The school was classified as a low income district in rural western New York. Ninety percent of the school population was Caucasian, while the remaining 10% were African-American or Latino.

Two mid-day classes were used in this research. Class A had 10 female students and 12 male students. Class B had 13 females and 11 males. All students were high-functioning and there were a total of three students who had an IEP. Two were in Class B.

#### ***III.b. Experimental design and instruments***

The experimental class that is being tested is known as Class A. The control, which is receiving passive instruction, is known as Class B. I am using these two classes to compare the effectiveness of one method of teaching versus the other. The experimental class was given a lab without any content matter on the subject of blood types and blood transfusions.

I decided to make the procedural lesson about blood types and blood transfusions. The rationale for this is due to the fact that blood types and blood transfusions are barely discussed in the Living Environment curriculum. However, students did have the instruction in their 8th grade Life Science classes, so background knowledge was present on the topic.

The lab they carried out had several test tubes. In four of the test tubes each blood type was represented by a different color.

- Type O was clear
- Type A was red
- Type B was blue
- Type AB was purple

To determine whether two types of blood could be mixed for a transfusion, students would pick two blood types and mix them in a separate test tube. If a color change occurred, then those two blood types could not be mixed. All blood types could accept Type O, making it a universal

donor. However, Type O can only accept itself. The passive learning group was given a worksheet with detailed information and facts about blood types and blood transfusions.

In order to conduct this research, a letter seeking permission from parents/guardians was sent home. Only those students with guardian permission and personal consent participated in the study. The consent form informed the parents/guardians and students about the purpose of the research as well as the benefit to the target population. Written permission was also obtained from the high school principal. Previous to this, the research design had been approved by the SUNY Oswego's Human Subject Committee. Confidentiality and anonymity was maintained at all times in this research.

It is also important to note that the host teacher did not give out any information regarding blood and blood type. All information obtained by the student was done so independently.

### ***III.c. Instruments***

In order to obtain data, I will use a pre-test and a post-test. The tests are the same questions given at the before and after the experimental instruction. Using the resulting data from the pre-test and post-test I created an average score and these scores were then compared for analysis. These assessments were given to determine the effectiveness of knowledge retention and comparing active hands-on learning vs. passive studying.

### ***III.d. Procedure***

The first week, I met with a teacher at a rural high school who consented and received the experimental design. Experimentation was carried out in two of his 10th grade living environment classes. In the first week I discussed with the host teacher the two classes that would be most optimal for my research. We chose two classes from the middle of the day. The classes chosen are the most similar in terms of gender ratio, overall intelligence, quantity and overall diversity.

Before the research was conducted the host teacher allowed me to meet with the administration and go over the rationale and implications of my research. I gave them the necessary paperwork asking for approval and they understood that their staff (my host teacher) was conducting the experiment.

In the second week permission slips were collected consenting to the student participation. Only four students did not submit the permission slip so they were not involved in the research. Once the permissions were obtained, the students from both classes did a pre-test. The pre-test was given to each class before lesson implementation.

In the third week of research the experiments were conducted which compared hands-on (active) versus independent (passive) learning. The active class is known as "Class A" and the passive class is known as "Class B".

On the last week of experimentation, students were given the post-test on blood types and blood transfusion. With this post-test information, comparisons could then be made by comparing pre-test and post-test data to determine the effectiveness of the experimentation.

## **IV. Data Analysis**

### ***IV.a. Pre-Test experimental data***

The point of the pre-test was to assess student's prior knowledge before giving them information on blood types and blood transfusions. Students worked on the pre-test silently and completed all the questions with-in a 5 to 15 minute period.

In each of the classes there were 16 students who consented to take the pre-test. They had a lower pre-test score of 58%. This class was given the hands-on activity on blood later on. Class B had a higher pre-test score of 65%.

### ***IV.b. Post-Test experimental data***

Before the post-test was given, each of the students went though their intended lessons. The post-test was given one week after lesson implementation to test their knowledge as well as their retention.

There were 16 students in each class who consented to take the post-test. Class A had a higher post-test score of 87%. This class was given the hands-on activity on blood. Class B, has a lower post-test score of 78%.

## **V. Results**

### ***V.a. Hands-on vs. passive***

Before the pre-test data was collected and analyzed, it was arranged so that despite the data, Class A would be getting the hands-on instruction. Coincidentally, Class A yielded the lower pre-test score. Rationale for this could be several reasons. The students may have applied more "guess work" as opposed to using their thought processes.

Class A did significantly better. They started out with the lower pre-test scores but ultimately had the higher post-test score. The students in Class B had a poorer retention of their lesson implementation based on the post-test data. They had a higher initial knowledge, but no new information was retained

### ***V.b. Analysis of data***

When comparing the pre-test and post-test averages, we can see that Class A saw an increase of 29% and Class B saw an increase of 13%. Because there was only one trial conducted, generalizability is limited. For the sake of this research, it seems that Class A is much better using the active via hands-on learning methods as opposed to the passive via studying and reading learning method.

## **VI. Discussion**

According to the host teacher, as students were taking the Post-Test on blood and blood transfusion, an interesting observation was that students who did their own passive learning (Class B)

complained more about the assignment. One student said “This is stupid, do I really need to take this again?” Once the students were reminded that this was for research only and no grade was being taken, they were more compliant. It can also be noted that students from Class A finished the post-test faster and did not complain like Class B. Class A seemed more confident in their knowledge. It appeared that they could recall information better than those students in Class B.

High-stakes assessment like the NYS Regents Exam calls for knowledge that is more specific and detailed. The format of the test is similar to the passive learning worksheet the students in Class B were given. My hypothesis, which stated that hands-on learning would yield higher retention, was supported as well. While high-stakes assessment is essential, investigation in authentic learning needs to take precedent in the classroom, as opposed to restrictions that are in place due to pressures from high-stakes assessments.

## **VII. Limitations**

The main drawback of this research is that there is only one comparison. This study would need to be conducted several more times to increase the data’s validity. Also, even though I was conducting the research, I did not oversee it. I used a host teacher to implement the experiment in my stead. This may have allowed for more objectivity in terms of data analysis, but it may also allow for more error in case the procedures weren’t carried out as I intended.

In order to truly test the effectiveness of hands-on learning on retention, a time span between experimentation and the post-test assessment needs to be longer than a week. If more time was available, tests could be conducted on retention of a week after experimentation, a month, or even a year. Hands-on learning allowing for more vivid visual memory and to study the long term effects for retention is beneficial in the educational setting. Other limitations prohibited me to use two other host teachers to carry out the same comparison experiment in a 10th grade Living Environment class. This would have provided three sets of data to analyze which will yield more effective conclusions.

## **VIII. Conclusion**

The students who had an active, hands-on approach to the information yielded significantly high post-test results compared to the passive learners whom were presented with more factual, detailed information on the subject. The main strength of this experiment is that the results show a correlation between retention and hands-on activities as opposed to memorization. The literature review on this topic supports the notion that hands-on activities lead to higher assessment scores and better retention rates. My own experiment yielded the same results as well. It is important we get STEM educators to apply more hands-on investigative research into the curriculum. While arguments can be made that state labs are effective hands-on tools in the Regents science classes, they are limited in their effectiveness because half the labs are done solely on paper without hands-on activities. The other half that utilizes performance tasks have a specific conclusion they want students to reach, there is no personal investigation. It is a simple process of following a step-by-step guide line. Using these state mandated lab techniques takes away from the trail and error process, which is what science is supposed to be.

Recently, President Barack Obama launched a new campaign called “Educate to Innovate” (Whitehouse.gov). This is a campaign for excellence in science, technology, engineering & math (STEM) education. The program calls for after school activities that involve more hands-on and service-based learning in the STEM fields. This initiative was released in late November of 2009. It is clear that there is a call to action for authentic science education. By being informed, teachers can take the initial steps that begin in the classroom and perhaps work the curriculum in ways that both address the state standards as well as the essential hands-on learning that is so imperative to science education.

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# INTEGRATING USER-GENERATED CONTENT DESCRIPTION INTO INFORMATION REPRESENTATION

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There are two propositions: 1) user-created tagging is a valuable source of user's personal views and annotations that can augment the content description of information resources; and 2) information search can be viewed as seeking meaning and making sense of information content for the user that can bridge the need. It was intended to draw user-based meaning of content from tag data and represent the content with semantic relations in contrast to the traditional topic-based document organization and classification systems. A simple semantic relation structure is suggested by employing the topic and comment as two dimensions of linguistic meaning to derive the content users associate with.

## I. Problem statement

Information retrieval (IR) is an area of study that is concerned with “finding material (usually documents) of an unstructured nature (usually text) that satisfies an information need within large collections (usually stored on computers)” (Manning et. al., 2008). It usually involves computerized text processing of unstructured data and search of information relevant to a search query from a document collection, including Web search systems and library catalogs. The text processing is based on the “bag of words” approach where a document is represented as “a collection of words with no relationships, either syntactic or statistical, between them (Croft et. al., 2009). Most of the retrieval models have been based on this bag of words approach of keyword matching to search an inverted file.

In the keyword matching paradigm, the query of a user is a list of keywords, and document representation (i.e., surrogate) is composed of a list of terms that appear in the text (e.g., inverted index), both of which do not reflect any semantic relationships among them but the independent term occurrences. The mathematical application of retrieval models utilizes term frequencies and adjacency of terms. The topic or aboutness of a document is the core criteria for document representation and for user query formulation.

The keyword matching concept has been criticized for its unidimensional and generic characterization of topic in the field of information science. Lately, there have been attempts to incorporate situational aspects of user's relevance and contextual features of user need in information seeking and retrieval research.

## II. Literature Review

### *II. a. Information Seeking and Meaning*

The focus of this paper is in the “specified search” (Belkin, 2000) context, where users are searching for information to meet the need rather than fact or data retrieval, nor exploratory of

navigational search. Information search emphasizes the user as the primary part and the ultimate goal of the retrieval system.

In fact, Belkin and others claimed that a system should be designed in a way that provides users with diverse ways to search and access to information depends on their situational need under the Anomalous States of Knowledge (ASK) assumption (Belkin, 1980). The ASK principle stresses that information users do not know what exact information description they are looking for when they are in need.

Information seeking and search is also viewed as a discourse between the user and the system that involves the use of language. The meaningful connection between a user need and the information content was sought in a study of information seeking interaction that empirically examined topic and comment as two linguistic components of information description (Yoon, 2007; Yoon & Nilan, 1999). The study confirmed that both topic and comment are essential in user's information need articulation as the two orthogonal dimensions of information to meaningfully describe the user's information as well as to represent information content meaningful to a specific user need and use context. According to functional linguistics, meanings are complete in both topic and comment (Jacobson, 1968). Topic is what it is about and comment is what the speaker attaches and relates to the topic. The concept of topic and comment has been applied to information science and the traditional classification theory, which adopted topic as a dominant element to represent a document's content (Beghtol, 1986). Topic alone is not a sufficient criterion and needs to be supplemented by other criteria such as situational factors. The term comment implies not only the discrete individual attributes of the use context but also the relations among them to the user meaning.

This suggests a strong basis for an argument that information search can be improved if the meaning of the information and the need are related by the two components of topic and comment together. Often users may not address both the topic and comment components when they search for information even though the connection of topic and comment is the full meaning represented in the content. It is because their cognitive state lacks the full meaning when they are in need (i.e., they do not know about something, thus their need to find out about it). But providing the topic and comment relations of the content of search result will be useful for the user's relevance check. Given that topic is first employed for the information need specification and then comment is the subsequent necessary component, it is suggested that the comment dimension should be considered as an addition to the content description of the search result, under the current topic-based matching paradigm.

### ***II. b. User-Generated Content Description for Information Search***

User tagging is an actively growing research area in information science that has been gaining popularity lately with increased use and interest in Web 2.0 applications. There are many social bookmarking websites where users can create and assign terms to marked information content which provides a viable way for the users to create their description of the selected content. Tagging is seen as a process of labeling and categorizing information through which meaning emerges from the users (Golder & Huberman, 2007). For example, adding users' personal narratives to an information object has been claimed as a valuable service by having the general public engage in the process of generating tags to an art collection of a digital library (Trant & Wayman, 2007). Trant and Wayman (2007) described an art museum project, which assured the utility of the user-generated narratives over the professionally provided content description of the art work in pro-

viding meaningful access to the museum collections. Tagging has become a community tool to engage user community in sharing individual perspectives, assertions and narratives to an information object to enable other users to access the object by additional user assigned description.

The aggregated user content description is viewed as a valuable source to augment the traditional document representation of the rigid and unitary language model for information representation (Tuominen et al 2003). According to the social constructionist view, the traditional information description assumes that “documents have a substance [i.e., objectively identifiable meanings or messages that can be represented in a clear structure of terms (nouns)].” (Tuominen et al 2003). The user activity of freely describing and assigning labels will enable users to incorporate various perspectives and meanings at multiple levels to enrich the content representation. The importance of user-generated content description has been stated as a valuable source to augment the traditional document representation of the topic-based keyword matching system (Yoon, 2007). With the rapidly growing amount of digital resources on the web and the second-generation web applications, it is vital for users to contribute to creating the content description of information resources not only of user tagging and notes but also link labels and descriptions.

Even though user tagging is one of the fast growing applications that allow users to participate in content description, they are limited in conveying linguistic meaning because they are carried within the keyword-based information representation that assumes independence of terms. Tag terms are listed discretely by a user. Some of the user tags are topic elements that describe aboutness of the object and some others are the comment element that describes how the user views how the object is related to his/her situation. If we find ways to organize the user tags to represent meaning it will help other users to search and access the content.

There have been a few attempts to make use of folksonomic characteristics of user tagging incorporated in the traditional and controlled vocabulary-based classification and representation schemes. Facet tags is one example that shows a semantic approach to collaborative tagging by incorporating faceted classification schemes to facilitate multidimensional browsing where it is assumed that users provide the structure with a folksonomy (Quintarelli et al, 2007). Bubble up tags is another example in which aggregated terms of the most popular tags are assumed to represent the content (Smith, 2008). Terms together in a group may indicate a semantic relationship and association among terms and can be a useful content description. Even though the co-occurrence of terms does not identify any explicit relationship, the value seems to be in the highly movable usage of the terms and their linguistic relations to a user group at specific points in time and space (Bruns, 2008). Overall, these studies suggested an implicit structure in the usage of terms in folksonomy and a rich source for metadata filters based on shared or divergent approaches to the categorization of knowledge (Bruns, 2008).

Facets of tags and bubble up tags are an attempt to incorporate the multiple dimensions of words and their relations together, but they are limited in conveying linguistic meaning. They are carried within the topic-based information organization paradigm that assumes independent terms for information search rather than a meaning created by a set of terms with semantic relations.

### ***II. c. Semantic relations***

Semantic relations represent knowledge structure of “associations between two or more concepts, entities, or sets of entities” (Khoo & Na, 2006). The concepts and relations are considered as fundamental to knowledge and text representation. There are many different types of semantic

relations identified in linguistics and cognitive psychology as well as applied to text processing applications such as information extraction and retrieval. There have been studies in the field of information retrieval that investigated the usefulness of semantic relations. They have applied paradigmatic relations of ontology such as synonymy, antonymy or hyponymy type of rigid relations in generic form. They are also at a lexical level of relations rather than to be employed at the textual level of meaning. These studies did not find the improvement in retrieval effectiveness. One of the interpretations suggests that “document retrieval is too coarse-grained to require the subtlety of semantic relations” (Khoo & Na, 2006).

The use of the semantic relations seems to be more effective in filtering out non-relevant documents (i.e., false positives) from the search result or grouping the search results for the users to view. Given that topic based keyword matching would result in a set of documents for a search, the semantic relations can be used to cluster or filter. Probably the types of relations among terms are only those among the major concepts which have stronger semantic associations than others. Topic and comment relation is proposed because it is a type of relation that can be found among text segments (VanDijk, 1972) and because it involves two conceptual entities, topic and comment, semantically related. In the following section, the proposed research is trying to utilize the idea of simple semantic relations of topic and comment. Topic and comment, the two distinct linguistic components of a meaning, provide an approach to identifying a semantic relation of information seeking (Yoon, 2002, Yoon & Nilan 1999).

### III. Proposed Study

In this study, it is proposed to integrate the folksonomic description of user tags to represent information content in search interface design. The idea of utilizing the user tagging data can be attained by representing the two linguistic components of topic and comment of the content as a simple semantic relation. It is syntagmatic relations from topic and comment components of the user description, that is distinguished from paradigmatic relations of generic ontological semantic relation in which terms are organized to their corresponding hierarchical concepts. They were applied in information research with explicit and logical associations of concepts and relations (Khoo & Na 2006). Most ontological relations were concerned with generic (i.e., free of context) and unitary topic-based relations, which were found of little utility in facilitating information retrieval (Green, 1995). Utilizing folksonomic descriptions will facilitate a strong and dynamic engagement of user searching based on the use of contexts. It is suggested, in this paper, to take a simple relation of topic and comment from the user-generated content descriptions.

It is a simple form of semantic relation with two nodes of topic and comment, and a connector, the relation between the two entities. A simple form of semantic relation of topic and comment relation might be useful to improve the search results because it is possible to provide related concepts are identified in the set of discrete terms in the index. The simple semantic relation of topic and comment can be inferred from user tags to be applied to the user interface to provide document description with clustering to help users to better grasp the content in a search situation. Information search starts with one or a partial dimension of information (i.e., topic or comment) as an incomplete meaning with a few keywords because users do not know how to fully represent the need. The search is done by matching the keyword(s) between the user query and the docu-

ment surrogate. Then the search results are displayed and this can be done by consolidating both topic and comment dimension of the information content. It will be useful to display the document of the search result and how the document content is related to the keywords used in the query in relation to its full meaning of the content.

The semantic relations of topic-comment are proposed as a specific way to supplement the topic-based keyword matching. Assuming the user query is not a complete representation of the information since the users have difficulty describing what they do not know or need to find out (i.e., ASK principle), topic based keyword matching can be a first step to exclude those not relevant; then, the next step would require a filtering technique to refine the search results displayed in a way to provide better representation of the content for the user. Users, however, are able to recognize what they need encountering the resources from the search result. Distinction of topic or comment may not be critical once the relation is defined. That is, each entity can be viewed as topic or comment. Each entity may have relations of narrow-broad terms and the type of relation between the entities can be drawn from the user notes and the actual content as well as tag terms.

The objective of this study is to utilize the semantic relation of topic-comment of the user-generated content description into information representation. The hypothesis is that there are a set of terms that are semantically associated more strongly than others in representing information content and that they can be identified from user tags. The study will analyze user tags to see if they can provide the meaningful simple relations among concepts to represent the content.

Research Questions are the following:

What would be the user-based description of information content from user tags?

1. Whether or what are the simple semantic relations found from tag terms?
2. Whether or to what degree the simple semantic relations can be used to represent document content?
  - 1.1 Whether or what are the linguistic clues found in such relations?
  - 1.2 Whether or what are other patterns identified from user tags?

#### **IV. Data collection**

A social bookmarking site, delicious (delicious.com), was chosen for the context of data gathering of user tags because this site is one of the earlier social bookmarking sites, and has minimal limitations in the types of web sites users access and in the way they assign tags and notations. The source documents are selected from the bookmarked materials in delicious. They are intentionally limited to journal articles, news and blogs in order to retain the independent document unit of information for content analysis. User tags contain a list of single terms the user assigned to the bookmarked website. User notes are a full text of user meaning in natural language form that Delicious allows users to freely attach. There are little explicit semantic relations among the top tags indicated from the list alone but the notes attached to tags are useful indications of user meaning.

The unit of analysis is a document, each article chosen. For each document there is a source text, the original article and user tags and notes attached. The source text will be processed into a list of index with frequencies. The source text includes the original text and the topic-comment

relations which is based on the Hutchins' (1977) text analysis scheme of theme-rheme for micro and macro text analysis. The user tags will be processed into a list of index with identifying user so that analysis can be done for both within user and across users.

## V. Preliminary Data Analysis

The data analysis presented here was from an exploratory and initial analysis investigating the possibility of inferring topic and comment relations from user tags to create content description. Even though words appearing together in a document may indicate a useful association, there is yet no explicit relationship identified "even if two tags were used in concert all the time by a wide variety of users across multiple resources, we couldn't make any claims about them other than that they are highly related" (Smith, 2008). Therefore, the analysis was mainly an exploratory investigation of capturing semantic meaning from the user by using semantic definitions and relations in natural language, which is expected to provide a basis for later automated inquiries.

The initial analysis with user tags and notes was done looking at the tags of individual users with notes in order to explore the user meaning. User tags contain a list of single terms the user assigned to the bookmarked website. Overall, there were little explicit semantic relations among the top tags indicated from the list alone. User notes are a full text of user meaning in natural language form that Delicious allows users to freely attach. User notes were particularly helpful to induce the user meaning associated with specific use of tag terms. Users used notes to remind themselves why they bookmarked the material, and why it was important.<sup>1</sup> Often, user notes included quotes from the original content or from the link where the article was located. It also included the user's own annotative descriptions and comments. In either case, it was in a natural language text, not a single word, to possibly present a semantic basis close to the user meaning. Thus it helped to understand a user's view and analysis of the user defined concept. The analysis was also looking at the co-occurrence of the tag terms within individual user's tag lists.

The other analysis was focused on the descriptive tags and notes of personal annotation and review among different kinds of tags such as resource type, source and ownership, descriptive and personal (Smith, 2008). For each sample, a simple semantic relation was constructed from the content analysis of user notes and sets of tags. The intention was to create two different clusters of concepts for the topic and the comment.

## VI. Results

The data set used for this pretest is described in Table 1 below. There was a total of ten selected source texts gathered from the delicious site. Among the ten, six were text based and four were non- text based such as video or flash animation. The difference between the text based and non-text based was noted from the number of notes attached. More notes were available for text based sites. The further analysis was only examined the six text-based sources.

The type of user tags and notes within a user were from the source text, from the link text and from users' own description. First, many user notes were a part of original text in the source article. This shows the segments of the text that is highly useful that seems to overlap with earlier

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<sup>1</sup> This came from user interviews for other related studies not published yet

studies of partial relevance. Second, many users were taking the same description phrase from the content, that was used for anchor text where the source document was linked from. Third, some of the tag terms were driven from user's specific attachment rather than presented in the original text. For example, in Fig. 2, the concept of Internet, hypertext, Web and Web 2.0 was added by users even though the terms were not mentioned in the actual content: the article was forecasting such technologies. User notes often indicated different kinds of common usage of description such as "by Donald Norman," "for 112 class," "from Bob," or "to read."

**Table 1.** Summary of Data Set

Title	No. of marked	No. of notes (%)	No. for top tag (%)
"Is Google making us stupid"	4500	1146 (25.46)	2056 (45.68)
"Ontology is overrated"	4441	889 (20.01)	2407 (54.19)
"As we may think" Bush	1187	351 (29.57)	433 (36.47)
"simplicity is highly overrated"	450	114 (25.33)	275 (61.11)
"The checklist"	409	98 (23.96)	160 (39.11)
"Archives and museum informatics"	77	23 (29.87)	30 (38.96)
*Randy Pausch "Last Lecture" CMU	435	56 (12.87)	157 (36.09)
*Randy Pausch "Last Lecture" Youtube	2064	381 (18.45)	722 (34.98)
**"Animator v. animation" Youtube	105	17 (16.10)	50 (47.61)
**"Animator v. animation" Flash	1069	169 (15.80)	564 (52.75)
Average for text based materials	1844	2621 (25.70)	893.5 (46.09)
* non-text based materials	1836.5	* 155.8(15.81)	*373 (42.86)

One of the interesting findings that invites further investigation was that some words tend to occur together. For example, "medicine" and "science" together and "internet" and "technology" was found together for specific content by most user tags.

The analysis of semantic relations among tag terms showed that there were two main entities of concepts for the document. The type of relations among terms for an entity was Hyponym-Hyperonym, antonym and synonym relations but only within the context of the source text. The topic-comment relation includes verb phrases, the cluster for comment was treated as a cluster of noun phrases similar to that of topic because most user tags were nouns. The relation inferred by verbs from user notes provided a connection between the two nodes. Each of the terms was selected from the top tags and placed in the circle while the cluster of related concepts was formed with connecting circles. Usually, the cluster of a concept included terms to represent the concept at multiple levels as the semantic progression in the text develops. The term is related to the broader concepts as it goes down. There are two main clusters: one of topic in the left and one of comment in the right.

The simple semantic relations resemble Hutchins' micro structure and macro structure of text semantic progression of the two components of theme and rheme. Macro structure is a semantic relation representing the underlying propositions in the global semantic progression; whereas micro structure is a semantic association of specific and individual segments within the semantic coherence of the global progression (Hutchins, 1977). Each cluster of the simple semantic relation from the analysis included terms in hierarchical progression, which is not necessarily the same as in the original text even though it does include a broader context of use. Some individual user tags pertained to the micro structure (i.e., a part of the content rather than the whole text) but the count did not seem to be significant enough to reach the top tags across the user group. The broad level

concepts are usually from user-created meanings related to the content such as application area and use dimension that were not included in the original content.

Even though it was a preliminary investigation, the results suggest the simple relations of two entities among the tag terms. For an example, the text can be matched to a query “simplicity” or “simplicity in UI design.” In displaying the text as one of the search result, the description not only contains the “simplicity” how it matches the user query which is mostly done in the current search systems but also the other dimension, “overrated” or “doesn’t sell” of the content. This new dimension will discriminate the text from others in the search results all of which will match the topic of “simplicity” but with a variety of diverse meanings such as “to improve design process” or “as critical design principle” to make up a few.

Another way is to use the terms from the user tags in matching and incorporate the semantic relations in displaying the results. For another example, the text can be matched to a query, “Internet history,” or “evolution of Internet” even though the text does not have the term Internet. Then this text will be grouped with those that foretell the Internet. Under the topic used in the search, “Internet history,” the new dimension can be used to create clusters of search results other than those explicitly used in the user query.

## VII. Implications

The idea of using tags can also be applied to a personalized interface design for creating tags or for displaying search results. A tag creating interface can be designed to provide automated tag categories based on repeating use of certain word such as “for,” “from,” or “by.” A search display interface can be designed to provide multiple ways to cluster search results according to the use dimension.

There are search engines that already cluster search results (e.g., clusty.com) but they do not incorporate terms outside the content such as those from user tags. Adding a use dimension will be useful for other users to recognize those they want because they can make a connection based on the similar perspective or need situation.

The topic-comment relation is suggested not only for the document level description but also for the problem level. At the document level, the relations can be used to represent the document contents by two related concepts. The content can be related to a particular use, or to a user annotation that may not appear in the actual text of the content. At the problem level they can be used to represent user meanings where user problem or question can be related a set of documents. It seems to work well with a small community of user groups or a special collection of information of a selected subject area such as a set of blogs or reviews attached to an article. Given a collection of information resources, searching can be done by user-added description as well as topic. User-generated description can be either questions or content description. FAQ is one such service, but the way these questions are organized is by topical elements. This requires further user studies to find detail use dimensions and user questions in a given problem area.

## VII. Conclusion

The value of collaborated tagging was viewed in the creation of the aggregated user assigned information content description that can meaningfully connect other users to the information in the collection. The discussion addressed the nature of users' information behavior inherent in the meaning attached to information contents. An attempt was made to capture user-created meaning attached to the content from user tagging data with the implicit relations of their meaning that they were trying to connect with information objects. Topic and comment was used as the basis for simple semantic relations of the user tags. Sample analyses showed interesting evidence for further in-depth investigation of the user-created tagging.

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