DEVRY UNIVERSITY JOURNAL OF SCHOLARLY RESEARCH

Vol. 4 No. 2
Winter 2018

DeVry University
Keller Graduate School of Management

DeVry University
Keller Graduate School of Management

DEVRY UNIVERSITY JOURNAL OF SCHOLARLY RESEARCH

TABLE OF CONTENTS

ARTICLES:

CASE STUDY:

FROM THE CLASSROOM:

BOOK REVIEWS:

CALL FOR PAPERS:

A MESSAGE FROM THE NATIONAL DEAN, FACULTY LEADERSHIP AND DEVELOPMENT

I am honored to present to you our Winter 2018 *DeVry University Journal of Scholarly Research*. As a community of faculty embracing Ernest Boyer's model of scholarship, this volume brings some particularly timely and thought-provoking scholarly contributions to strengthen our practices of classroom androgogy.

Dr. Penn Wu writes an intriguing article on Problem Based Learning and its application in technology programs. Dr. Wu cites current challenges and solutions to move this instructional strategy forward as an innovative teaching practice for highly technical courses/programs.

Dr. Sarbani Vengadaslam presents a piece from the classroom on The Why And The How of The Infographic. This is a critical contribution to our classroom scholarship as we move to support Universal Design Learning – and allow learners to consume content in different ways that align with their learning preferences.

Finally, Dr. Dasantila Sherifi writes an affirming piece advocating for the importance of ensuring that academic quality drives the course design process. Dr. Sherifi evaluates current traditions and offers several well thought out implications for practice to improve teaching and learning via course design.

We continue to be proud of the andragogical practices our faculty have embraced to transform our classrooms. The current volume and associated artifacts of scholarship continue to modernize our classrooms. Let this journal continue to be a vital catalyst of change that is happening in our ever transformative classrooms.

Lynn Marie Burks, PhD.
National Dean, Faculty Leadership and Development

A MESSAGE FROM THE MANAGING EDITORS

We would like to extend a very warm welcome to the DeVry University community and our broader audience of scholars to the Winter 2018 issue of the *DeVry University Journal of Scholarly Research* (DUJOSR).

In this issue, we have included four papers, two from-the-classroom pieces, a case study, and a book review. We were so delighted to receive so many submissions for this issue, and among these, a great many came from our visiting professors. As we have seen in the past, this issue includes contributions from across our University disciplines. To whet your appetite, we will very briefly introduce the work of our contributors:

- An examination of the rationality of carbon-driven economic policies and the global evidence and implications for decision-making
- The state of standardized testing
- Applied project-based pedagogy to stimulate coding literacy for non-computer-science majors
- How to qualify for more free money for college by using effective financial planning, from a practitioner's perspective
- Goldman Sachs and Toshiba case study – Regulatory compliance: Can employees resist adaptation and conformation?
- Course design, an important aspect of academic quality
- The why and the how of the infographic wow – Infographics in teaching and writing: Best Practices
- Life, music, and art in 15th Century Bruges

We would like to recognize and thank the very dedicated members of the Board of the DUJOSR, which includes Dr. Lynn Burks, the design team, college editors, our team of copy editors and peer reviewers, and our authors. Our ability to develop and sustain our journal is due to the efforts of this very fine team. We would like to welcome Shawn Schumacher to the role of College of Liberal Arts and Sciences Co-Editor and Lisa McCool to her role as a copy editor. Please consider joining us as an author or reviewer for the next issue!

To view or share current or past issues of the journal, visit the DeVry University Newsroom: *newroom@devry.edu* and internally in the CTE in Canvas.

Deborah Helman, PhD
Managing Editor

Michael Bird, PhD
Managing Editor

DeVry University
Keller Graduate School of Management

DEVRY UNIVERSITY JOURNAL OF SCHOLARLY RESEARCH

EDITORIAL BOARD OF THE DEVRY UNIVERSITY JOURNAL OF SCHOLARLY RESEARCH

JOURNAL INFORMATION

The DeVry University Journal of Scholarly Research (ISSN 2375-5393 1) is a semi-annual, multi-discipline, peer-reviewed, journal devoted to scholarship and education research.

MANUSCRIPT SUBMISSIONS INFORMATION

The journal welcomes unsolicited articles, case studies, reviews, and letters on scholarship, education research or related subjects. Text and citations should conform to APA style as described in the *Publication Manual of the American Psychological Association* (6th ed.). Because the journal employs a system of anonymous peer review of manuscripts as part of its process of selecting articles for publication, manuscripts should not bear the author's name or identifying information.

Electronic submissions of manuscripts (MS Word) and all other communications should be directed to: *DUJOSR@devry.edu*

EDITORS AND REVIEWERS

DeVry faculty who wish to apply for positions on the Journal's board of editors or as reviewers of manuscripts should contact Deborah Helman or Michael Bird.

PEER REVIEWERS FOR THIS ISSUE

The following DeVry faculty served as peer reviewers for this issue. We thank them for their service.

Barbara Bailey, PhD
Michael Dufresne, MA
Louis Freese, MS
Jennifer Harris, PhD
Paula Herring, MBA
John Kavouras, MA
Jacqueline Lang, PhD
John MacCatherine, PhD
Elliot Masocha, DBA
Jacqueline Saldano, DM
Russ Walker, PhD
Penn Wu, PhD

INSTITUTIONAL REVIEW BOARD

DeVry University has an Institutional Review Board (IRB) to protect the rights and welfare of humans participating as subjects in a research study. The IRB ensures the protection of subjects by reviewing research protocols and related materials. DeVry University's colleagues and students who want to conduct research must first contact the IRB for an application. Once received, the IRB will review the application and supporting materials to determine if all criteria have been met before approving the research.

In support of helping colleagues and students gain an in-depth understanding of ethical research processes, the IRB obtained a Collaborative Institutional Training Initiative (CITI) membership. CITI provides globally accepted training that aids the research process.

Those who wish to submit applications to the IRB are required to complete CITI training beforehand. For additional information, you can contact the DeVry University IRB through the following email address: *dvuirb@devry.edu*.

IRB MEMBERS

Lorenzo Bowman, JD, PhD
Senior Professor
College of Business & Management
404-270-2927
lbowman@devry.edu

Moe Saouli, DPA
Assistant Dean of Academic Excellence,
Long Beach & San Diego
562-997-558
1msaouli2@devry.edu

John W. Weber, DBA
Senior Professor and Faculty Chair
630-829-0208
jweber@devry.edu

IRB ADMINISTRATOR

Andrea Henne, EdD
Professor
College of Liberal Arts & Sciences
858-361-5002
ahenne@devry.edu

DeVry University Journal of Scholarly Research (2018) / Volume 4, Number 2

EXAMINING THE RATIONALITY OF CARBON-DRIVEN ECONOMIC POLICIES: GLOBAL EVIDENCE AND IMPLICATIONS FOR DECISION-MAKING

ANDREW TUHOLSKI
COLLEGE OF LIBERAL ARTS & SCIENCES

Author Note: Andrew Tuholski is a visiting professor in political science at Chamberlain University, Downers Grove, IL.

ABSTRACT

Economically rational behavior is likely to be more important than social change in terms of determining the quality of the human response to climate change, and emissions trading is an attempt to introduce self-interested emissions-related behavior that is also sustainable. The main drawback of previous methods of calculating the environmental Kuznets hypothesis (EKH) curve has been the absence of a time component, which not only precludes forecasting but also impedes the identification of when, if at all, a country might have transitioned to the downslope of the EKH. In this research paper, a log-transformed, time-series ratio approach is utilized as a means of overcoming these limitations. The relationship between carbon emissions and economic developments in the context of the United States, China, and the world are examined with an eye on practical recommendations.

Correspondence regarding this article should be addressed to Andy Tuholski at andy.tuholski@gmail.com

Keywords: climate change, environmental policy, carbon emissions, environmental Kuznets hypothesis, economic rationality

Arthur Pigou (1924) famously noted that the short lifespans of individual humans can lead to economically rapacious behavior, a tendency that requires either firm regulation or an economically rational alternative to the capacity to obviate. This observation applies most aptly to the global grand challenge presented by climate change. Perhaps the most important question that can be asked of policies that favor a carbon-driven approach to economic development is whether—and for whom—such policies are rational. In the context of numerous countries in the developing world, carbon has been overtly or tacitly described as a driver of economic growth, a necessary evil whose existence is accepted in order to grow the global middle class (Müller et al., 2013; Wiedenhofer et al., 2017). Such claims make conceptual sense in the context of economies heavily dependent on manufacturing and industry as well as on the mass purchase of automobiles and other sources of emissions (Wang & Chen, 2015). Even in the United States, there are numerous voices in government that support more emissions-friendly policies. In 2017, under the direction of President Donald Trump, the United States abandoned the Paris Treaty (Butler, 2017), placing it, for the moment, on the side of those countries that embrace carbon emissions as a source of economic growth.

The main question asked, and answered, in this paper is whether a carbon-driven approach to economic development is rational. One plausible rationale for emissions-friendly practices would be if such practices exerted a causal impact on economic growth. If such a causal relationship either does not exist—for a set of countries, a specific country, or the globe as a whole—or if the relationship is weak, then the argument for embracing emissions is weakened. Accordingly, the first objective of this paper is to test the relationship between carbon emissions and economic developments in the context of the United States, China, and the world. The second objective of the paper is to apply the results of the empirical analysis to the formulation of global emissions policies.

EXAMINING THE EMISSIONS-GROWTH RELATIONSHIP

Carbon emissions are conceptually related to economic growth in numerous ways. First, carbon emissions result from the operation of the industrial and manufacturing infrastructure; nations that are rich in factories and other sites of physical production are therefore likely to emit (on a per capita basis) high amounts of carbon (Lin & Wang, 2015). To the extent that industry and manufacturing are drivers of economic growth, then, there is a positive correlation between emissions and economic growth.

Second, in addition to being a byproduct of the kind of industrial and manufacturing activity that drives growth in many countries, carbon emissions reflect the kind of consumption likely to drive further growth. In countries such as China and India, an expanding middle class has taken to the mass purchase of automobiles and the consumption of natural gas for heating and powering dwellings, thus increasing emissions further (Huaman & Jun, 2014; Sanwal & Wang, 2015; Shirgaokar, 2014). In terms of both consumption and production, carbon emissions appear to be positively correlated with economic growth.

However, it is not universally accepted that carbon emissions are positively correlated with economic growth in an open-ended manner. The environmental Kuznets hypothesis (EKH) is that after a certain threshold of development, the environmental damage wrought by economic activity declines (Al-Mulali, Saboori, & Ozturk, 2015; Apergis & Ozturk, 2015; de Vita, Katircioglu, Altinay, Fethi, & Mercan, 2015; Jebli, Youssef, & Ozturk, 2016; Lau, Choong, & Eng, 2014; López-Menéndez, Pérez, & Moreno, 2014). According to the EKH, income first increases as environmental quality declines; afterwards, income increases as environmental quality also increases.

If the EKH is correct, there are several important implications for policy and practice. First, emissions-friendly policies are likely to be rational for countries in the first stage of the EKH, because the relationship between environmental degradation and economic growth is self-correcting. At the first stage of development, a country will incur environmental damage, but this damage will decline once a certain threshold of development is reached. There has been evidence for this claim long before the advent of statistical testing; for example, developed countries such as the United States and the United Kingdom have been noted to experience periods of high emissions during their early stages of industrial and manufacturing growth, with such emissions declining steadily as both countries became more mature industrial powers and continuing to decline as the U.K. and U.S. moved to services-based economies (Marsiglio, Ansuategi, & Gallastegui, 2016). More recently, there is panel-based and other kinds of statistical evidence for the viability of the EKH as tested for specific countries (Al-Mulali et al., 2015; Apergis & Ozturk, 2015; de Vita et al., 2015; Jebli et al., 2016; Lau et al., 2014; López-Menéndez et al., 2014).

Second, if the EKH is correct, countries who are in the second stage—the stage during which environmental degradation is no longer a necessary byproduct and driver of economic growth—need not pursue what would be the rational first-stage policy of emissions-friendly governance.

Therefore, the EKH suggests the rationality of a two-stage model of environmental policy. First, developing countries should embrace carbon emissions in order to speed their transitions to becoming developed countries. Second, developed countries should not consciously attempt to implement high-emissions policies, because, for such countries, wealth is no longer driven by highly environmentally degrading activities.

The EKH has been formally tested in numerous studies and with numerous approaches (Al-Mulali et al., 2015; Apergis & Ozturk, 2015; de Vita et al., 2015; Jebli et al., 2016; Lau et al., 2014; López-Menéndez et al., 2014). One approach is to utilize an autoregressive distributed lag (ARDL) model combined with Granger causality (Bölük & Mert, 2015). The advantage of such an approach is that it models the impact of changes in carbon emissions alongside the impact of past values of gross domestic product (GDP) per capita; given that GDP per capita is highly autocorrelated, its past values clearly need to be taken into account when measuring the impact of changes in carbon emissions. This kind of time-series approach is also useful for estimating the impact of a shock in carbon emissions on the subsequent n periods of GDP per capita.

EMPIRICAL TESTING: THE UNITED STATES

For certain countries — such as the United States — the ARDL approach does not elucidate the nature of the relationship between economic growth and emissions. An ARDL test on American carbon emissions per capita (measured in metric tons) and GDP per capita, with GDP per capita treated as the dependent, indicated the lack of long-run cointegration, $p = .9484$. *Table 1* below contains the bounds test (Pesaran, Shin, & Smith, 2001) result of this model.

TABLE 1: ARDL BOUNDS TEST, USCO2 →USGDP

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship F = 0.359
t = -0.556

Critical Values (0.1-0.01), **F-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_1	4.04	4.78	4.94	5.73	5.77	6.68	6.84	7.84

accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), **t-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_1	-2.57	-2.91	-2.86	-3.22	-3.13	-3.50	-3.43	-3.82

accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

While ARDLs might have been useful in developing countries, which is the context in which such models appear to have been used more frequently (Al-Mulali et al., 2015; Apergis & Ozturk, 2015; de Vita et al., 2015; Jebli et al., 2016; Lau et al., 2014; López-Menéndez et al., 2014), they do not contribute as much to understanding the nature of the relationship between economic growth and carbon emissions in the United States and perhaps other developing economies, as is clear from *Table 1* above.

One novel approach to the examination of the EKH is the use of Chow breakpoint testing (Chow, 1960) in order to (a) determine the location of the break, if any, between the two stages of EKH; and (b) utilize what is learned about the break in order to predict when other countries might shift from the first to the second stage of EKH.

Both of these results of Chow breakpoint testing are highly useful. It should be noted that the detection of the EKH has tended to be highly visual in nature, with researchers generating their own EKH curves and inspecting the results for evidence of a transition from the first to the second stage of the EKH. However, the EKH curve is not always simple to interpret, as is clear from *Figure 1* below. In *Figure 1*, the classic inverted-U shape (Al-Mulali et al., 2015; Apergis & Ozturk, 2015; de Vita et al., 2015; Jebli et al., 2016; Lau et al., 2014; López-Menéndez et al., 2014) of the EKH is distorted, and it is not clear when the United States entered the second stage

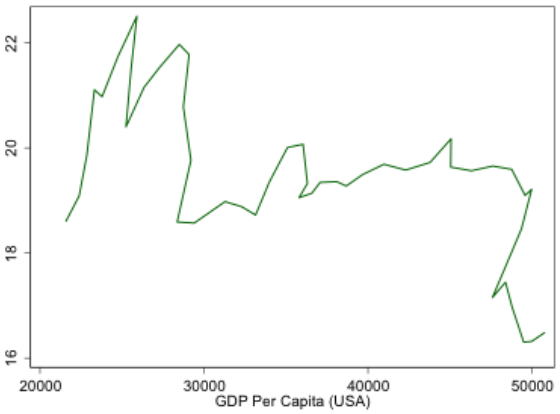


Figure 1. *EKH curve for the United States, 1967-2014. **Note:** original figure based on World Bank data World Bank (WB, 2017).*

of the EKH, the period during which emissions no longer need to be courted or tolerated in order to generate economic growth. A Chow breakpoint analysis can be applied to these data as follows. First, both the GDP per capita and CO2 emissions per capita figures can be log-transformed. Second, a ratio of the log-transformed CO2 emissions per capita to the log-transformed GDP per capita can be calculated. Third, this ratio can be graphed by year. The resulting graph (see *Figure 2*) does not take the classic inverted-U shape of the EKH, but it is substantially cleaner than the unadjusted graph (see *Figure 1*) and also keyed to the year, which allows time-series procedures such as Chow breakpoint analysis to be conducted on the data.

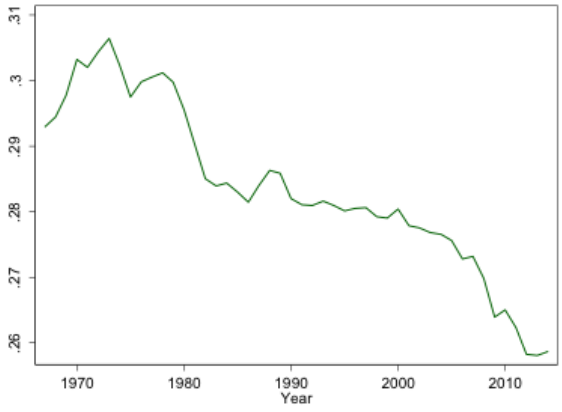


Figure 2. *Ratio of log-transformed CO2 emissions to log-transformed GDP per capita for the United States, 1967-2014. **Note:** original figure based on World Bank data (WB, 2017).*

Essentially, the use of a CO2 / GDP per capita ratio sorted by year allows the identification of a breakpoint following ordinary least squares (OLS) regression analysis. In the case of the United States, the regression of year on ratio is statistically significant, $F(1, 46) = 341.19$, $p < .001$, with the yearly decline in the CO2 / GDP per capita ratio being -0.0009. Following this regression, the breakpoint for the ratio appears to come in 1980:

TABLE 2: ESTIMATED BREAKPOINT FOR THE U.S. CO2 / GDP RATIO

```
Full sample:                1 - 48
Trimmed sample:             9 - 41
Estimated break date:       1980
Ho: No structural break

     Test            Statistic          p-value
─────────────────────────────────────────────────
     swald            23.0944            0.0003
─────────────────────────────────────────────────
Exogenous variables:          Year
Coefficients included in test: Year _cons
```

Thus, for the United States, 1980 was potentially the final year in which the CO2 / GDP ratio was still part of the inverted-U dynamic of the EKH. Alternatively, put more simply, the U.S. can be said to have been in the second stage of the EKH from 1980 onwards, meaning that 1980 was the last year in which carbon-friendly policies could have been useful in terms of driving

economic growth. If this analysis is correct, then demands for increased carbon emissions in the United States as a means of spurring economic growth are likely to be irrational. Therefore, in the United States, the demand for increased carbon emissions through the relaxing of regulation is better understood not as a rational economic policy but as the expression of an anti-environmental political stance disguised as economic policy.

An added point of interest in empirical testing of the relationship between economic growth and carbon emissions in the United States is the apparent one-way causality of this relationship. As indicated in *Table 3*, U.S. GDP per capita (USGDPPC) Granger-causes U.S. carbon emissions per capita (USCO2), but U.S. carbon emissions do not Granger-cause U.S. GDP per capita. The absence of a statistically significant Granger-causal effect of carbon emissions on U.S. GDP per capita further suggests the pointlessness of seeking additional economic growth through the kinds of policies that would allow an increase in emissions.

TABLE 3: GRANGER CAUSALITY TESTS, U.S. CARBON EMISSIONS AND GDP PER CAPITA

VAR GRANGER CAUSALITY/BLOCK EXOGENEITY WALD TESTS *SAMPLE: 1967 2014* *INCLUDED OBSERVATIONS: 46*			
Dependent variable: USCO2			
Excluded	Chi-sq	df	Prob.
USGDPPC	8.151478	2	3.515424
All	8.151478	2	3.515424
Dependent variable: USGDPPC			
Excluded	Chi-sq	df	Prob.
USCO2	3.515424	2	0.1724
All	3.515424	2	0.1724

The same procedures applied to examining the relationship between economic growth and carbon emissions in the United States have next been applied to China, and, after China, to the world.

EMPIRICAL TESTING: CHINA

The case of China is of interest for a number of reasons. First, as the second-largest economy in the world, China is intrinsically worthy of analysis. Second, China still appears to be on the first EKH stage (see *Figure 3* below), raising the question of when China might transition to the second stage.

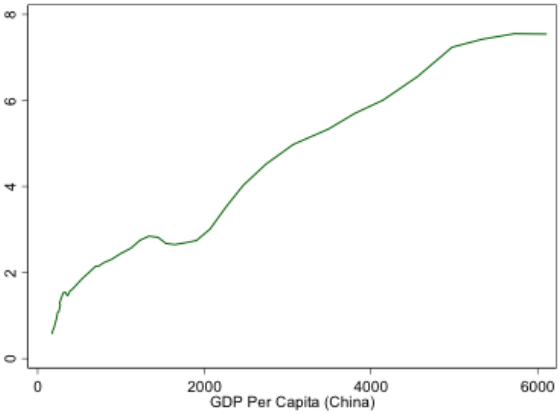


Figure 3. *EKH curve for China, 1967-2014.*
Note: *original figure based on World Bank data (WB, 2017).*

The relationship between Chinese GDP per capita and CO2 emissions per capita is highly linear, $F(1, 46) = 2{,}030.72$, $p < .0001$. The coefficient of determination of this relationship is 0.98, indicating that 98% of the variation in Chinese GDP per capita can be explained through variation in Chinese emissions per capita. Every added one metric ton of carbon emissions in China is associated with a rise in China GDP per capita of $824.98. This relationship suggests the current rationality of Chinese emissions policies, which are lax (Dhakal, 2009; Ou, Zhang, & Chang, 2010; Zhang, He, & Huo, 2012), and it also calls at least one previous set of results (Jalil & Mahmud, 2009) into question. Jalil and Mahmud found evidence for the existence of a classic inverted-U relationship between Chinese emissions and real GPD per capita on the basis of 1975-2005 data; such a relationship does not appear to exist, at least based on the use of 1967-2014 World Bank data and the variables of CO2 emissions per capita and GDP per capita.

One point of similarity between China and the United States is the nature of the Granger-causal relationships between GDP and carbon emissions. As was the case for the U.S., in China, GDP per capita Granger-causes carbon emissions per capita, but emissions do not Granger-cause GDP per capita.

TABLE 4: GRANGER CAUSALITY TESTS, CHINA CARBON EMISSIONS AND GDP PER CAPITA

VAR GRANGER CAUSALITY/BLOCK EXOGENEITY WALD TESTS *SAMPLE: 1967 2014* *INCLUDED OBSERVATIONS: 46*			
Dependent variable: CHINACO2			
Excluded	Chi-sq	df	Prob.
CHINAGDPPC	8.558417	2	0.0139
All	8.558417	2	0.0139
Dependent variable: CHINAGDPPC			
Excluded	Chi-sq	df	Prob.
CHINACO2	2.019688	2	0.3643
All	2.019688	2	0.3643

The results of Granger causality testing suggest that, despite the high correlation between Chinese GDP and Chinese carbon emissions, the relationship appears to be one in which growth raises emissions without emissions having the same kind of reciprocal effect on growth. The results of Granger testing offer some reasons to be skeptical about an emissions-driven growth strategy for China.

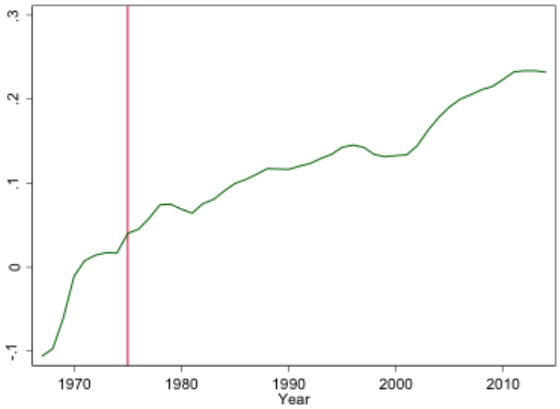


Figure 4. *Ratio of log-transformed CO2 emissions to log-transformed GDP per capita for China, 1967-2014. **Note:** original figure based on World Bank data (WB, 2017).*

For the Chinese ratio of log-transformed CO2 emissions to log-transformed GDP per capita, the breakpoint comes in 1975. It can therefore be concluded that China definitively entered the first stage of EKH in 1975, and that it remained in this stage as of 2014.

One point of interest in the EKH curve for China is the apparent quadratic fit, which, in turn, can be used to predict when China might enter the second EKH curve (that is, the point at which economic growth no longer seems to need carbon emissions).

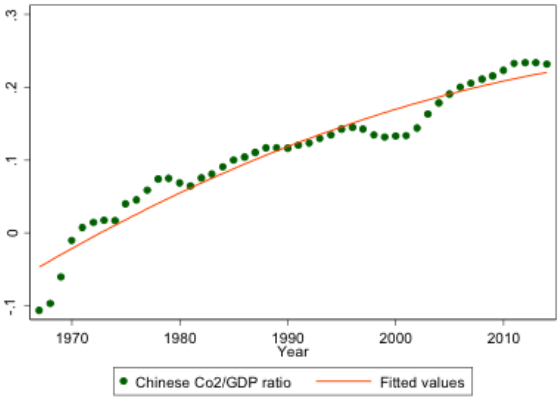


Figure 5. *Potential quadratic pattern in the ratio of log-transformed CO2 emissions to log-transformed GDP per capita for China, 1967-2014. **Note:** original figure based on World Bank data (WB, 2017).*

The quadratic regression equation formula for China is as follows:

$$\text{Ratio} = (\text{Year})(0.0068) + (\text{Ratio}^2)(-0.91) - 13.17$$

Based on the quadratic fit, the high point of China's CO2 emissions per capita to GDP per capita ratio was 2013, the year in which this ratio was 0.0546. In 2014, the ratio fell to 0.0538. Therefore, China appears to have recently made the transition to the second EKH stage. For Chinese policy, the main implication of this finding is that carbon-favoring regulations or approaches are no longer necessary.

One method of testing the EKH is to graph the curve of income versus emissions and observe the shape of the emerging curve. However, this

approach is of limited predictive value, because the X-axis measures income, not time. Creating a CO2 / GDP ratio allows for the generation of a simple but explanatorily powerful predictive model, as the shape of the generated curve can be modeled by any number of techniques (such as quadratic regression for China), and changes in the regression regime can easily be identified.

EMPIRICAL TESTING: THE WORLD

The shape of the EKH curve for the world is very interesting, as there is evidence for the inverted-U shape until the threshold of around $8,000, after which the relationship between CO2 emissions and GDP capita once again becomes linear.

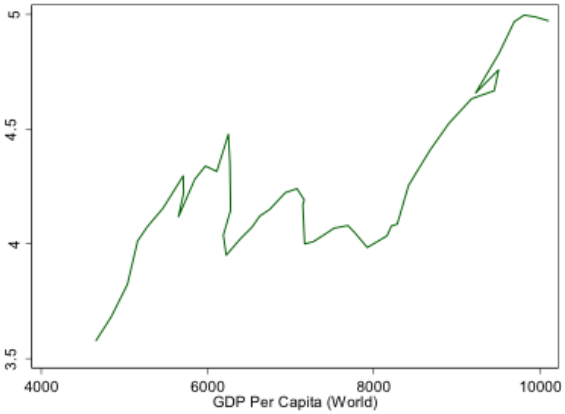


Figure 6. *EKH curve for the world, 1967-2014. **Note:** original figure based on World Bank data (WB, 2017).*

After log-transformation and placement into a time-indexed ratio, the data suggest that the EKH curve for the world is either a random walk or a highly distorted U-curve that entered the second EKH stage as of 2013.

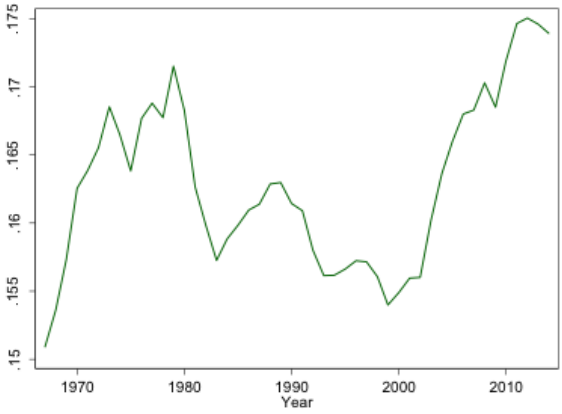


Figure 7. *Ratio of log-transformed CO2 emissions to log-transformed GDP per capita for the world, 1967-2014. **Note:** original figure based on World Bank data (WB, 2017).*

At the world level, therefore, the EKH has an inconclusive shape.

CARBON EMISSIONS AND ECONOMIC POLICY

The empirical analyses offered in the first section of the paper have important implications for emissions policies. Perhaps the most important implication involves the rationality of carbon trading. If the EKH is correct, then, at some point, countries will enter a period during which they will not obtain additional increases in income on the basis of increased CO2 emissions. There are at least two policy implications that follow. The first implication is that some countries are likely to be emissions over- or under-users depending on where they might be on the EKH, and that policy might be required to correct economically irrational behavior in this regard. The second implication is that the identification of carbon emissions trading partners might be more efficient if pairing stage-1 EKH countries with stage-2 EKH countries.

Consider the data on surrendered emission reduction units (ERUs) in various European countries for the trading period 2008-2012 (European Union [EU], 2017). These data, presented in ***Table 5***, identify the European countries that were most likely to pay in order to use more carbon emissions units than they were allotted by regulation. Once these data are converted to per capita figures (see ***Table 6***

b) and tabulated by each country's position on the EKH curve, they can be used to identify advanced economies that are disproportionately reliant on carbon emissions to drive economic growth.

As expected, the histogram (see ***Figure 8***) for the European countries in ***Table 5*** indicates a clustering close to 0. As advanced economies, these countries are more likely to be on the downslope of the EKH and therefore not reliant on carbon emissions for growth. However, although there are no outliers *per se* (see ***Figure 9***), there are clearly some countries that are surrendering more emissions, even after controlling for population. These data suggest that, for some European countries, there is an over-reliance on carbon emissions that is not likely to be justified by the need for economic growth. In terms of policy, therefore, it would be appropriate for both heavy and light carbon emissions credits users to revisit their policies in light of their EKH curves. The prediction that emerges from ***Table 6***, for example, is that a country such as Slovenia is an over-user of ERUs. After the presentation of the tables and figures related to ERU measurement for the sample of 30 European countries, the case of Slovenia has been analyzed through the construction of an EKH curve for that country. This EKH curve can help to cast further light on whether current policies related to emissions in Slovenia are economically rational.

TABLE 5: EMISSION REDUCTION UNITS [ERUs] BY COUNTRY, EUROPE (2008-2012 TRADING PERIOD)

COUNTRY	SURRENDERED ERUs
Austria	4988952
Belgium	5397712
Bulgaria	13587718
Croatia	0
Cyprus	854130
Czech Republic	18735943
Denmark	7450563
Estonia	2268127
Finland	4075998
France	19008759
Germany	132857556
Greece	11322449
Hungary	2792995
Iceland	0
Ireland	2874551
Italy	29167171
Latvia	467620
Liechtenstein	0
Lithuania	3477985
Luxembourg	8066
Malta	1071529
Netherlands	11027404
Poland	30702902
Portugal	4567634
Romania	16294449
Slovakia	292783
Slovenia	4683998
Spain	23585622
Sweden	2113323
United Kingdom	22105493

TABLE 6: POPULATION ADJUSTED ERUs BY COUNTRY, EUROPE (2008-2012 TRADING PERIOD)

COUNTRY	SURRENDERED ERUs	POPULATION (2014)	ERUs PER CAPITA
Austria	4988952	8541575	0.584079
Belgium	5397712	11209057	0.481549
Bulgaria	13587718	7223938	1.88093
Croatia	0	4238389	0
Cyprus	854130	1152309	0.741233
Czech Republic	18735943	10525347	1.78008
Denmark	7450563	5643475	1.32021
Estonia	2268127	1314545	1.72541
Finland	4075998	5461512	0.746313
France	19008759	66331957	0.28657
Germany	132857556	80982500	1.64057
Greece	11322449	10892413	1.03948
Hungary	2792995	9866468	0.28308
Iceland	0	327386	0
Ireland	2874551	4617225	0.622571
Italy	29167171	60789140	0.479809
Latvia	467620	1993782	0.234539
Liechtenstein	0	37127	0
Lithuania	3477985	2932367	1.18607
Luxembourg	8066	556319	0.014499
Malta	1071529	427364	2.5073
Netherlands	11027404	16865008	0.653863
Poland	30702902	38011735	0.807722
Portugal	4567634	10401062	0.439151
Romania	16294449	19908979	0.818447
Slovakia	292783	5418649	0.054032
Slovenia	4683998	2061980	2.2716
Spain	23585622	46480882	0.507426
Sweden	2113323	9696110	0.217956
United Kingdom	22105493	64613160	0.342121

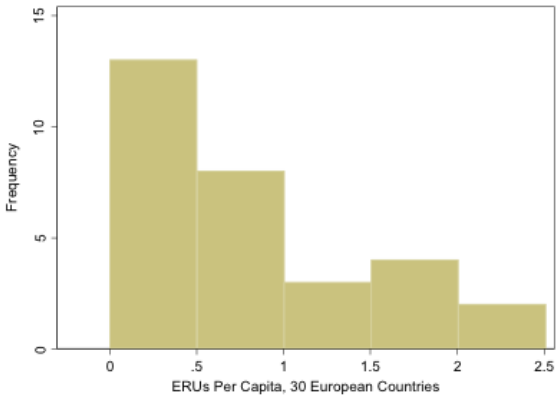


Figure 8. *Histogram, ERUs per capita in 30 selected European countries.*

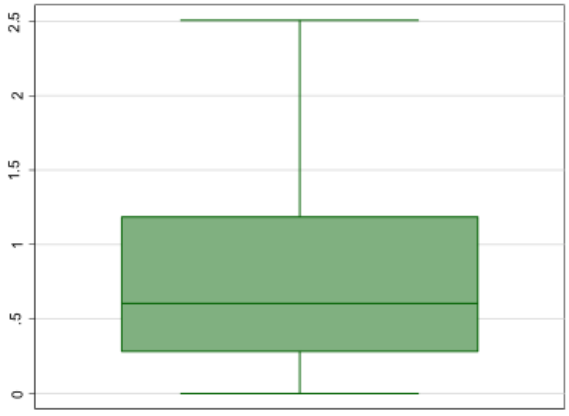


Figure 9. *Boxplot, ERUs per capita in 30 selected European countries.*

Theoretically, then, Iceland should be on the downslope of the EKH. ***Figure 10*** contains a line of quadratic best fit on the log-transformed CO2 per capita / GDP per capita ratio for Iceland. The fitted curve resembles the shape that the EKH ought to take, that of an inverted U. In fact, Iceland is far along into the second EKH stage, which would, in turn, indicate that Iceland is acting rationally in terms of ensuring that it has no surrendered ERUs.

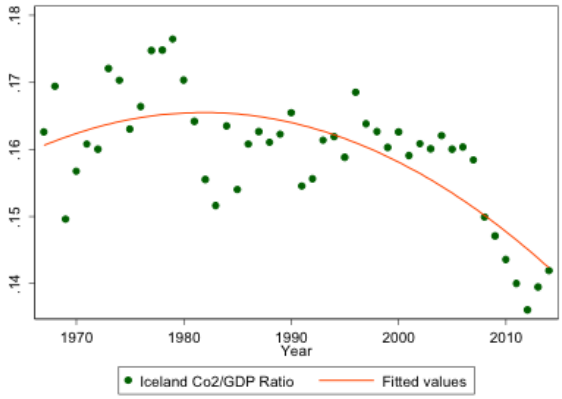


Figure 10. *Potential quadratic pattern in the ratio of log-transformed CO2 emissions to log-transformed GDP per capita for Iceland, 1967-2014.* ***Note:*** *original figure based on World Bank data (WB, 2017).*

The country with the highest ERUs per capita was Malta. The time-transformed EHK curve for Malta indicates that the country is still close to the first stage of the EHK. In the time period from 2003-2008, it was justified for Malta to surrender ERUs, as the country was just about to make the transition to the second stage of the EHK. However, if Malta were to continue to pursue an emissions-based strategy in a post-2014 recording period, it would probably be irrational, as the country is now on the downslope of the EHK.

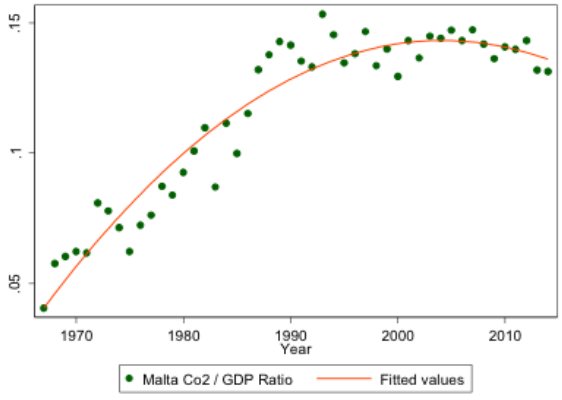


Figure 11. *Potential quadratic pattern in the ratio of log-transformed CO2 emissions to log-transformed GDP per capita for Malta, 1967-2014.* ***Note:*** *original figure based on World Bank data (WB, 2017).*

Thus, both Malta and Iceland can be described as engaging in rational emissions behavior based on their respective locations on the EKH curve. As Malta was still on the upslope in the 2003-2008 period, it was correct to pursue a policy that resulted in the surrender of large numbers of ERUs per capita, as doing so could have been a means of speeding Malta's tradition to the downslope of the EKH. Likewise, for Iceland, which has been on the downslope of its EKH curve for many years, it is similarly rational to eschew surrendering ERUs and, instead, pursue policies that do not emphasize emissions-driven growth. On the other hand, Germany, which was a leading emitter in the 2003-2008 period vis-à-vis its regulatory obligations (see ***Table 6***), is also on the downslope of its HKC curve, which suggests that Germany's emissions policy is currently irrational.

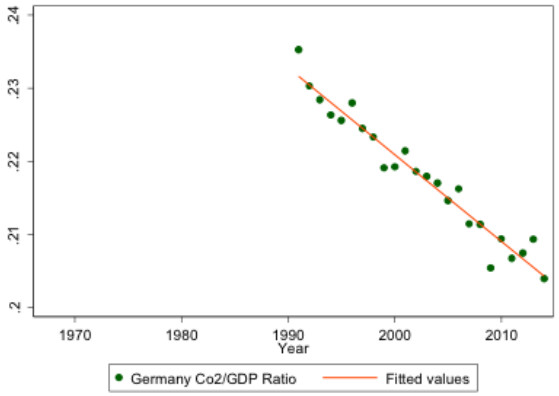


Figure 11. *Potential quadratic pattern in the ratio of log-transformed CO2 emissions to log-transformed GDP per capita for Germany, 1967-2014. **Note:** original figure based on World Bank data (WB, 2017).*

Admittedly, the concept of rational economic behavior at the country level is a simplification. There are likely to be individual considerations that could prompt a country such as Germany to trade carbon in a manner that does not appear consonant with its position on the EKH curve. On the other hand, it would also be the case that carbon-trading policy is not driven by policy-makers who are themselves informed by empirical analysis. Whatever considerations of rationality might or might not apply to a country in terms of its carbon-trading strategy and positioning on the EKH, the kinds of empirical analysis presented above can help researchers and policy-makers to better understand the broad outlines of an emissions strategy that is appropriately informed by theory.

CONCLUSION

Climate change is perhaps the most important existing threat to human survival (Cook et al., 2013; Levermann et al., 2013; Rogelj, Meinshausen, & Knutti, 2012; Trenberth et al., 2014; Yoshida, Gable, & Park, 2012). Climate change has taken place, and continues to take place, because of a paradigm of economic development in which the burning of fossil fuels is held to be a necessary component of economic growth, which, in turn, addresses the needs of the world's rising middle class (Heede, 2014; Ou et al., 2010). Therefore, one of the most important debates in economics, political science, and international relations is the debate over the relationship, if any, between economic growth and environmental degradation, as emissions are a major factor in climate change (Cook et al., 2013; Levermann et al., 2013; Rogelj et al., 2012; Trenberth et al., 2014; Yoshida et al., 2012). If carbon emissions are ineluctably associated with growth, then, at some point in the future, either unbridled human consumption will lead to a genuine environmental catastrophe, or consumption will be curtailed by regulation, changing lifestyles, and other social forces.

By contrast, if carbon emissions are not associated with economic growth, then there is no environmental cap on development. In theory, all countries could become service economies and pursue growth through means not associated with an increase in emissions. Thus, a great deal is at stake in determining whether the EKH is true.

Previous empirical studies (Al-Mulali et al., 2015; Apergis & Ozturk, 2015; de Vita et al., 2015; Jebli et al., 2016; Lau et al., 2014; López-Menéndez et al., 2014) have validated the EKH for several developing countries. In this study, the classic inverted-U curve of the EKH hypothesis was not identified for the United States, China, or the

world. However, for the United States and China, it seems likely that the absence of a curve is a data artifact. The World Bank's carbon emissions data begin in 1967, which appears to be during the end of the era of America's time in the first EKH state. To be sure, the post-1967 data for the United States look like half of an inverted-U shape, and it is likely that the pre-1967 data would, if generated, represent the characteristic curve of the EKH. For China, on the other hand, not enough time seems to have passed for the country to have transitioned from the first to the second stage of the EKH, but, from the highly quadratic form taken by the existing data, it seems justified to predict that China has just entered the downslope of the EKH. The world data, finally, are a random walk, which is also a theoretically likely result of combining data from countries at different stages of their own EKH curves and also other countries for which the EKH is not as likely to be explanatorily useful.

If the EKH is correct, then, in terms of policy, there are a number of important implications, from the global to the more local levels. In terms of carbon trading, there is likely to be an empirical basis for identifying optimal trading partners. A country that is on the downslope of the EKH would, for example, be best suited to a trading partner on the upslope of the EKH.

It might seem as if the general trajectory of carbon trading takes this format anyway, with the more advanced economies selling emissions credits to developing economies (Lau et al., 2014). However, based on the analyses presented in this paper, there are two important conclusions to be reached about global carbon trading. With respect to the EU, there appear to be some countries that have surrendered more carbon credits than they should have done and they should therefore revisit their carbon-driven economic growth policies. An analysis of surrendered credits and other variables relevant to carbon trading might reveal the existence of other such countries — for example, stage-2 EKH countries that appear to be embracing stage-1 policies, and vice versa. If the EKH curve for a particular country takes a neat quadratic form or can otherwise be forecast with a relatively high degree of certainty, it is possible to identify appropriate carbon-trading partners that might not be apparent through other means. For example, according to the analysis of China presented earlier in this study, it seems justified to conclude that China is entering its EKH downslope, which, in turn, means that China should rely less on carbon emissions to drive growth during this period in its economy. Thus, China is actually a good candidate to sell carbon emission rights to a less-developed country.

The main drawback of previous methods of calculating the EKH curve has been the absence of a time component, which not only precludes forecasting but also impedes the identification of when, if at all, a country might have transitioned to the downslope of the EKH. Creating a log-transformed, time-series ratio variable is a means of overcoming these limitations and generating the kinds of findings and practical recommendations that were provided in this study.

Pigou's words from 1924 still ring true: our short lifespans directly lead to economically rapacious behavior that requires regulation or economically rational alternatives. Economically rational behavior is likely to be more important than social change in terms of determining the quality of the human response to climate change. Emissions trading is an attempt to introduce self-interested emissions-related behavior that is also sustainable (Brunner, 2008; De Gouw, Parrish, Frost, & Trainer, 2014; Gavard, Winchester, & Paltsev, 2016; Heede, 2014; Ranson & Stavins, 2016). We are no longer in a position to prevent all of the dangerous effects of climate change; however, it is clear that we must identify and promote behaviors that are more rational in order to minimize potential future harm.

REFERENCES

Al-Mulali, U., Saboori, B., & Ozturk, I. (2015). Investigating the environmental Kuznets curve hypothesis in Vietnam. *Energy Policy*, *76*, 123-131.

Apergis, N., & Ozturk, I. (2015). Testing environmental Kuznets curve hypothesis in Asian countries. *Ecological Indicators*, *52*, 16-22.

Bölük, G., & Mert, M. (2015). The renewable energy, growth and environmental Kuznets curve in Turkey: An ARDL approach. *Renewable and Sustainable Energy Reviews*, *52*, 587-595.

Brunner, S. (2008). Understanding policy change: Multiple streams and emissions trading in Germany. *Global Environmental Change*, *18(3)*, 501-507.

Butler, D. (2017). Climate scientists flock to France's call. *Nature*, 547(7663), 269-273.

Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica: Journal of the Econometric Society*, *28(3)*, 591-605.

Cook, J., Nuccitelli, D., Green, S. A., Richardson, M., Winkler, B., Painting, R., ... Skuce, A. (2013). Quantifying the consensus on anthropogenic global warming in the scientific literature. *Environmental Research Letters*, *8(2)*, 2-24.

De Gouw, J., Parrish, D., Frost, G., & Trainer, M. (2014). Reduced emissions of CO2, NOx, and SO2 from US power plants owing to switch from coal to natural gas with combined cycle technology. *Earth's Future*, *2(2)*, 75-82.

de Vita, G., Katircioglu, S., Altinay, L., Fethi, S., & Mercan, M. (2015). Revisiting the environmental Kuznets curve hypothesis in a tourism development context. *Environmental Science and Pollution Research*, *22(21)*, 16652-16663.

Dhakal, S. (2009). Urban energy use and carbon emissions from cities in China and policy implications. *Energy Policy*, *37(11)*, 4208-4219.

European Union. (2017). *Surrendered units*. Retrieved from https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1

Gavard, C., Winchester, N., & Paltsev, S. (2016). Limited trading of emissions permits as a climate cooperation mechanism? US–China and EU–China examples. *Energy Economics*, *58*, 95-104.

Heede, R. (2014). Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854–2010. *Climatic Change*, *122(1-2)*, 229-241.

Huaman, R. N. E., & Jun, T. X. (2014). Energy related CO2 emissions and the progress on CCS projects: A review. *Renewable and Sustainable Energy Reviews*, *31*, 368-385.

Jalil, A., & Mahmud, S. F. (2009). Environment Kuznets curve for CO2 emissions: a cointegration analysis for China. *Energy Policy*, *37(12)*, 5167-5172.

Jebli, M. B., Youssef, S. B., & Ozturk, I. (2016). Testing environmental Kuznets curve hypothesis: The role of renewable and non-renewable energy consumption and trade in OECD countries. *Ecological Indicators*, *60*, 824-831.

REFERENCES (CONT'D)

Lau, L.-S., Choong, C.-K., & Eng, Y.-K. (2014). Investigation of the environmental Kuznets curve for carbon emissions in Malaysia: Do foreign direct investment and trade matter? *Energy Policy, 68*, 490-497.

Levermann, A., Clark, P. U., Marzeion, B., Milne, G. A., Pollard, D., Radic, V., & Robinson, A. (2013). The multimillennial sea-level commitment of global warming. *Proceedings of the National Academy of Sciences, 110(34)*, 13745-13750.

Lin, B., & Wang, X. (2015). Carbon emissions from energy intensive industry in China: Evidence from the iron and steel industry. *Renewable and Sustainable Energy Reviews, 47*, 746-754.

López-Menéndez, A. J., Pérez, R., & Moreno, B. (2014). Environmental costs and renewable energy: Re-visiting the environmental Kuznets curve. *Journal of Environmental Management, 145*, 368-373.

Marsiglio, S., Ansuategi, A., & Gallastegui, M. C. (2016). The environmental Kuznets curve and the structural change hypothesis. *Environmental and Resource Economics, 63(2)*, 265-288.

Müller, D. B., Liu, G., Løvik, A. N., Modaresi, R., Pauliuk, S., Steinhoff, F. S., & Brattebø, H. (2013). Carbon emissions of infrastructure development. *Environmental Science & Technology, 47(20)*, 11739-11746.

Ou, X., Zhang, X., & Chang, S. (2010). Alternative fuel buses currently in use in China: Life-cycle fossil energy use, GHG emissions and policy recommendations. *Energy Policy, 38(1)*, 406-418.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16(3)*, 289-326.

Pigou, A. C. (1924). The economics of welfare. New York, NY: Transaction Publishers.

Ranson, M., & Stavins, R. N. (2016). Linkage of greenhouse gas emissions trading systems: Learning from experience. *Climate Policy, 16(3)*, 284-300.

Rogelj, J., Meinshausen, M., & Knutti, R. (2012). Global warming under old and new scenarios using IPCC climate sensitivity range estimates. *Nature Climate Change, 2(4)*, 248-253.

Sanwal, M., & Wang, B. (2015). China and India and the new climate regime: The emergence of a new paradigm. *Global Policy, 6(4)*, 517-521.

Shirgaokar, M. (2014). Employment centers and travel behavior: Exploring the work commute of Mumbai's rapidly motorizing middle class. *Journal of Transport Geography, 41*, 249-258.

Trenberth, K. E., Dai, A., Van Der Schrier, G., Jones, P. D., Barichivich, J., Briffa, K. R., & Sheffield, J. (2014). Global warming and changes in drought. *Nature Climate Change, 4(1)*, 17-22.

Wang, Q., & Chen, X. (2015). Energy policies for managing China's carbon emission. *Renewable and Sustainable Energy Reviews, 50*, 470-479.

Wiedenhofer, D., Guan, D., Liu, Z., Meng, J., Zhang, N., & Wei, Y.-M. (2017). Unequal household carbon footprints in China. *Nature Climate Change, 7(1)*, 75-80.

World Bank. (2017). Development indicators. Retrieved from http://data.worldbank.org Yoshida, H., Gable, J. J., & Park, J. K. (2012). Evaluation of organic waste diversion alternatives for greenhouse gas reduction. *Resources, Conservation & Recycling*, 60, 1-9.

Zhang, Q., He, K., & Huo, H. (2012). Policy: Cleaning China's air. *Nature, 484(7393)*, 161-162.

DeVry University Journal of Scholarly Research (2018) / Volume 4, Number 2

STATE OF STANDARDIZED TESTING

DEBORAH LYNN WHITE OWEN
COLLEGE OF LIBERAL ARTS & SCIENCES

Author Note: Deborah Lynn White Owen is a visiting professor at DeVry University, Jacksonville, Fl.

ABSTRACT

Florida had been involved in high-stakes, standards-based, standardized testing used for high school graduation purposes since 1972. With Common Core State Standards (CCSS) being used by the majority of the states in the country, Florida's lack of participation in the formative assessment platform for the CCSS left a reference gap between the Florida Standards Assessments (FSA) platform, the CCSS participants, and the global community. An historical critique of the literature supporting both standardized testing generally, and Florida's standardized testing specifically, was presented; a call for additional research on both the ACT and SAT college entrance exams, currently accepted as concordant exams for the FSA, in order to determine the validity of possible substitution, was also presented. With the Governor and the State of Florida calling for further research on possible testing alternatives, concordant test results, including supporting statistical data from a large district in the state, were indicated in order to affect portability, comparability, and accountability, for future Florida assessment.

Correspondence regarding this article should be addressed to Deborah Lynn White Owen at lowen@devry.edu.

Keywords: standardized testing, common core, accountability, Florida

Florida held the distinction of being the first state in the country to require a high school exit exam. Since 1977, the statewide assessment program had seen several versions of the mandated assessment instrument, including the current Florida Standards Assessments (FSA), English Language Arts (ELA), and FSA Algebra 1 End-Of-Course Assessment (EOC), which was required in mathematics. A concordant score on either of the nationally recognized ACT or SAT college entrance examinations could be substituted for the FSA in English Language Arts. Additionally, a concordant score on the Postsecondary Education Readiness Test (PERT) could be substituted for the FSA Algebra 1 EOC. Regardless of which version of ELA or mathematics exam was considered, the design and intent of the Florida high school assessment system had been to measure Florida standards-based accountability, at the student, teacher, school, and district levels.

On Monday, April 3, 2017, a Florida Senate Panel determined that examination of the assessment, after more than a decade of accountability reports attached to the actual student scores, must focus on the expanding possibilities presented by tests which were currently recognized as concordant exams. The questions raised by the panel's discussions drew those involved to consider the need for research to be conducted into the feasibility of using concordant college entrance exams and corresponding scores to replace the

current Florida Standards Assessments (FSA) and FSA Algebra 1 EOC (Ferrante, 2017). The call for research raised the hopes of the state's stakeholders and raised the question of whether or not the legislature's proposal had gone far enough. With the ACT and SAT college entrance exams filling the current needs of students desperately seeking an alternative to the state assessment system, which was standards-based rather than norm-referenced, the possibilities raised by the substitution of one or both of these exams for the state-approved and -created exams, became the subject of the present research.

The need to determine the advantages, if any, relating to feasibility, accountability, and portability of primary-use college entrance examinations, instead of the current Florida Standards Assessments system, made it necessary to investigate the Florida testing system. Since Florida was the first state to recognize the validity of a high school exit exam, the challenge was expanded to include the theory or theories surrounding standardized testing generally, including the validity of such testing and measures of assessment in educational settings. A critical analysis and review of the literature of standardized, high-stakes testing, from historical roots to present, was indicated, in order to determine the future course of the research. Future research, leading to the collection and analysis of data, directed by research hypotheses, was to be determined from the literature review presented.

HISTORICAL TIMELINE AND PREDECESSOR ASSESSMENT

Despite a rise in awareness and popularity in contemporary American educational settings, the roots of standardized testing were not established in the United States, but rather the process of testing to determine level of achievement can be traced to China's civil service exams in 2200 B.C. Archery, arithmetic, ceremonial comportment, equestrian skills, and writing were all assessed for mastery levels in order to place each candidate at the appropriate administrative level in the Chinese government (Miyazaki, 1976). Standardized testing in the United States did not make its appearance in the public school arena until the mid-1800s (Giordano, 2005). Oral recitation method of assessment had become the norm for determining individual educational growth throughout most of the school districts in the United States, assessing each student, one recitation at a time, until 1845. The oral recitation method of assessment was replaced by a standardized written essay exam, which was promoted by Horace Mann's efforts to develop a more efficient method of examination. Produced by compulsory education laws in the United States, swelling student enrollments forced the need for a more efficiently administered tool of assessment, which would also make evaluation more objective than the oral predecessor (Rothman, 1995).

During the early 1900s, intelligence and achievement tests were developed in the United States after French psychologists Alfred Binet and Theodore Simon created the first test of intelligence measurement to accurately predict students' success or academic failure in France's school systems (Wolf, 1973). The thirty-question exam prompted American psychologists Henry Goddard, Edmund Huey, and Lewis Terman to develop an American version of the Binet test, which became known as the Stanford-Binet, in order to determine student success rates in the United States (Resnick, 1982). After the appearance of the Stanford-Binet exam, Edward L. Thorndike, also an American psychologist, with his Columbia University students, continued to perfect his version of an achievement test by adding tests in reading, language, handwriting, spelling, drawing, and arithmetic (Wigdor & Gardner, 1982). In fact, Thorndike's handwriting test was considered to be one of the first norm-referenced tests in the country, impacting the design of all future standardized testing in the United States and beyond (Pearson & Stallman, 1994).

Due to the advent of World War I, the government felt it necessary to screen nearly two million recruits for the military, assessing and sorting soldiers according to their abilities. Individual administrations of written essay examinations were both tedious and potentially subjective, without the benefits of needed precision of

data. Arthur Otis, Stanford graduate student and assistant to Lewis Terman (Stanford-Binet), emerged as the creator of yet another, more efficient assessment system, using paper-and-pencil approach to the original Stanford-Binet. By adopting the technology, which had made Frederick J. Kelly's (1916) *The Kansas Silent Reading Test* unique, Otis introduced the American assessment community to multiple-choice questions. By creating an examination of intelligence, which could assess the level of achievement of an entire room of participants, using exactly the same questions in a fraction of the time it had taken to assess written essays, the American standardized exam industry was born (Samelson, 1987).

The first intelligence tests of the new multiple-question type were administered in the forms of Army Alpha and Army Beta tests (Dubois, 1970). World War II saw the consolidation of the Army Alpha and Beta tests into a test known as the Army General Classification Test, a test designed to measure individual aptitude, as opposed to the former general tests that measured many aptitudes. With the addition of Johnson's Markograph test-scoring device (Lemann, 1999) and the transition from oral to silent reading examinations (Smith, 1934/2002), achievement tests had become an integral part of both education and psychology in America (Ward & Murray-Ward, 1999).

Shortly after the Russian launch of Sputnik in 1957, a populist accountability reform effort was instigated. The infant Russian space program had suddenly launched widespread concern among the American public regarding American students' preparation in math and science. Many Americans suddenly questioned the quality of an American educational system that allowed the Soviet Union to be the first in space. The public cry for school reform at the end of the 1950s and the beginning of the 1960s was accompanied by demands for regular scrutiny of student progress on standardized tests (Gredler, 1999; Airasian, 1988).

The Elementary and Secondary Education Act (ESEA) was passed in 1965, requiring all schools receiving federal funding to provide evidence that educational goals were being met. Each school's scores were required to be reported directly to Washington, D. C. The basis of the requirement was known as *accountability in education*, and the testing begun during the 1960s was still in force in 2004. By 1969, legislation was signed into law, creating the National Assessment of Educational Progress (NAEP) as a means of tracking the status of education across the nation, state-by-state (Gredler, 1999; Airasian, 1988).

With accountability transferred from federal to state level, by the mid-1970s states had researched, developed, and implemented various accountability measures, such as competency testing for high school graduation (Cibulka and Derlin, 1995). Test scores became the focus of the taxpayers interested in assessing minimal competencies. The scores became the focal points for both funding and the front-page news. The status of local schools was determined by comparisons made between the test scores of one school versus the scores of another school. Norm-referenced tests became part of the latest educational jargon, but norm-referenced tests and the ensuing scores provided little useful information aimed at improvement of teachers, schools, or school district effectiveness (Gredler, 1999).

Public concern for educational improvement continued into the 1980s, with various reforms leading Selden (1988) to conclude that the public used any information available to monitor reform efforts for school improvement. According to Berlak (1992), the frenzy surrounding competency and assessment peaked when the college entrance exam scores revealed an obvious decline. The focus shifted to a new target — minimum competency standards. Even with the new shift in focus, the 1980s yielded more than just information gathering. In 1983, the United States Department of Education produced a report entitled *A Nation at Risk*. The publication sparked a debate about accountability in public education that was still being felt well into the new millennium (Sanders & Horn, 1998). It did not take long for the governors of the states to take up the debate and the gauntlet, as they began

looking for ways to address their states' education problems (Sanders & Horn, 1998). As a result of the educational emphasis at the state level, many states implemented criterion-referenced, statewide, testing programs (Barton & Coley, 1994).

State governments enacted accountability laws as a method of making schools show whether or not their students were making sufficient progress academically. Accountability laws were a direct result of the significant numbers of negative reports publicizing illiterate high school graduates. The public wondered how the government was spending public tax dollars—emotions ran high. The cause for public distress was the perception that educators were making excuses. The public demanded improved student performance at no increased cost (Popham, 1998). According to Hoff, the 1990s marked the decade of the educational accountability obsession, with many researchers concluding that the United States was truly an *assessment culture* (1999).

Hoff's 1999 treatise also reminded readers that taxpayers were no longer satisfied to allow standardized testing to rest on the fringes of educational circles. The decade's trends had forced standardized testing into the mainstream, as a means of evaluating curriculum and teaching strategies. For the purpose of determining the effectiveness of public schools and public educational programs, state instituted testing programs made sweeping reforms. By 1993, thirty-four of the fifty states had criterion-referenced, statewide testing programs (Barton & Coley 1994). The increased pressure to improve test scores weighed heavily enough on the educational community, forcing shareholders to spend increased amounts of time preparing students for the tests (Smith & Rottenberg, 1991; Herman & Golan, 1993).

In the United States, the large-scale education reform effort of the 1990s was standards-based reform, fueled by the assumption that reform was accomplished when all students learned the challenging content standards of the respective states. Standards-based reform was embodied in the federal *Elementary and Secondary Education Act of 1994: Improving America's School Act*; *Goals 2000: Educate America Act*; and President George W. Bush's reauthorization of the *Elementary and Secondary Education Act of 2001: No Child Left Behind Act*, which focused on closing the achievement gap through accountability, flexibility, and choice. In general, each state was to demonstrate that it had developed and implemented a single, statewide accountability system and provide evidence that the accountability system was effective in ensuring that all local educational agencies, public elementary schools, and public secondary schools made adequate yearly progress (New Jersey Depart of Education, 2002).

Research tended to indicate that for any given educational reform to be successful, teachers had to claim ownership of the process. Berger (2000) speculated teachers were willing to take the necessary actions to enable the testing programs and take an active role in test success in the various states, because the tests were being used to indicate improvement in student achievement. The states were holding the teachers increasingly accountable for student test scores.

Hand-in-hand with educational reform came the cries for school accountability in the United States. Political, populist, and professional pressures had driven the movement, according to the researchers Cibulka and Derlin (1995). They revisited the 1990s era of change, affirming that political and economic elites had taken an accountability stance based on the belief that once goals were clearly defined and stated in behavioral terms, they could be measured, and funding could be linked to results. Ultimately, the movement led to 48 states mandating accountability reforms involving testing, leading to statewide accountability assessments of public educational systems. Thirty-six of the 48 states issued public reports on the test results of individual schools. Despite all of the increased accountability standards, Jones (1998) crystallized the issue when he wrote that almost every state had student academic standards, and that academic standards meant very little without

assessment of progress toward the standards. Simply stated, assessment meant very little without accountability.

HISTORICAL ASPECTS OF EDUCATIONAL ACCOUNTABILITY IN FLORIDA

Initiated in 1972, Florida's statewide assessment program went through many changes over the years. The Florida Standards Assessment (FSA) was the latest of several versions of assessment instruments in the last twenty-five years. The original assessment program measured only a sample of students, but was changed quickly to include all students at selected grade levels. The first tests measured acquisition of certain student minimum competency skills and was known as *minimum competency testing program*. In 1976, the Florida Legislature passed a new accountability act that apportioned the statewide assessment tests to grades three, five, eight, and eleven. The Legislature authorized the nation's first required high school graduation test, implemented in October 1977 (Florida Department of Education, 2001).

By the early 1990s and like many other states, Florida was convinced that accountability for academic achievement should be decided by closer scrutiny of student needs. Pressure built as the state challenged the educational community to educate the students, while considering the workplace, demographics, and the national climate for education reform (Lewandowski & Moller, 1997). The Florida Legislature passed the Education Reform and Accountability Act in May 1991. *Blueprint 2000*, as it was called, provided clear guidelines that schools could use for improvement (OPPAGA, 2004).

The most important feature of Blueprint 2000 was the accountability factor, which returned responsibility for educating children to the schools, teachers, and parents. Justification for the accountability measure was deemed necessary in order to involve the people closest to the students (OPPAGA, 2004). The essence of Blueprint 2000 was the identification of seven state education goals and accompanying performance goals. The delineated goals included were: (1) readiness to start school — communities and schools collaborated to prepare children and families for children's success; (2) graduation rate, readiness for postsecondary education, and employment — students graduated and were prepared to enter the workforce and postsecondary education; (3) student performance — students successfully competed at the highest levels nationally and internationally and were prepared to make well-reasoned, thoughtful, and healthy lifelong decisions; (4) learning environment — school boards provided a learning environment conducive to teaching and learning; (5) school safety and environment — communities provided a drug-free environment and protected student health, safety, and civil rights; (6) teachers and staff — the schools, districts, and state ensured professional teachers and staff, and (7) adult literacy — adult Floridians were literate, had the knowledge and skills needed to compete in a global economy, and exercised the rights and responsibilities of citizenship. Many of the changes outlined were reflective of the national and international reforms instituted beyond Florida (Kushner, Carey, & Kromrey, 1996).

According to Linn (1987), the use of alternative assessments, specifically performance-based assessments, were closely tied to contemporary educational initiatives that dealt with reform. With assessment in mind, the Florida Commissioner of Education established the Committee on Educational Assessment in an effort to study the latest developments in educational assessment programs. Specifically, the Committee's focus was to investigate assessments that were congruent to and in compliance with Florida's accountability program (Florida Commission, 1992). Among the alternative assessment techniques the Committee considered were: (a) addressing student knowledge directly, (b) incorporating tasks that provided an opportunity for students to use higher-order thinking skills, and (c) integrating knowledge learned in and out of the school environment (Janiak, 1997). Even with the suggestions of alternative assessments, the Committee's conclusions acknowledged the complexities that alternative assessments presented. Caution was urged as the Committee implemented several pilot projects.

CURRENT ASSESSMENT OF A STANDARDIZED STATE

After the National Governors Association and the Council of Chief State School Officers determined in 2009 that state educational standards should be uniform throughout the country, the Common Core State Standards (CCSS) initiative was launched in 43 states, two territories, and the District of Columbia (Huddleston & Rockwell, 2015). One of two possible assessments of Common Core standards was administered in these states, beginning with the 2014-2015 school year. Forty-six educational groups around the United States adopted the Partnership for Assessment of Readiness of College and Careers (PARCC) and the SMARTER Balanced Assessment Consortium (SBAC) (Long, 2011). Both exams promised differences in assessment due to their performance-based, computer-administered nature, as well as their formative components. The goals of the new testing platform included informed instruction fueled by statistical data generated throughout the year rather than data that had been generated traditionally by only one, single, end-of-year assessment (Huddleston & Rockwell, 2015).

Governor Rick Scott, Commissioner of Education Pam Stewart, and the Florida State Board of Education initially approved and adopted the Common Core State Standards, along with the other 42 states, in an attempt to establish uniform educational standards across state borders. The efforts of Florida educational leaders to strengthen state educational standards parallel to other states was short-lived. Objections from multiple sectors vocalized concerns of federalization of Florida's educational system; teachers' unions voiced their concerns over too many regulations; parents and students raised their complaints about harder examinations required for graduation purposes; schools focused on additional educational requirements without sufficient funding increases to implement needed programs. It did not take much time for the State of Florida to withdraw from all efforts to become part of the national CCSS movement, the foundational and formative phase for PARCC and SBAC creation and implementation. Without Florida's active participation in the national CCSS premier assessment efforts, Florida was no longer able to anticipate a system of assessment which would allow comparability and compatibility with the other 42 CCSS states (Howard, 2013).

ASSESSMENT OF TEST CHANGE

Florida's withdrawal from active participation in the Common Core State Standards left many questions unanswered, including the question of how students in Florida schools could be expected to compete globally, when 42 states knew what was expected of students across the country and were able to educate their students accordingly. Without some system of referencing other states' academic standards, three major challenges faced Florida's future educational systems: (1) Florida had no portability — out-of-state students could not bring their test scores to Florida for graduation purposes, and Florida students could not take their test scores to another state. (2) Florida had no comparability — global educational standards of growth could not be measured without an assessment platform which allowed for some form of referencing said standards; in addition, Florida only tested reading and math at crucial grade levels, currently, immobilizing comparison in any other subject areas. (3) Florida had no economic accountability — with nearly $110 million allotted for the necessary test creation, maintenance, delivery, and administration, in the 2016-2017 fiscal year, monies spent were not allocated based on expenses which could be compared with those of another state; even with an accountability system based on value-added measurement, Florida had no point of comparison beyond the state's own borders.

Florida's assessment system already recognized and allowed for an alternate testing platform which met and overcame all three of the challenges currently faced within the state assessment program. With a thorough review of the literature and current analysis of the statistical data from both ACT and SAT results within a large school district in the State, possible answers could be correlated and supported with said data, leading to hypotheses and statistical

evidence based on the data given. Such an analysis might allow for global comparison while maintaining the autonomy desired by shareholders of the Florida Educational System. Research of this nature was indicated by the present analysis and, due to Florida's historical assessment efforts, would be considered important to all states from the perspective of maintaining a global educational presence while successfully navigating and overcoming accountability challenges through concordant testing efforts.

REFERENCES

Airasian, P. (1988). Symbolic validation: The case of state-mandated high stakes testing. *Educational Evaluation and Policy Analysis 10(301),*-313.

Barton, P., & Coley, R. (1994). *Testing in America's schools*. Princeton, NJ: Educational Testing Service.

Berger, J. (2000). Does top-down, standards-based reform work? A review of the status of statewide standards-based reform. *NASSP Bulletin*, *84(612)*: 57-65.

Berlaku, H. (1992). The Need for a New Science of Assessment. In H. Berlaku, F. Newmann, E. Adams, D. Archibald, T. Burgess, J. Raven & T. Ronberg (Eds.), *Toward a new science of educational testing and assessment.* New York: SUNY Press.

Cibulka, J. G., & Derlin, R. L. (1995). State educational performance reporting policies in the U.S.: Accountability's many faces. *Dialog,* ERIC, ED 401613.

Ferrante, D. (2017, April 4). *New bill would overhaul Florida's standardized testing system*. [Web log post] Bloggytown. Retrieved from http://www.orlandoweekly.com/Blogs/archives/2017/04/04/new-bill-would-overhaul-floridas-standardized-testing-system

Florida Commission on Education Reform and Accountability. (1992). *Blueprint 2000: A system of school improvement and accountability.* Tallahassee, FL: State of Florida, Department of State.

Florida Department of Education. (1994). An Assessment Design for Goal 3 Student Performance. (Report for Project 290-90950-40001). Tallahassee, FL: Student Assessment Services Section, Bureau of School Improvement and Curriculum.

Florida Department of Education. (2004). *FCAT Briefing Book*. Tallahassee, FL: Florida Department of Education. Retrieved from http://www.firn.eu/doe/sas/fcat/pdf/fcat_brief.pdf

Giordano, G. (2005). *How testing came to dominate American schools: The history of educational assessment*. New York, NY: Peter Lang.

Gredler, M. (1999). *Classroom Assessment and learning.* New York: Longman.

Hoff, D. (1999). Lessons of a century: The assessment culture. *Education Week*, *3*, 20-28.

Howard, M. (2013). *Core wars*. Florida Trend, Business Collection, 136. Retrieved from http://go.galegroup.com/ps/i.do?

Huddleston, A. P., & Rockwell, E. C. (2015). Assessment for the masses: A historical critique of high-stakes testing in reading. *Texas Journal of Literacy Education*, *3(1)*, 39-49. Retrieved from http://www.texasreaders.org_5/15/17

REFERENCES (CONT'D)

Janiak, R. (1997). Blueprint 2000 student performance standards: What variables correlate with teacher perceptions of goal 3. *Florida Journal of Educational Research, 37(1)*, 35-48. Retreived from http://www.coedu.usf.edu/fjer/1997/1997_Janiak.htm

Jones, R., & Fulton, M. (1998). What works. *The American School Board Journal, 185(4)*, 28-33.

Kelly, F. J. (1916). The Kansas silent reading tests. *Journal of Educational Psychology, 7(2)*, 63-80.

Kushner, S. N., Carey, L. M.. & Kromrey, J. D. (1995). A portrait of school improvement efforts across Florida high schools: A content analysis of the 1993-94 school improvement plans. *Paper presented at the American Educational Research Association*. San Francisco, CA.

Learning Research and Development Center and the National Center on Education and the Economy. (1991). *The New Standards Project: An Overview*. Pittsburgh: University of Pittsburgh, Learning Research and Development Center.

Lemann, N. (1999). *The big test: The secret history of the American meritocracy*. New York: Farrar, Straus and Giroux.

Lewandowski, A., & Moller, G. (1997). The change that matters. *Journal of Staff Development 18(3)*, 45-49. Retrieved from http://www.NSDC.org

Long, R. (2011). Common core state standards: Approaching the assessment issue. *Reading Today, 29(1)*, 23-25.

Linn, R. L. (1993). Educational assessment: Expanded expectations and challenges. *Educational Evaluation and Policy Analysis, 15 (1)*, 1-16.

Miyazaki, I. (1976). *China's examination hell: The civil service examinations of Imperial China* (C. Schirokauer, Trans.). New York: Weatherhill.

New Jersey Department of Education. (2002). *Accountability plan. Improving New Jersey Schools*. Trenton, NJ: New Jersey Department of Education, Retrieved from http://www.nipep.rutgers.edu/ImproveNJ/Accountability/Plan/national.htm

Office of Program Policy Analysis and Government Accountability. (2004). *The implementation and impact of Blueprint 2000 administered by the Department of Education (Report No. 95-53)*. Tallahassee, FL: The Florida Legislature/OPPAGA. Retrieved from http://www.oppaga.state.fl.us/reports/educ/r95-54s.html

Pearson, P. D. & Stallman, A. C. (1994). *Resistance, complacency, and reform in reading assessment*. In F. Lehr & J. Osborn (Eds.), *Reading, language, and literacy: Instruction for the twenty-first century* (pp. 239-251). Hillsdale, NJ: Lawrence Erlbaum.

Popham, W. J. (1998). *Tests that help teaching: A personal odyssey*. Los Angeles: IOX Assessment Associates.

Resnick, D. (1982). *History of educational testing*. In A. K. Wigdor and W. R. Gardner (Eds.), *Ability testing: Uses, consequences, and controversies* (pp. 173-194). Washington, DC: National Academy Press.

Rothman, R. (1995). *Measuring up: Standards, assessment, and school reform*. San Francisco, CA: Jossey-Bass.

Samelson, F. (1987). Was early mental testing (a) racist inspired, (b) objective science, (c) a Technology for democracy, (d) the origin of multiple-choice exams, (e) none of the above? In M. M. Sokal (Ed.), *Psychological testing and American society 1890-1930* (pp. 113-127). Piscataway, NJ: Rutgers University Press.

REFERENCES (CONT'D)

Sanders, W. and Horn, S. (1998). Research findings from the Tennessee Value-Added Assessment System (TVAAS) Database: Implications for educational evaluation and research. *Journal of Personnel Evaluation in Education, 12(3)*, . 247-256.

Selden, R. W. (1988). Missing data: A progress report from the states. *The Phi Delta Kappan, 69(7)*, 492-494.

Smith, M. L., & Rottenberg, C. (1991). Unintended consequences of external testing in elementary schools. *Educational Measurement: Issues and Practice, 10(4)*, 7-11.

Smith, N. B. (2002). *American reading instruction (Special Ed.)*. Newark, DE: International Reading Association.

State of Florida. (1991). *Official Florida statutes 1991*. Tallahassee, FL: State of Florida.

Tollefson, N., Tracy, D. B., , Kaiser, J., Chen, J. S., & Kleinsasser, A. (1985). *Teachers' attitudes toward tests. Paper presented at American Educational Research Association*. Chicago, IL.

Ward, A. and Murray-Ward, M. (1999). *Assessment in the Classroom*. Belmont, CA: Wadsworth.

Wigdor, A. K., & Gardner, W. R. (1982). *Ability testing: Uses, consequences, and controversies* (Vol. 1). Washington, DC: National Academy Press.

Wolf, T. H. (1973). *Alfred Binet*. Chicago, IL: University of Chicago Press.

DeVry University Journal of Scholarly Research (2018) / Volume 4, Number 2

APPLYING PROJECT-BASED PEDAGOGY TO STIMULATE CODING LITERACY FOR NON-COMPUTER-SCIENCE MAJORS: AN EXAMPLE OF BARCODE GENERATOR APPLICATION DEVELOPMENT PROJECT

PENN WU
COLLEGE OF ENGINEERING & INFORMATION SYSTEMS

Author Note: Penn Wu is a professor in the College of Engineering & Information Sciences at DeVry University, Sherman Oaks, CA.

ABSTRACT

One overlooked topic among college-level educators is how project-based pedagogy can stimulate learning outcomes in a coding literacy course. This paper attempts to raise the awareness of how project-based learning (PBL), as a non-traditional model, can possibly engage students, particularly those who are not computer science (CS) majors, in exercising basic programming skills for solving real-world problems while learning what they need to know to become a coding literate. This paper starts with the discussion of how a traditional CS-based programming course is not instructionally proper to serve as a course for coding literacy of non-CS majors; continues with a briefing of how project-based pedagogy could stimulate the learning of basic programming skills; and then discusses a proposed project-based lecture as well as the preparation of instructional materials to engage non-CS majors in a hands-on coding project.

Correspondence regarding this article should be addressed to Penn Wu at 818-932-3009 or pwu@devry.edu

Keywords: project-based pedagogy, project-based learning, project-based teaching, project-based coding

Many collaborative efforts have been given to advocate that coding is the new literacy (Dylan, 2015; Papadakis, Kalogiannakis, and Zaranis, 2016; Rushkoff, 2012; Vee, 2017), especially for those who will pursue technical careers. Many schools, from elementary schools to colleges, have responded to the initiative and begun offering computer science (CS) courses across all grades. However, enrolling students in a CS-based programming course is probably not an effective solution to help students become coding literate. A traditional programming course offered by a CS department, if complied with the ACM Curriculum model (ACM, 2013), is not designed for teaching computer literacy. For example, Carnegie Mellon University offers a course titled "Fundamentals of Programming and Computer Science" which is more a preparation course for subsequent CS courses, according to the schools' online catalog (CMU, 2018):

> "A technical introduction to the fundamentals of programming with an emphasis on producing clear, robust, and reasonably efficient code using top-down design, informal analysis, and effective testing and debugging. Starting from first principles, we will cover a large subset of the Python programming language, including its standard libraries and programming paradigms. We will also target numerous deployment scenarios, including standalone programs, shell scripts, and

> web-based applications. This course assumes no prior programming experience. Even so, it is a fast-paced and rigorous preparation for 15-122. Students seeking a more gentle introduction to computer science should consider first taking 15-110. NOTE: students must achieve a C or better in order to use this course to satisfy the pre-requisite for any subsequent Computer Science course."

Teaching a non-CS major with the curriculum compatible or similar to that of a CS major could possibly help the students build a strong foundation to study the core knowledge domains of CS; however, it might not engage students in the realization of practical applications of the learned programming skills unless the students continue to take more CS courses that guide students to explore the application opportunities. If the course objective of an introductory programming course is to help students build coding literacy, then the instructional content does not have to be limited to sequential illustration of traditional topics, as listed in ***Table 1***. The term "coding literacy" refers to the ability to understand how developers implement logics and exercise critical thinking and problem solving skills to write instructions for digital devices to simulate human behaviors. Instructors can design coding projects that guide students through problem identification, concept formulation, solution developing, and hands-on programming activities to produce immediately usable applications, such as a talking text-reader, a simple barcode generator, or a simple financial calculator preferably in the GUI (graphical user-interface) mode.

TABLE 1: BASIC PROGRAMMING TOPICS

TOPICS
Data types
Variables
Inputs, Processing, and Outputs
Arrays and Lists
Operators
Decision structures
Repetition structures
Functions
File Input and Output (I/O)
Object and Class
Exception Handling

Note: *These are the commonly seen topics of a traditional introduction to programming course.*

All the above topics are must-learn topics (core skills), because they are building blocks of useful programs. However, a non-CS major can place more weight on learning on the "know-how" and less weight on the "know-why". Similarly, instructors can guide students to learn how to practically apply these core skills to the building of a software application, and discuss less about "why" they appear in the topic list of course syllabus. One feasible direction is to engage students in hands-on coding projects that use these core skills to manipulate popular application programming interfaces (APIs) to build immediately usable applications. ***Table 2*** is a sample list of popular APIs.

TABLE 2: POPULAR APIs

API
Android
Google Maps Geocoding
Amazon S3
Facebook
.Net Framework
Tel/Tk

Note: *They provide tools for building task-specific application software.*

ADVANTAGES OF PROJECT-BASED CODING PROJECTS

In a hand-coding project that leads to an application, students need to apply almost all the basic programming concepts and skills to develop the code. By building a barcode generator, for example, students will learn to practically apply the following topics.

- Variable: Declare local and global variables to temporarily store data.
- Data type: Convert integer to strings.
- Input, processing, and output: Take a string input from user, process it by matching every character with a drawing pattern, and then a draw barcode.
- Array: Convert string to a character array.
- Operator: Use arithmetic, relational, and Boolean operators to perform algorithmic calculations.
- Decision structure: Use if and switch..case (simulated with a Python "dictionary") structures to produce demanded results.
- Repetition structure: Use for loops to repeatedly process similar tasks.
- Functions: Codes with commonality are organized into functions.
- File I/O: Save the generated barcode as an image file in the local drive.
- Exception handling: The homework requires students to provide a solution to handle an exception which happens when the user enters one or more characters that are not supported by the Code 39 standard (e.g. "^").

In the next sections, the author will describe how to use Python as the scripting language and the "Tkinter" module as the interface to create a barcode generator by manipulating tools of the "Tk" part of the Tcl/Tk API.

INSTRUCTIONAL PREPARATIONS

A frustrating disadvantage of project-based teaching is lack of available instructional materials. Finding the appropriate materials for a technical program of a career-oriented college is always a challenge. Therefore, instructors often have to: (a) develop the lecture notes, (b) create demo codes, (c) write the hands-on learning activities, and (d) design projected-based homework.

The proposed format of lecture notes should start with a brief discussion of the problem, the goals to achieve, or the objectives to meet; continue with a description of how a coding project could viably solve (or reach) the problem (or goals); then, illustrate how to formulate a conceptual coding model and design the coding structure; and finally, write the code to implement the solution. ***Table 3*** illustrates the structure of the proposed lecture notes.

TABLE 3: STRUCTURE OF THE LECTURE NOTES

PHASE
Problem Definition, Goal Statement, Objective Identification
Feasibility Study
Solution Formation
Conceptual Design
Implementation

Note: *Instructors can add items to or remove items from the list to make the instructional materials more effective.*

The next sections will demonstrate how an instructor can prepare a hand-coding project that builds a barcode generator for non-CS majors. Interested instructors can use generated barcodes as examples to prepare the instructional materials for a three-hour, in-class, project-based coding lecture.

PROBLEM DEFINITION

In this scenario, the objective is to build a GUI-based application that: (a) allows users to enter a string such as "apple tree"; (b) generates a scannable Code 39 barcode; and (c) saves the barcode as an image file in the local drive. ***Figure 1*** is a sample user interface of the application, ***Figure 2*** demonstrates how the created image file looks when being loaded by

a graphics editor, and ***Figure 3*** is a screen shot captured by an Android smartphone showing how the generated barcode was scanned and interpreted a "scanner app."

Figure 1. *User interface*

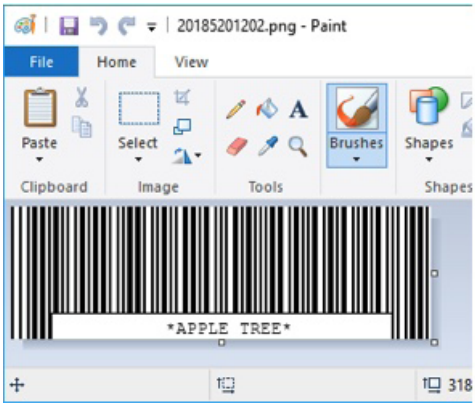


Figure 2. *Image file*

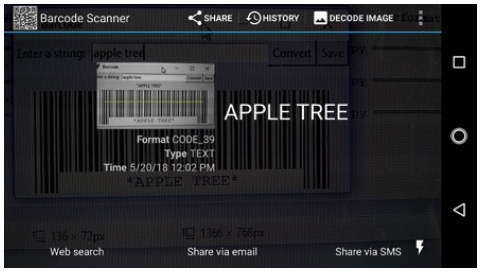


Figure 3. *Result of scanning*

FEASIBILITY STUDY

Every barcode generated by the proposed application is a two-dimensional (2D) computer graphic. In order to draw the graphic in the classroom, instructors need to evaluate the availability and cost of equipment and software toolkits. The requirements are listed below.

- Machine: A desktop or laptop computer running Microsoft Windows, Linux, or Mac OS.
- Programming Language: A programming or scripting language that supports GUI programming and a graphics API. Sample languages are Visual C++, Visual C# Visual Basic, Java, Python, PHP, Perl, and JavaScript, while open-source languages are preferred to lower the initial investment.
- Graphics API: Tk, GDI+, or Java 2D API.
- Coding tool: A generic text editor suitable for hand-coding such as Microsoft Notepad, Linux "gedit", or Mac TextEdit.
- Testing tool: A hand-held barcode scanner or a smartphone with built-in camera that can run a generic "barcode scanner app."

Interestingly, all equipment, software, and tools can be considered as sunk costs that should have been invested by the school before offering programming courses and thus can be ignored. In the classroom, students with a smartphone-based scanner application can help those who do not have the testing tool to eliminate the cost of buying the testing tool.

Additionally, the feasibility study can be extended to cover the discussion of choosing the "best-fit" barcode standard. The "best-fit" candidate is the one that is (a) functionally sufficient for exercising students' programming skills; (b) pedagogically effective for teaching project-based coding; and (c) easy to implement.

Among all available barcode "symbologies," the "Code 39" is an ideal standard for three reasons: (a) it is the alpha-numeric barcodes used by many industries for labels such as name badges, inventory, and store items; (b) its encoding is easy to implement; and (c) almost every barcode scanner (including the "scanner app" of Android and iOS mobile devices) can decode (scan, read, and interpret) Code 39 symbological graphics, so students do not need to purchase hand-held barcode scanners to test their programs.

SOLUTION FORMULATION

Code 39 was originally developed by Dr. David Allais and Ray Stevens of Intermec in 1974 in response to the need of some industries to encode the alphanumeric text in a symbological

graphic which is later known as "barcode" (Allais, 2006). The Code 39 symbology defines the drawing patterns of 43 English characters including: (a) 10 digits (0-9), 26 uppercase letters (A-Z), and (c) 7 symbols (Acordex, n.d.). The seven symbols are space, minus (-), plus (+), period (.), dollar sign ($), slash (/), and percent (%). Additional, asterisk (*) is also defined to be used to enclose the alphanumeric text. The drawing pattern of every Code 39 character is a combination of nine vertical bars: 5 black and 4 white bars. Among these nine bars, six are thin bars, and three are thick bars. Wu and Manrique (2013) use four letters, "b", "B", "w", and "W", known as "legends" to represent the drawing patterns as shown in ***Table 4***.

TABLE 4: CODE 39 LEGENDS

LEGEND	DESCRIPTION
B	Wide Black Bar
b	Narrow Black Bar
W	Wide White Bar
w	Narrow White Bar

Note: Another notation is "F", "N", "f", and "n" for "filled" and "nonfilled" bars.

Figure 4. *Sample barcode*

The ratio of width between a thin and a thick bar can be either 1:2 or 1:3 (Azalea Software, Inc., 2016). If the legend "b" represents a black vertical bar whose width is two pixels, then "B" is a black bar of four or six pixels wide. By definition, all the bars do not have outline (border); therefore, a white vertical bar has its width but is not visible to human eyes unless it is placed between two black bars, as illustrated by ***Figure 4*** which is a sample barcode that encodes the word "car". The action to convert a character to its designated legends is known as "encoding". ***Table 5*** lists all 44 Code 39 characters and their designated drawing patterns (legends).

TABLE 5: DRAWING PATTERNS

CHAR	ENCODING	CHAR	ENCODING
0	bwbWBwBwb	M	BwBwbwbWb
1	BwbWbwbwB	N	bwbwBwbWB
2	bwBWbwbwB	O	BwbwBwbWb
3	BwBWbwbwb	P	bwBwBwbWb
4	bwbWBwbwB	Q	bwbwbwBWB
5	BwbWBwbwb	R	BwbwbwBWb
6	bwBWBwbwb	S	bwBwbwBWb
7	bwbWbwBwB	T	bwbwBwBWb
8	BwbWbwBwb	U	BWbwbwbwB
9	bwBWbwBwb	V	bWBwbwbwB
A	BwbwbWbwB	W	BWBwbwbwb
B	bwBwbWbwB	X	bWbwBwbwB
C	BwBwbWbwb	Y	BWbwBwbwb
D	bwbwBWbwB	Z	bWBwBwbwb
E	BwbwBWbwb	-	bWbwbwBwB
F	bwBwBWbwb	.	BWbwbwBwb
G	bwbwbWBwB	(space)	bWBwbwBwb
H	BwbwbWBwb	$	bWbWbWbwb
I	bwBwbWBwb	/	bWbWbwbWb
J	bwbwBWBwb	+	bWbwbWbWb
K	BwbwbwbWB	%	bwbWbWbWb
L	bwBwbwbWB	*	bWbwBwBwb

Note: This paper adopts the "BbWw" notation (Wu & Manrique, 2013)

The Code 39 standard requires the message (an alphanumeric text) to be enclosed by a pair of asterisks. For example, if the word "car" is the message to be encoded, then the word "car" must be enclosed by a pair of asterisks to form a new string "*car*" before the encoding begins. During the encoding, the Code 39 standard requires a "start indicator", "bW", as prefix. A delimiter, "w", must be inserted between every two characters. ***Figure 5*** (bottom of page) illustrates how the encoding works while ***Figure 4*** (in the previous section) demonstrates the result of drawing based on the following encoding.

DESIGN CONCEPT

The design concept, in this project, has three aspects: (a) convert a string to legends, (b) find a way to draw bars, and (c) draw Code 39 barcodes based on legends. The coding project starts with developing an algorithm to break a string into a character array and then convert each character to its Code 39 legends (the drawing pattern). In the classroom, instructors can explain how to develop pseudo codes, flow charts, or the real computer code to fulfill the IPO (input, processing, and output) requirements of the coding. In the next sections, the author chooses to use Python codes for demonstrations.

CONVERT A STRING TO LEGENDS

The following "getLegend(c)" function takes a character (represented by c) as its parameter. The value of parameter c is specified by the calling party when making a call to the "getLegend()" function. Inside the "getLegend()" function, there is a Python "dictionary" which is used to simulate the *switch..case* structure. In Python, an associative array is called a "dictionary". Unlike other languages, Python does not support the *switch..case* structure. The statement, ′D′: ″bwbwBWbwB″, for example, defines the legends of the letter "D" as "bwbwBWbwB". Therefore, an inquiry like switch[′D′] will return "bwbwBWbwB", as shown in ***Figure 6***.

```
def getLegend(c):
 legend = "";

 switch = {
  '0': "bwbWBwBwb",
  '1': "BwbWbwbwB",
  '2': "bwBWbwbwB",
  '3': "BwBWbwbwb",
  ........
  ........
  '+': "bWbwbWbWb",
  '%': "bwbWbWbWb",
  '*': "bWbwBwBwb"
 }

 return switch[c]
```

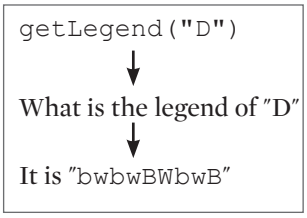


Figure 6. *Legends*

The following Python code demonstrates how to break a string (user input) to an array of characters. It starts with prompting for a string and storing the user input in a variable named "str". It then uses the "upper()" method to convert all letters to uppercase because Code 39 only allows uppercase letters. The Python code also changes the user input (message) to a format that complies with the Code 39 standard. First, the Python code encloses the message with a pair of "*" characters. Consequently the message, such as "apple," will become "*apple*" before being converted to legends. Second, it adds a prefix "bw" to the a variable named "result" which will temporarily store the legends. Third, during the iteration of the *for* loop, every character of the message will be sent to the "getLegend()" function to get its legends. The iteration will also insert a thin-white space (represented by "w") between every two sets of legends (each present a character). Since Python treats a string literal as an array of characters, the *for* loop can retrieve characters stored in the "str" variable one by one, and pass each of the retrieved characters to the "result" variable using "appending" operators (+=).

	*		C		A		R		*	
bw	bWbwBwBwb	w	BwBwbWbwb	w	BwbwbWbwB	w	BwbwbwBWb	w	bWbwBwBwb	w

Figure 5. *Code 39 sample*

```
def getText():
 str=input("Enter a string: ") # get user
input
 str=str.upper() # convert to uppercase
 str = "*" + str + "*"  # Code39 format:
*data*
 result="bW"  # Code39 uses "bW" as
starting character
 for i in str:
  result += getLegend(i) + "w" # Code39 use
"w" as delimiter
 print(result) # display the character one
by one
```

The following is a sample output.

```
Enter a string: Apple
bWbWbwBwBwbwBwbwbWbwBwbwBwBwbWbwbwBwBw
bWbwbwBwbwbWBwBwbwBWbwbwbWbwBwBwbw
```

The above version of code is a console code that only demonstrates how a string is converted to legends, and can only display legends in a command-line environment. However, a barcode is a graphic and should be displayed in a GUI environment. Python supports the "tkinter" module which is a standard Python interface to use the "Tk" GUI APIs (application programming interfaces).

The following is the modified version of the "getText()" function. It uses an "Entry" control to take user inputs. In terms of "tkinter", an "Entry" is a GUI component that provides a single-line textbox for users to enter a string literal. The "form", which is a rectangular area hosting all the GUI components, is defined by the statement, `root = tk.Tk()`. The GUI components include two "Label" controls to display text in the designated location, one "Button" control for users to activate an "onclick" event in addition to the mentioned "Entry" control. The "get()" method obtains the user input from the "Entry" (named "entry1"). The output (which are "legends") will be displayed in a Label named "label1" when a button named "button1" is clicked.

```
from tkinter import *    # obtain the
library

def getText():
 s = entry1.get()
 s=s.upper()

 s = "*" + s + "*"  # Code39 format: *data*

 result="bW"  # Code39 uses "bW" as
starting character

 for i in s:
  result += getLegend(i) + "w" # Code39 use
"w" as delimiter

 label2['text'] = result # display the
character one by one

#create the GUI form
root = Tk()
label1 = Label(root, text="Enter a
string:") ## caption
label1.grid(row=0, column=0)

entry1 = Entry(root, width=30) ## user
input
entry1.grid(row=0, column=1)

button1 = Button(root, text='Convert',
command=getText)
button1.grid(row=0, column=2)

label2 = Label(root, height=10, text="") ##
display output
label2.grid(row=2, columnspan=2)

root.mainloop()
```

The above code produces a result similar to the following. It takes a string from the user, converts the string to Code 39 legends, and displays the legends in a GUI "form". This version of code provides a coding ground for further converting the legends to a barcode. The next section will focus on how to draw filled and unfilled rectangle to create a Code 39 barcode.

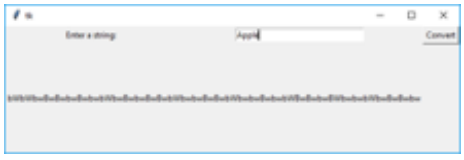


Figure 7. *Results in a GUI form*

HOW TO DRAW THE BARS

Drawing in "tkinter" is performed by the "Canvas" widget, which is a graphics drawing utility provided by the "tkinter" module. However, it is not part of the "tk" class, developers need to import the "Canvas" class, as shown below.

```
from tkinter import Canvas
```

By definition, a "canvas" is described as a rectangular area intended for drawing graphics or other complex layouts. Once a "canvas" is created, developers can write Python code to place graphics, text, widgets, or frames (also known as a "window") on it. In this coding project, students will use the "**create_rectangle**()" method to draw filed rectangles. The following illustrates the syntax of the "create_rectangle()" method, which defines a rectangle with two points: (x1, y1) is the top left corner and (x2, y2) is the location of the pixel just outside of the bottom right corner.

```
create _ rectangle(x1, y1, x2, y2,
[params, ...])
```

For example, the rectangle specified by top left corner (10,10) and bottom right corner (12,100) is a vertical bar of 2 pixels in width and 100 pixels in height. Useful parameters syntax of the "create_rectangle()" method are:

- **fill:** Set the color to fill the interior of rectangle. By the default, the interior is empty.
- **width:** Set the width of the border. The default is 1 pixel.

The following is a sample code that will draw a filled blank bar at (10, 10) inside the "Tk" form. The bar has a dimension of 2×100 pixels and is a vertical bar. ***Figure 8*** is a sample output.

```
from tkinter import *

root = Tk()
canvas1 = Canvas(root, width=300,
height=150)
canvas1.pack(expand=YES, fill=BOTH)
canvas1.create _ rectangle(10, 10, 12, 110,
width=0, fill='black')
mainloop()
```

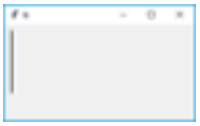


Figure 8. *Drawing of 1 bar*

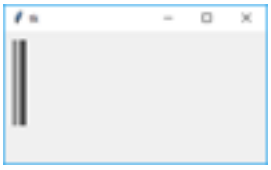


Figure 9. *Drawing of multiple bars*

In the above code, the width of a bar is determined by the difference of the *x*-coordinate of (*x*1, *y*1) and (*x*2, *y*2), namely, $w = x2 - x1$. The height is determined by the difference of the *y*-coordinates, namely, $h = y2 - y1$. Since the two points are (10, 10) and (12, 110), the width is 12-10=2 and the height is 110-10=100.

The following sample code adds four more rectangles: two filled in black and two filled in white. The sequence of legends used in the drawing is "bWbwB" with "b" and "w" having 2 pixels in width while "B" and "W" are 4 pixels wide. ***Figure 9*** is the sample output.

```
from tkinter import *

root = Tk()
canvas1 = Canvas(root, width=300,
height=150)
canvas1.pack(expand=YES, fill=BOTH)
canvas1.create _ rectangle(10, 10, 12, 110,
width=0, fill='black')
canvas1.create _ rectangle(12, 10, 16, 110,
width=0, fill='white')
canvas1.create _ rectangle(16, 10, 18, 110,
width=0, fill='black')
canvas1.create _ rectangle(18, 10, 20, 110,
width=0, fill='white')
canvas1.create _ rectangle(20, 10, 24, 110,
width=0, fill='black')

mainloop()
```

It is necessary to note that the width of rectangles are not specified by the "width=0" parameter of the "create_rectangle()" method. It is determined by the expression $x2 - x1$. The "width=0" expression indicates "no border" or no "outline". ***Table 6*** (page 37) illustrates the drawing concept.

TABLE 6: ILLUSTRATION OF WIDTH CALCULATION

RECTANGLE	1	2	3	4	5
start point	(10,10)	(12,10)	(16,10)	(18,10)	(20,10)
end point	(12,110)	(16,110)	(18,110)	(20,110)	(24,110)
width	2	4	2	2	4
fill color	black	white	black	white	black
legend	b	W	b	w	B

DRAWING CODE 39 BARCODES

In order to draw graphics, the following code must be added to the "Tk" form. The identifier of the "canvas" is "canvas1", which means the drawing pad (the Canvas object) is identified as "canvas1" in this code. Before the drawing of barcode starts, the width of the "canvas1" object is purposely set to 0, simply because it does not have any content before the drawing starts.

```
#### create GUI
root = Tk()
root.title("Barcode")
.................
.................
# create a Canvas for drawing
canvas1 = Canvas(root, width=0, height=100)
canvas1.grid(row=2, columnspan=3)

root.mainloop()
```

The following "drawBars()" function takes two parameters: c and x. The "*c*" parameter will hold one of the legend characters, "b", "B", "w", or "W", passed to it while the "*x*" parameter specifies the designate *x*-coordinate to draw the rectangle. Inside the "drawBar()" function, the "*w*" variable is used to determine the width of the rectangular bar, while the "clr" variable determines the color to fill the rectangle.

```
##### draw rectangles as bars
def drawBars(c, x):
 w=0  # variable for width
 clr=""

 if c=='b':
  clr="#000000"
  w=2
 elif c=='B':
  clr="#000000"
  w=4
 elif c=='w':
  clr="#ffffff"
  w=2
 elif c=='W':
  clr="#ffffff"
  w=4

 canvas1.create_rectangle(x, 0, x+w, 100,
fill=clr, width=0)

 x+=w
 return x
```

The *if* structure inside the "drawbar()" function makes the decision of the width (either 2 pixels or 4 pixels) and the color (either black or white). When the value of "*c*" is "B" or "b", the fill color is black. When the value of "*c*" is "W" or "w", the fill color is "white". Similarly, when the value of "*c*" is "b" or "w", the width of rectangle is 2. When the value of "*c*" is "B" or "W", the width of rectangle is 4. In a programming language that supports *switch..case* structure, it might be ideal to write the above code using a *switch..case* structure.

The following is the statement that actually draws the rectangular bar using the value held by the "*x*", "*w*", and "clr" variables. It is necessary to note that the "width=0" parameter is a parameter of the "create_rectangle()" method that specifies the width of border (or outline). The following sets the border width of the rectangle to 0, so the rectangle will not have border.

```
canvas1.create_rectangle(x, 0, x+w, 100,
fill=clr, width=0)
```

Assuming the drawing is based on a legend "bWbwB", the following table explains how the value of *x* increments. Before the drawing starts, the value of "*x*" is set to 0.

TABLE 7: ILLUSTRATION OF INCREMENT OF VARIABLE "X"

LEGEND	b	W	b	w	B	–
Width (w)	2	2	2	2	2	–
Value of x	0	0+2=2	2+4=6	6+2=8	8+2=10	10+4 =14
Value of y	0	0	0	0	0	–
Start Point	(0,0)	(2,0)	(6,0)	(8,0)	(10,10)	–
End Point	(2,110)	(6,110)	(8,110)	(10,110)	(14,110)	–

Note: "-" indicates that the calculation occurs after the bar is drawn.

The start point of every rectangle has its y-coordinate fixed to 0. The x-coordinate of the first rectangle starts with 0 and then increments by the value of "*w*". This is because, as shown in ***Figure 10***, the first (a thin-black) bar is placed at (0, 0), so the second (a thick-white) bar is placed at (0+2, 0) because the width of think-black bar is 2. The third bar is placed at (2+4, 0). The fourth is placed at (6+2, 0). The pattern of increment is *w*.

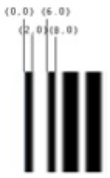


Figure 10. *Start points*

After the drawing of a rectangle, the following statement will update the value of "*x*" by adding the value of "*w*" (width of the rectangle) to it. Therefore, the next rectangle will start at (*x*+*w*, *y*).

```
x+=w
```

The following is the revised *for* loop of the "getText()" function. Previously, the "getText()" function only breaks a string literal (given by the user, such as "apple") to a series of Code 39 legends (such as "BwbwbWbwB"). The following modification will call the "drawBar()" function to draw the barcode.

```
def getText():
 canvas1.delete("all") # clear the current
drawing if nay

 s = entry1.get() # get the user entry
 s=s.upper() # convert to uppercase

 s = "*" + s + "*"  # Code39 format: *data*

 result="bW"  # Code39 uses "bW" as
starting character

 for i in s:
  result += getLegend(i) + "w" # Code39 use
"w" as delimiter

 x=0       # initial value
 for c in result:
  x=drawBars(c, x)
```

It is necessary to note that the value of "*x*", which is used to designate the starting point of every rectangle, has an initial value of 0. As shown in the above code, the following statement is declared outside the *for* loop, so the statements inside the *for* loop do not have the limit of scope. The "drawBars()" function can update the value of "*x*".

```
x=0
for c in result:
 x=drawBars(c, x)
```

By the way, a Button control named "button1" is used to launch the drawing. Without clicking the "button1" control (whose caption is "Convert"), the drawing will not launch. The following is the "Tk" code that associates the "button1" control with the "getText()" method.

```
button1 = Button(root, text='Convert',
command=getText)

button1.grid(row=0, column=2)
```

The "getText()" method, after being called, will obtain the user entry, convert the user entry to upper case string, add the prefix and sufix "*" to comply with Code 39 requirement, break the string literal to a character array, and then use a *for* loop to send every character to the "getLegend()" function to convert the string to Code 39 legend. Another *for* loop inside the "getText()" method will call the "drawBars()" function to draw vertical bars one by one. ***Figure 2*** in a previous section is a sample output after the "Convert" button is clicked.

As of this phase, the Python program is functionally sufficient to generate a scannable Code 39 barcode. ***Figure 3*** in a previous section is the screen shot captured by using a barcode "scanner app" of an Android smartphone. It shows that the barcode is scanned and interpreted.

While the Canvas class adds the graphic drawing features to the "Tk" form, it does not support the feature to save the graphics as an image. The Python Imaging Library (PIL) is the library that can duplicate and save Canvas-based graphics as an image. However, due to the limit on the length of this paper, the discussion about saving

the created barcode as an image file is omitted. The author has furnished the lecture notes and coding exercises upon requests.

CONCLUSION

This paper uses a hands-on coding project to demonstrate how instructors can develop project-based instructional materials to guide non-CS majors to build an immediately usable application. To a college professor, particularly those who teach at career-oriented colleges, the development of instructional materials could be time-consuming, but the learning outcome could be fruitful because students can: (a) explore how programming concepts improve problem-solving skills; (b) observe how basic programming skills lead to the design, development, and creation of a usable tool; (c) understand the importance of learning programming skills. A project-based learning activity that engages students in building useful applications can better motivate students than traditional ways of coding demonstrations; therefore, this paper encourages interested instructors to adopt the proposed pedagogy to assist non-CS majors to learn basic programming skills by doing the hands-on coding projects, and then inadvertently becoming a coding literate.

REFERENCES

Acordex. (n.d.). *Bar Code 39 implementation*. Retrieved from http://www.acordex.com/consulting/BarCode39.html

Allais, D. (2006). *AIDC memoirs*. Retrieved from http://aidc100.org/files/Allais-_David_Memoirs.pdf.

Association for Computing Machinery. (2013). *Computer science curricula 2013*. Retrieved from https://www.acm.org/binaries/content/assets/education/cs2013_web_final.pdf

Azalea Software, Inc. (2016). *How to size barcodes*. Retrieved from http://www.azalea.com/white-papers/how-to-size-barcodes/

CMU. (2018). *Catalog of school of computer science courses*. Retrieved from http://coursecatalog.web.cmu.edu/schoolofcomputerscience/courses/

Dylan, P. (2015). *Code and tell: An Exploration of Peer Interviews and Computational Thinking With scratchjr in the Early Childhood Classroom* (Doctoral dissertation of Tufts University). Available from ProQuest Dissertations. (UMI No.: 1589497)

Papadakis, S., Kalogiannakis, M., & Zaranis, N. (2016). Developing fundamental programming concepts and computational thinking with ScratchJr in preschool education: a case study. *International Journal of Mobile Learning and Organization, 10(3)*. https://doi.org/10.1504/IJMLO.2016.077867

Rushkoff, D. (2012). *Code literacy: A 21st-century requirement*. Retrieved from https://www.edutopia.org/blog/code-literacy-21st-century-requirement-douglas-rushkoff

Vee, A. (2017). *Coding literacy: How computer programming is changing writing*, p. 44. Boston, MA: The MIT Press.

Wu, P., & Pedro Manrique. (2013). A hands-on programming lecture that teaches Code39 barcode generating. *Proceeding of the Clute Conference 2013*.

DeVry University Journal of Scholarly Research (2018) / Volume 4, Number 2

HOW TO QUALIFY FOR MORE FREE MONEY FOR COLLEGE BY USING EFFECTIVE FINANCIAL PLANNING: A PRACTITIONER'S VIEW

RODNEY JEAN-BAPTISTE
COLLEGE OF BUSINESS AND MANAGEMENT

Author Note: Rodney Jean-Baptiste is a visiting professor at DeVry College of New York, NY

ABSTRACT

This article concentrates on how most middle-class applicants and their families can manage their incomes and assets and use effective and legal planning tools to qualify for free money for undergraduate degrees in college. A partial list of elite universities is selected to analyze the income threshold for free tuition and room and board. The key strategies highlighted are income management, increase of retirement funds, and reduction of assets.

It is a very challenging time for most families when their kids are about to go to college. Most parents are nervous not only about the quality of the education that their children are about to receive but also worry about affordability. Adult learners also face the same challenges. Most colleges and universities offer students some forms of financial aid through loans, awards, grants, scholarships, work-study opportunities and other programs (Hay, 2012). The majority of all aids now come in the form of loans usually from federal funds (Nica and Bonciu, 2017); however, loans need to be repaid. Many students graduate with a lot of debts with an average student debt load of $53,000 (Hiltonsmith, 2013).

Most families want their children to graduate with a lower burden of debt. Adult learners who do not obtain financial assistance from their employers need to plan their education expenses very carefully. One way to accomplish that goal is to use common-sense financial planning tools to qualify for as much free money as possible. These free monies take the form of Pell Grants, state scholarships, awards, and other need-based school scholarships. Most of those programs depend on students' and parents' incomes and assets (Jesse, 2017).

Correspondence regarding this article should be addressed to Rodney Jean-Baptiste at rjean-baptiste@devry.edu.

Keywords: college funds, financial planning, asset management, free money, reducing college debt

RELATIONSHIP BETWEEN INCOME/ASSET AND FREE FINANCIAL AID

Many universities offer free tuition for all students whose parents earn less than a certain amount of income. Those universities propose excellent financial aid packages. Furthermore, some of the nation's top universities actually have specific policies that guarantee middle-class families free tuition or even full-ride scholarships based on their income. See ***Table 1*** (Princeton University – $140,000), (Stanford, – $125,000). Some schools are even more generous by offering free room and board in addition to tuition and

fees. However the threshold is usually lower with an average income of $60,000 or less (See ***Table 1***). For Harvard and Yale, for instance, the income limit is $65,000 to qualify for free room and board in addition to free tuition (Jesse, 2017).

TABLE 1: PARTIAL LIST OF TOP UNIVERSITIES OFFERING FREE TUITION IN 2017-2018

UNDERGRAD PROGRAMS	TUITION & FEES	ROOM & BOARD	TOTAL COST TO ATTEND	FREE-TUITION INCOME	FREE TUITION, ROOM & BOARD INCOME
Princeton University	$45,320	$18,370	$63,690	$140,000	$65,000
Brown University	$50,224	$17,882	$68,106	$60,000	$60,000
Cornell University	$51,510	$16,103	$67,613	$60,000	$60,000
Duke University	$47,074	$23,018	$70,092	$60,000	$60,000
Harvard University	$49,480	$22,620	$72,100	$65,000	$65,000
Yale University	$47,331	$20,844	$68,175	$65,000	$65,000
Stanford University	$51,438	$15,258	$66,696	$125,000	$65,000
Dartmouth College	$51,438	$18,036	$69,474	$100,000	$100,000

Note: This Table represents costs for Undergraduate Degrees only

Students and parents also need to disclose their assets in most financial aid forms to qualify for financial aid when applying for the Federal Financial Aid Form (FAFSA) and the college's internal financial aid form. Assets in excess of a certain amount may hinder the ability to receive aids. Cash on hand may have a significant bearing on the decision whereas home equity may not be considered by the FAFSA. "For instance, a $50,000 in a checking account may prevent a student from receiving some aids while a $200,000 in Home equity may not circumvent this same student from obtaining financial aid. In other words, a home equity may not count toward total assets. Usually, students are expected to contribute 20-30% of their assets and their parents 2-7% "(Nica and Bonciu, 2017).

Consequently, students and parents must manage their assets and incomes to qualify for more aid. Most importantly, middle-class families can take advantage of effective financial planning tools to qualify for more financial aid. Families with total income close to the respective thresholds discussed earlier, have the incentives to try harder to reduce their income and assets legally. The next sections will review some of those tools individually.

INCREASE RETIREMENT CONTRIBUTION SUCH AS 401K/403B

It is a very controversial strategy to increase a family retirement contribution when money is very tight to go to college. However, in some cases, many families may qualify for free tuition and the benefit of contributing some money to their retirement may be far greater.

To start, it is good to review the benefits of a retirement plan. The most compelling benefit of a retirement plan such as a 401K or 403B is the employer's matching amount. Some companies match up to 100% of employees' contributions up to a maximum percentage of annual salary. Even if the employer matches 50%, if one contributes $5,000 for the year, the employer may match up to $2,500. This is a total of $7,500 invested for the employee retirement for the year. Most employers who offer a retirement plan provide some sort of matching contribution.

A second advantage of a 401K/403B/IRA is the postponement of tax payment. The employee monies as well as the employer contributions for the employee are growing tax-free without owing taxable interest expenses until retirement. A third benefit is the reduction of taxable income when one invests in a traditional 401K or IRA. For instance, if you earn $70,000 for the year and you contribute $7,000 toward your 401K, only $63,000 is taxable. Note a Roth 401K/403B/IRA would not reduce your taxable income. The maximum contribution for 2017 for a 401K/403B is $18,000 for individuals who are younger than 50 and $24,000/year for those who are age of 50 or older (catch up contribution is $6,000). IRA (Individual Retirement Account) limits are $5,500 per year for individuals who are younger

than 50 and $6,500/year for those who are age of 50 or older (catch up contribution is $1,000).

As discussed earlier, families need to show income as low as possible to qualify legally for more free financial aid. Most colleges and the Federal Government use Wages amounts from Box 7 on the taxpayer's W2 form, or wages after deduction of 401K/403B contribution and premiums for medical insurance. FAFSA and many colleges also use AGI (Adjusted Gross Income: Wages plus other income minus some deductions such as IRA, moving expenses, etc). None of those amounts include 401K contributions. For instance, Family ABC earns $64,000 in 2017; assume they contribute $5,000 towards their 401K, their taxable income becomes, $59,000. With this income, they may enjoy several tax benefits including tax credits, and they may show a lower income that can enable them to qualify for more financial aid. As a fact, if a family makes $59,000, it may qualify for free tuition at all of the 8 colleges mentioned earlier. Even if it chooses any other colleges, it will qualify for more Pell grants and some State Scholarships. Again, this is the use of a popular tax planning strategy that can save the adult student or a family tens of thousands of dollars for college. This legal tax strategy can also work in getting more free money for college. A Traditional IRA will also help reduce the AGI (adjusted gross income).

However, parents need to be careful when using this strategy. They must not withdraw the money for those years during which their children go to school. Otherwise their income will go up each time they cash in the 401K money. Sometimes, in this case, it is better to borrow against the 401K money in the case of an emergency. A 401K/403B loan does not increase taxable income.

REDUCE ASSETS

Reducing assets is another good strategy to receive more free money for college. Most schools take a close look at the assets of the students and parents when applying for free tuition, room and board, and other financial aid products. If students' or parents' assets are too high, they may be disqualified for free college money. The obvious response to that barrier is to reduce their assets wherever they can and where it is legal.

The first question college applicants usually ask is how much assets they are allowed to own? In other words, what is the asset amount that will prevent them from receiving financial aid including free college money? This amount varies from colleges to colleges. The range is between $85,000-$110,000. Middle-income families have some good news: the Federal Form usually does not count your home that you live in as a reportable asset. Students and their parents may live in a $500,000 home and still qualify for most financial aid products. FAFSA also does not consider Home Equity. Note some private schools may still consider your home as reportable asset in their internal financial aid application form. Usually colleges would not consider home equity of more than 2.6 times the family income. For financial aid purposes, it is also a good idea to use idle cash to make more payments on the mortgage since home equity does not count but cash in your bank may go against you.

Other investment amounts such as Cash, CDs, Mutual Funds, awards, inheritance money, 529 plans, and other assets are still considered reportable assets and are counted towards your total assets. College applicants need to know that they are expected to contribute more than their parents towards their education. Usually students are expected to contribute 20-30% of their assets and their parents 2-7%. As a result, a good strategy is to reduce the student's income as much as possible. For example, some assets may be placed under the name of a parent or a grandparent.

MANAGE INCOME OR OTHER EARNINGS

Another way to qualify for more college financial aids is the reduction of income. The lower your income, the better your chances of getting more free financial aid. Sometimes an additional $5,000 that you did not have to earn can make a difference. For instance, the Auguste family makes $104,000 for the year. The husband earns

$50,000 and the wife gets $54,000. The husband earns $40,000 in one job but works a second job for $10,000. The college applicant is not working. Because of that second job, the family pays an extra $4,000/year for babysitting two younger kids. The real income derived from the second job is $3,500 assuming a tax bracket of 25%. It is made of: 10,000 – 2,500 (10000 X.25) – 4,000. As you can see in this example, for an incremental income of $3,500, you may forgo $100,000 in free tuition. Had they made $99,000 or less, they could have qualified for free tuition at some colleges such as Dartmouth College as ***Table 1*** indicates.

Other measures include reducing the amount of voluntary overtime when students and parents are near a threshold for free tuition to get more aid. One could also use Municipal bonds versus other corporate bonds since the interest earned on municipal bonds is not taxable and is not reported as additional income. All families need to analyze their situation when they are about to get a divorce or separation. Families should select the best scenario to get the most financial aid.

CONCLUSION

Most families, no matter the level of income, can find some ways to get free money for higher education. It is easier for middle-class families with low to modest incomes and assets whose children are pursuing an undergraduate degree. This article shows how they can manage their income to qualify for free money for college including free tuition and room and board. Even those who cannot qualify for most scholarships and grants from government agencies can get other forms of financial aid through subsidized loans, work studies, and other programs. Here again the level of income and assets will dictate how much help college applicants can get.

The cost of tuition, fees, room, board, and others fees will change every year. However, the thresholds to qualify for free tuition and room and board are pretty consistent for most schools. As a result, after reading the article, you may verify the actual costs to attend these colleges and universities mentioned on this article before making a decision.

This article does not encourage parents of college students to stop working and not to help their employers when they need the extra help in overtime. However, it explains many strategies for students and parents to lower their income specifically when it is closer to the threshold of receiving free tuition, Pell grants, some scholarships, and other financial aid products. This article also encourages other scientific studies on the relationship between income and free tuition. The correlation of the effectiveness of financial planning with the success of obtaining free money for college would also be an interesting study

REFERENCES

Hay, J. (2012, Aug 27). Graduating in debt: high cost of higher education: SSU students leave owning an average of $17,251, more than most of their CSU peers and an 18.4 percent jump from two years earlier. *The Press Democrat* Retrieved from https://search-proquest-com.ezproxy2.apus.edu/docview/1035466537?accountid=8289

Hiltonsmith, R. (2013) At what cost: how student debt reduces lifetime wealth. *Demos pp.2-22*. https://www.demos.org/sites/default/files/imce/AtWhatCostFinal.pdf

Jesse, D. (2017, Jun 16). Tuition at U-M to be free for some. *Detroit Free Press* Retrieved from https://www.freep.com/story/news/local/michigan/2017/06/15/university-michigan-free-tuition-students/400761001/

Nica, E., & Bonciu, C. (2017). Student loans-an essential element of the financial aid system in the US. *Economics, Management and Financial Markets, 12(2)*, 74-80. doi:http://dx.doi.org.ezproxy2.apus.edu/10.22381/EMFM12220175

DeVry University Journal of Scholarly Research (2018) / Volume 4, Number 2

THE GOLDMAN SACHS AND TOSHIBA CASE STUDY

FELICIA A. RINEY, KELLER GRADUATE SCHOOL OF MANAGEMENT

Study Author Note: Felicia A. Riney is a visiting professor, Keller Graduate School of Management

The Institutional Anomie Theory highlights behaviors that diverge from generally accepted procedures and regulations for material rewards, even if they involve disregarding the standard practices (Bame-Aldred, Cullen, Martin, & Parboteeah, 2013). The Goldman Sachs and Toshiba case studies both show behavior deficiencies among employees can exist, despite the differences in industries. Unethical behavior can exist in any business. A newly hired employee faces the temptation to adapt and conform to the established behavior of new co-workers. In some companies, even the most seasoned, professional, and ethical employee has trouble maintaining his integrity and work ethics. The developed behavior of other workers can be a hindrance. The tone at the top encourages leaders to ignore problems and hope that they go away. In some instances, leaders develop solutions that often circumvent regulations. The new employee who exhibits principled behavior, is expected to guide the others to the proper line of thinking. If he does not, he is labeled as a toxic employee who is seeking to damage the culture. Therefore, you have that honest employee who wants to act properly versus long-term employees who are grounded in historical behavior. The new employee is often expected to lead others with no horizontal support from co-workers and no support from the foundation of leadership.

The cases of Goldman Sachs and Toshiba show how easy it is to follow the behavior of people that you work closely with within a department. Sometimes it is just easier to go with the flow than to be seen as a toxic employee. What drives the decision? When employees are faced with the opportunity and desire to commit fraud, they must make a cognitive decision to be ethical or unethical (Dacin & Murphy, 2011). The two well-known companies lived through unethical acts and can provide great information as case studies. Although one company is an investment bank and the other a communication organization, both suffered from unacceptable employee behavior. In addition, the cases may help explain what happened and how to avoid the behavior in the future. The case information below shows employees adapting and conforming to leadership, culture, or other employees versus employees following regulatory guidelines.

GOLDMAN SACHS

When an investment bank that is selected to handle personal investments appears in the media for fraudulent acts, the investor often wonders how criminal activity can take place in such a large, well-known company. Two events at Goldman Sachs stand out, although more exist. Goldman Sachs is a multinational investment/finance bank that has been riddled by fraudulent activity that ranges from insider trading to theft. Investors expect a bank, such as Goldman Sachs,

to protect their money and place the money in secure funds. The expected net effect is an overall gain and minimal, if any loss. Investors also expect a bank to make smart decisions on a daily basis, whether the decisions involve operations, management, growth, or economic strategies.

In this case, Goldman Sachs hired Rohit Bansal in 2015 despite former ties with the Federal Reserve Bank of New York (FRB) and central banks. The former ties could have been considered a conflict of interest with his new position as a financial advisor (Protess & Eavis, 2015). Goldman Sachs performed some due diligence by requiring Bansal to attend compliance training, and Bansal recused himself from managing one bank in New York. Despite former ties, Bansal was later told to work with that bank behind the scenes by his Goldman Sachs supervisor (Protess & Eavis, 2015). Bansal, a former employee at the FRB for seven years, was hired by Goldman Sachs as a banker/advisor (Protess & Eavis, 2015). Goldman Sachs and the FRB were known for trading employees, and Bansal maintained close contact with FRB employee Jason Gross, who was Goldman Sachs' regulator (Protess & Eavis, 2015). Bansal was assigned to advise another bank (Bank B) that he used to regulate, and Gross leaked information to Bansal about Bank B (Protess & Eavis, 2015). In essence, there existed a federal reserve bank and an investment financing company trading information about a client, unknown to the client.

Joseph Jiampietro, senior colleague, sometimes supervised Bansal's work and had some of the FRB's documents on his desk. Jiampietro maintained that he did not notice the documents, read the documents, or encounter any illegal behavior (Protess & Eavis, 2015). During various encounters, Bansal shared a spreadsheet with delicate details and verified that the information came from FRB. He presented confidential information during a conference call, and even emailed private information to Mr. Jiampietro (Protess & Eavis, 2015). Finally, Goldman Sachs' compliance office was notified of the breach of confidential information; the FRB was alerted also. Did Goldman Sachs have enough controls in place? You be the judge.

Earlier on in 2014, in the wake of the fraudulent acts, specifically insider trading, Goldman Sachs decided to take action. Prior to Bansal's employment in 2014 and his illegal insider trading in 2015, Yue Han was hired. Han's new role at Goldman Sachs required him to monitor employees' emails in an effort to reduce insider trading and other illegal activities (McCoy, 2015). Han not only monitored the emails, but he used the information in the emails to his advantage. Han made trade transactions based on the confidential information that he obtained from the emails about upcoming mergers/acquisitions (McCoy, 2015). Instead of detecting and preventing fraud, Han violated Goldman Sachs' trust, extensive training, and trading policy (McCoy, 2015). Goldman Sachs' attempt to detect fraud failed as seen in the unethical behavior of Han. In addition, the company failed to prevent future fraud as seen in the unethical behavior of Bansal.

TOSHIBA

Plausibility suggests that a high-tech, communications organization would be well equipped with internal controls to impede attempts at fraudulent activity. However, plausibility is not absolute, and neither was Toshiba's resistance against fraud. When illegal activity starts at the top executive level, it may be harder to expose than the fraud committed by entry level employees. In this case, a chief executive, two predecessors, and several lesser executives were accused of overstating financial accounts in the amount of $1.2 billion over seven years (Soble, 2015). Financial overstatement can occur in several ways such as an overstatement of revenue or an understatement of liabilities. The overstatement was a method used by employees at Toshiba. The employees felt pressured under their current leaders and culture to turn a profit despite a decreasing demand for Toshiba's products (Soble, 2015). Toshiba is a conglomerate, multi-industry and multi-national. The tone at the top conveyed unspoken demands that established a culture driven by daily pressure to produce profits by whatever methods were necessary (Soble, 2015).

Prior to the fraudulent act at Toshiba, the Japanese government implemented management and institutional investor guidelines that Toshiba exceeded in terms of quantity, such as having more than the required directors. However, Toshiba fell short on quality based on the guidelines. The company had compliance issues, such having extra directors, but the directors had no experience in managing commercial enterprises (Soble, 2015). Low quality has been a recurring issue with Toshiba. Prior to the $1.2 billion fraud, the company reacted to the concerns of financial regulators by auditing one of its financial divisions for inaccurate financial information, which unveiled tens of millions of dollars of bookkeeping discrepancies (Soble, 2015). Despite the findings of the audit and the $1.2 billion dollar scandal, executives insisted that the intent was not to commit fraud and that they never led employees to commit illegal accounting practices (Soble, 2015).

QUESTIONS:

1. Were there signs that the environment contained characteristics that could lead to opportunities for employees to commit fraudulent acts? What were the signs? Could identifying the signs earlier have prevented the fraud? If so, how?

2. According to Donald Cressey's fraud triangle, an environment must have three variables present for fraud to occur: pressure, rationalization, and opportunity (Mackevicius & Giriunas, 2013). Did the case contain the three variables? If so, identify the variables. Could understanding the variables of fraud have helped the managers prevent the criminal acts in the cases? How?

3. From a manager's perspective, what would you have done differently? What regulations could the managers have referred to for guidance on proper behavior or standards? Who should be held liable in this case? List all and why.

INSTRUCTIONS:

Develop a 10 slide presentation that you would show your employees that explains fraud, what regulations the company has against fraudulent acts, and where those regulations can be found.

Address correspondence about this case study to Felicia A. Riney at friney1@yahoo.com or friney@devry.edu.

REFERENCES

Bame-Aldred, C., Cullen, J., Martin, K., & Parboteeah, P. (2013). National culture and firm-level tax evasion, *Journal of Business Research*, *66(3)*, 390-396. doi:10.1016/j.jbusres.2011.08.020

Dacin, M. T., & Murphy, P. R. (2011). Psychological pathways to fraud: Understanding and preventing fraud in organizations. *Journal of Business Ethics*, *101(4)*, 601-618. doi:10.1007/s10551-011-0741-0

Mackevicius, J., & Giriunas, L. (2013). Transformational research of the fraud triangle. *Ekonomika*, *92(4)*, 150-163.

McCoy, K. (2015). Ex-Goldman Sachs employee charged with insider trading. *USA Today*. Retrieved from https://www.usatoday.com/story/money/2015/11/25/ex-goldman-sachs-employee-charged-insider-trading/76373370/

Protess, B. & Eavis, P. (2015). Ex-Goldman banker and fed employee will plead guilty in document leak. *The New York Times*. Retrieved from https://www.nytimes.com/2015/10/27/business/dealbook/criminal-charges-and-50-million-fine-expected-in-goldman-new-york-fed-case.html

Soble, J. (2015). Scandal upends Toshiba's lauded reputation. *The New York Times*. Retrieved from https://www.nytimes.com/2015/07/22/business/international/toshiba-chief-and-7-others-resign-in-accounting-scandal.html

TEACHING NOTES

- This case study has been developed for use in MGMT 597, but it can be used in other management courses.
- It is designed to be a Week 7 case study to be worked on individually or in teams. The case study could also be used as a discussion topic or in-class activity.
- TCOs related to this case: MGMT 597 TCO C, D, and H relating to concepts and theories that underpin business compliance of public companies.
- The case study enables students to link governmental laws and regulations to the daily business operations and compliance of public companies.
- At a minimum, the student should make the connection between employee behavior and following government regulations.
- Through this case study, students have the opportunity to demonstrate competency in understanding governmental regulations and why they should be followed, the appearance of unethical behavior and how employees should react when in an unethical situation, early red flags of unethical behavior that leaders and employees should react upon, how internal controls may fail if they are not properly implemented, and understanding why cases such as this led to the Sarbanes-Oxley Act as well as the Security Acts of 1933 and 1934 (focus of Week 6 in MGMT 597). Students should also develop an understanding of the variables of fraud that can lead to insider trading and the devastating effects of trading confidential information (focus of Week 7 in MGMT 597).
- The cases will help students apply class concepts to help develop solutions that may have led to different outcomes.

DeVry University Journal of Scholarly Research (2018) / Volume 4, Number 2

FROM THE CLASSROOM: COURSE DESIGN, AN IMPORTANT ASPECT OF ACADEMIC QUALITY

DASANTILA SHERIFI
COLLEGE OF HEALTH SCIENCES

Author Note: Dasantila Sherifi is a professor in the College of Health Sciences, North East Group, DeVry University

ABSTRACT

Course design is related to course content, curriculum, teaching aspects, course development aspects, compliance with licensing and accreditation bodies, and student outcomes. DeVry University has dedicated multiple types of resources to course design, given its importance and the large online teaching component. There are several considerations when it comes to course design, including the desired outcome, the audience for the course (such as traditional or adult learners), amount of detail, connection to the rest of the curriculum, flexibility for updates and changes, consistency with other courses, and other elements that make the course interesting and unique. Maintaining the proper balance among these dimensions requires expertise, collaboration, and creativity.

COURSE DESIGN, AN IMPORTANT ASPECT OF ACADEMIC QUALITY

Academic quality may be discussed in terms of how it is measured or by zooming into the aspects that affect it. When addressing quality in academia, researchers have mostly focused on curriculum design, teaching and learning, student assessment, student selection, support services, learning resources, and continuous improvement. DeVry University is guided by five tenets of academic quality: advances in curriculum and innovation, student learning outcomes, faculty development and engagement, student care and experience, and student engagement to graduation and beyond (DeVry University, 2016). Given that the curriculum is a collection of courses, the design of each course is very important. Every course serves as a building block for the curriculum. Therefore, the design of each course is vital for a strong curriculum structure.

IMPORTANCE OF COURSE DESIGN

A curriculum is made up of various courses, which may serve as a prerequisite for each-other or build on each-other. Each course contributes to student learning and the overall achievement of the program outcomes. Course design is also known as course development, and it involves creation or enhancement of course content, which includes course objectives, enabling objectives, textbooks and other teaching materials, weekly introductions, lectures, discussion questions, assignments, tests, labs (where applicable), media tools, supplementary files or templates, and even tools that are available for faculty use only. In the online or hybrid environment, the published course content becomes more important than in the face-to-face teaching environment because it serves as the primary guide for the weekly deliverables. According to Aiken, Heinze,

Meuter, and Chapman (2016), the "electronics-driven era of intensive informational competition" makes it even more important that the course design is effective in keeping students focused on the course objectives and directing them to reliable sources of information. In the online environment, the course content becomes the driving force in student learning, as well as the primary medium for instructor-student communication. In addition, course design can help achieve compliance with programmatic or regional accreditation requirements because it serves as an important content area for review and audit (Mendenhall, 2013; Vlachopoulos, 2016).

A well-designed course can help deliver content, provide multiple ways for students to learn (such as by reading, listening to a recorded lecture, or completing an activity), as well as customize and personalize communication among instructors and students. Poor course design can be a source of confusion and frustration for students, as well as professors. It can inhibit a professor's creativity and academic freedom, and it can become inflexible in terms of ongoing updates and changes. Course design can affect students' perceptions and evaluations of the course and the instructor (Hinze, 2013), and it can impact student engagement and student outcomes (Angel, 2015).

COURSE DESIGN PROCESS AT DEVRY UNIVERSITY

At DeVry University, courses are assessed, redeveloped, and updated on an ongoing basis, depending on the changes in the field of study, time passed since last development, curriculum changes, new software, media needs, textbook changes, students' feedback and outcomes, instructors' feedback, and other indicators. There are two types of course development at DeVry. Tier 1 involves high draw, high profile innovation, pilots, and sandbox courses that need to comply with DeVry Tech Path (DTP) requirements. These can be full or partial developments. Full developments may require all new content, but they can also be completed by using some of the existing content. Partial developments are based on the current master shell, and they may include updates in media, labs, and assessments. These types of developments are done by a team that includes the subject matter expert (SME), a project manager, an instructional designer (ID), an instructional developer, a copy editor, and a multimedia developer. Tier 2 involves non-DTP courses and maintenance aspects. These types of developments are mostly done by an assigned professor or SME and the Course Enhancement Team, also known as the Adjustment Bureau in the Trello board. The number of courses that can be developed each session in either tier depend on the resources available.

CONSIDERATIONS IN COURSE DESIGN

Given the role each course plays in the curriculum and the resources utilized in the process of course development, it becomes imperative to strive for high quality course design. Daugherty (2006) suggests designing a course with the "end in mind", which means determining the desired outcomes for the students, and then developing the course from that perspective. Another "end in mind" is the reason for the development, which could be regular updates, new requirements (such as "DeVry Tech"), or the need to improve student outcomes. One more interpretation of the "end in mind" is the perspective of whether the course is effective and efficient for students, for the instructors who teach it, or for the course development team. These varied perspectives demand collaborative efforts (formal or informal). According to Dodd (2013), most higher learning institutions have employed teams in the process of course design.

Researchers have recognized the deficiencies in educating students who are self-directed learners and good critical thinkers (Hains & Smith, 2012; Schaber & Shanedling, 2012), and have provided a number of propositions related to course design. Schaber & Shanedling (2012) suggested incorporating a number of sequential activities with increased complexity that are related to the theory but also require students to do further research and connect the dots. Baldwin & Ching (2017) suggested using the journalistic style of interactive story-telling as a form of exploring

different paths for more information, as well as developing critical thinking, reflection, analysis, and synthesis. Ruwe and Leve (2001) brought up that interdisciplinary courses may need interdisciplinary team teaching, which means there may be a need for an interdisciplinary course development team. Allen (2016) focused on andragogy (versus pedagogy) and suggested applying adult learning principles to online course design with the premise that "adult learners can be afforded an authentic learning experience through a mix of learner autonomy, interactivity, and real-world focus" (p. 26). Aiken, Heinze, Meuter, and Chapman (2016) suggested involving students in the process of course design, with the premise that when students are engaged in developing a course, they have greater motivation to be successful in it. In studying the constructivist approach to learning, Hartwig (2009) found some relationships between elements of a constructivist course design measured by the Constructivist On-Line Learning Environment Survey and affective learning, as well as psychomotor learning. Use of effective multimedia and application of gaming principles were also considered to have an impact on students' engagement with the course and learning outcomes (Angel, 2015; Varonis & Varonis, 2015).

Another consideration in course design is the amount and level of instruction and detail provided for students and/or instructors. Prescriptive content can lead to "spoon-feeding" students and diminish efforts in engaging them in a process of discovery and self-learning. Also, what can be considered a hurdle in exhibiting academic freedom for a well-seasoned instructor, can be considered helpful for a new instructor.

It is challenging to achieve an optimal course design that has enough substance and provides the necessary consistency, and yet allows the students to thrive and faculty to shine with their own expertise.

Last, there is a tendency to keep all courses consistent so students can move smoothly from one class to another. This includes consistency in the discussion structure, weekly quizzes, or course project deliverables spread out at certain weeks during the session. On the other end of the spectrum, structure and processes in the workplace keep changing. Would a more varied course structure help students adjust better in the workplace and deal with change with less drama? Would a more varied course structure make students' experiences more unique and memorable?

CONCLUSION

Academic quality is multidimensional and course design is one of those dimensions. Course design plays a very important role in student engagement, learning, and achieving the desired outcomes. Given the varied nature, content, and purpose of each course, all involved in course development must give thoughtful considerations before deciding on the course approach, course resources, and activities. A student-centered course, designed with the end in mind, requires content expertise, pedagogical knowledge, collaboration, creative use of multimedia, and an open mind to change.

Correspondence regarding this article should be addressed to Dasantila Sherifi at dsherifi@devry.edu.

Keywords: course design, course content, academic quality

REFERENCES

Aiken, K. D., Heinze, T. C., Meuter, M. L., & Chapman, K. J. (2016). Innovation through collaborative course development: Theory and Practice. *Marketing Education Review, 26(1)*, 57-62. doi:10.1080/10528008.2015.1091679

Allen, S. (2016). Applying adult learning principles to online course design. *Distance Learning, 13(3)*, 25-32. Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/1876043451?accountid=44759

Angel, L. (2015). Does course design impact student engagement and/or student outcomes at community colleges? An empirical test of a web-based, student-centered learning design strategy (Order No. 10000145). Available from ProQuest Central. (1760978494). Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/1760978494?accountid=44759

Baldwin, S., & Ching, Y. (2017). Interactive storytelling: Opportunities for online course design. *TechTrends, 61(2)*, 179-186. http://dx.doi.org/10.1007/s11528-016-0136-2 Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/1871543329?accountid=44759

Daugherty, K. K. (2006). Backward course design: Making the end the beginning. *American Journal of Pharmaceutical Education, 70(6)*, 5-135. Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/211293092?accountid=44759

DeVry University (2016). Academic quality at DeVry University. Retrieved from https://www.devry.edu/academics/academic-quality.html

Dodd, B. J. (2013). Toward a theoretical model of decision-making and resistance to change among higher education online course designers (Order No. 3598895). Available from Education Database. (1465434145). Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/1465434145?accountid=44759

Hains, B. J., & Smith, B. (2012). Student-centered course design: Empowering students to become self-directed learners. *The Journal of Experiential Education, 35(2)*, 357-374. Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/1288615787?accountid=44759

Hartwig, S. M. (2009). Constructivist course design and educational effectiveness in online distance education (Order No. 3360802). Available from ProQuest Central. (305137024). Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/305137024?accountid=44759

Hinze, L. E. (2013). Feedback practices: Faculty perception on the influence of course design on feedback delivery in higher education online classrooms (Order No. 3601372). Available from Education Database. (1466302780). Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/1466302780?accountid=44759

Mendenhall, R. (2013, March 5). Ensuring academic quality in Higher Ed. Retrieved from https://www.huffingtonpost.com/dr-robert-mendenhall/ensuring-academic-quality_b_2793071.html

Ruwe, D., & Leve, J. (2001). Interdisciplinary course design. *The Clearing House, 74(3)*, 117-118. Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/196836684?accountid=44759

Schaber, P. & Shanedling, J. (2012). Online course design for teaching critical thinking. *Journal of Allied Health, 41(1)*, e9-14. Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/1347609320?accountid=44759

Varonis, E. M., & Varonis, M. E. (2015). Deconstructing candy crush: What instructional design can learn from game design. *The International Journal of Information and Learning Technology, 32(3)*, 150-164. Retrieved from heaps://search-proquest-com.proxy.devry.edu:5443/docview/1873598626?accountid=44759

Vlachopoulos, D. (2016). Assuring quality in e-learning course design: The roadmap. *International Review of Research in Open and Distance Learning, 17(6)* Retrieved from https://search-proquest-com.proxy.devry.edu:5443/docview/1866285284?accountid=44759

DeVry University Journal of Scholarly Research (2018) / Volume 4, Number 2

FROM THE CLASSROOM

THE WHY AND THE HOW OF THE INFOGRAPHIC WOW – INFOGRAPHICS IN TEACHING AND WRITING: BEST PRACTICES

SARBANI VENGADASLAM
COLLEGE OF LIBERAL ARTS & SCIENCES

Author Note: Sarbani Vengadaslam is a visiting professor at DeVry University, North Brunswick, NJ

ABSTRACT

This paper focuses on the need to use infographics in teaching and in academic writing. The special requirements of teaching to millennials are discussed, and why it has become necessary for teachers to use infographics to enhance their teaching and classroom interaction are highlighted. As students have to write for and thrive in an increasingly picture-oriented world, it is necessary that teachers offer opportunities to students to use infographics for sharing and presenting information. The paper proffers information on some infographic tools, practitioner details, possible assignments, and best practices. The paper ends with a spotlighting of how infographic expertise is necessary to wow audiences and have an advantage in the workplace.

Infographics is a great new way to communicate complicated data and present information. A form of visual shorthand, infographics offers presenters the power to distill content and showcase it through pictures in a manner where the subject matter neither loses its potency nor the context within which it operates. Infographics are a combination of texts and images, data visualizations, and illustrations; a combination that was brought together by the creator's compelling idea and controlling vision. Put differently, infographics can be used to tell a complete story of how data and ideas are linked. A way to sort, group and organize data, infographics have become commonplace in news media, marketing, and other venues because they help users visualize the big picture of an idea that might otherwise be difficult to understand. Given the trend toward visual rather than textual consumption of information, infographics can move beyond being a graphic representation of information into a new way of processing and demonstrating knowledge. "When these innovative visuals are connected with books and other library resources, synergy can occur to facilitate new ways of thinking" (Lamb & Johnson, 2014). This paper highlights how the new synergy can be achieved by proffering best practices on creating infographics as well as indicating how it can be used in the academic environment for writing and teaching.

Students of this generation are *informovores*. Surrounded and bombarded by visual information, they thirst for a way to learn that satisfies their visual instincts and increases their

ability to retain data. As infographics provide context and patterns while creating a "picture superiority" effect, even the most complex data can be presented in an organized and memorable manner. Infographics can be a godsend for writers of the push-pull era who are looking for a visual to summarize their achievements in their reports, summaries, papers and dissertations. It can also be of assistance to teachers looking for a way to demonstrate how theories and artifacts interact, impart a lesson on history and evolution, or discuss methods and results of scientific experiments. However, the benefits of infographics can be realized only if certain practices are followed.

Audience is king. Hence it is a good practice to know the audience so the infographic can be tailored to their taste. "Our findings show differences in terms of audience-specific preferences for presentation of research results. Our study supports other research indicating that tools for knowledge dissemination and translation need to be targeted to specific end users' preferences and needs." (Crick & Hartling, 2015, p. 2). It is important that infographic makers never lose sight of the audience because substance must always determine style.

Another good practice is to remember that less is more when it comes to using infographics. Since Infographics are "a condensed composition," busying it up with lots of extraneous imagery or flashy visuals would go against the very rationale for using infographics. It is easy to be drawn to slick, stylish fonts and gaudy lay-outs; therefore, it is essential to remember that "compelling content is the real driving force behind effective visualizations. The best infographics are easy to read, present information clearly and logically, and direct the reader's eye from one section to the next in a coherent, fluid motion" (Zayan, 2015, p.31). In order to ensure that the audience is not confused by having their attention shifted from one section to the next without any sensible order or rationale, it is necessary to plan and organize data meticulously while creating the infographic.

Having a design approach is a core requirement for creating infographics. It is necessary to use text, images, media, and color as efficiently as possible. It may be essential to pick visuals that are appropriate and do not overwhelm the content. Particular attention has to be paid to the actual data before sending it to the infographic program for visual transformation. A good practice is to plan the transcript with an outline or visual storyboard. It is essential to limit words and be mindful of the length and number of sources - simple is often better when it comes to infographics.

It is easy to commit plagiarism unconsciously while using infographics. It is, therefore, necessary not only to make sure that all sources have been cited while inputting data into the infographics creator, but also to double check facts and confirm that the original source of the data has been used. Since it is essential to maintain authorship over the infographics one has created, it may be a good idea to create a single web link (using Bit.ly for instance) to share.

While there are numerous tools to create infographics, the new breed of tools—such as Visual.ly, Easel.ly, Infogr.am, Vengage, Thng Link, Smore, Piktochart—allow faster and easier creation of infographics and enable even users without deep skills in graphic design to create amazing visualizations. For assignments in the classroom, it may be good to use Piktochart: http://piktochart.com/; Easely: http://www.easel.ly/; and Infogr.am: https://infogr.am/. These programs offer templates and examples and incorporate drag-and-drop functionality, so creators can focus their efforts on the concept rather than having to worry about creating the graphics. As software develops, it would be possible to create infographics with even greater flexibility, interactivity, and *shareability* than we have today. Though Lankow et al (2012) predicted that "[t]he future of infographics" will see an "increased automation of data visualization" (p.145), it is important that we never underestimate the need and power of authorial vision in creating a memorable infographic.

The advantage of utilizing infographics in a classroom or company, is that it brings the power of brevity, insight, action, and engagement to the presentation of research (Smiciklas, 2012).

Infographics need not just be used to emphasize specific numbers, statistics or trends; writers or teachers can use it to show linkages and the larger picture. Also, infographics can be woven into inquiry-based learning activities throughout the curriculum that include demonstrating social studies, historical, literary, biographical, scientific, and art connections. Here are some suggested assignments based on those collated by Annette Lamb and Larry Johnson (2014, p.56):

1. *Social Studies Connections*. Ask students to create their own infographic that ties in the social issue (bullying, drug abuse, etc.) to their realistic fiction book.

2. *Historical Connections*. Consider introducing infographics as part of primary-source documentation activities. For instance, students can be asked to connect Rebecca Skloots' reportage on Henrietta Lacks to the HELA cells controversy, black history, and development of HIPAA laws

3. *Biography Connections*. An increasing number of biography infographics features the lives of famous people. Students can, for instance, be asked to connect Steve Job's life and milestones of Apple Inc., or Shakespeare's themes in his plays with events in his life in an infographics exercise.

4. *Science Connections*. Students can investigate numerous scientific phenomena and space exploration events by creating infographics on them.

5. *Art and Design Connections*. Business and Marketing students can create infographics connecting the Psychology of Color in Logo Design and successful brands and branding.

Each teacher can create such assignments for their own disciplines as per his or her own course needs and syllabus requirements.

Infographics are poised to "play an exciting role in inquiry-based learning. The teacher-librarian can play an important role in helping teachers and their students select, use, and create infographics for projects across the curriculum" (Lamb & Johnson, 2014, p.55). Sharing best practices and experiences will encourage both teachers and students to inculcate an infographics way of thinking. Institutions, too, would need to offer opportunities, training, and support before the comfort level of students and teachers in using infographics rise. However, the time, money, and effort spent is necessary so students get to develop the knowledge and the skills to generate the infographics wow when they speak and present in their academic as well as professional careers.

Correspondence regarding this article should be addressed to Sarbani Vengadaslam at svengadasalam@devry.edu

Keywords: technology, classroom, writing tools, infographics

REFERENCES

Crick, K., & Hartling, L. (2015). Preferences of knowledge users for two formats of summarizing results from systematic reviews: Infographics and critical appraisals. *PloS One, 10(10)*, e0140029

Lamb, A., & Johnson, L. (2014). Infographics part 1: Invitations to inquiry. *Teacher Librarian 41(4)*, 54-58.

Lankow, J., Ritchie, J., & Crooks, R. (2012). *Infographics: The power of visual storytelling.* Hoboken, NJ: John Wiley & Sons.

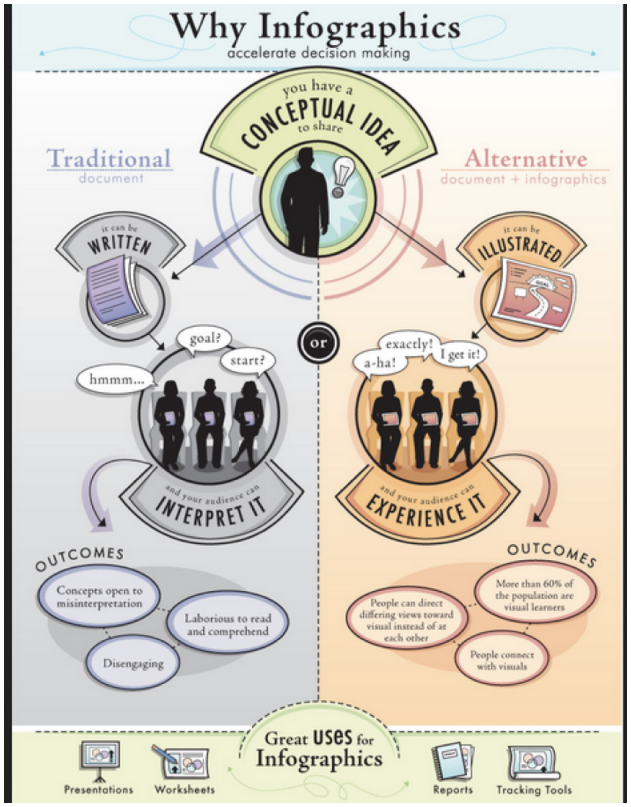
Smiciklas, M. (2012). *The Power of Infographics: Using pictures to communicate and connect with your audiences*. Indianapolis, IN: Que Publishing.

Thompson, C. M. (2015). Creating "visual legacies": Infographics as a means of interpreting and sharing research. *Communication Teacher, 29(2)*, 91-101.

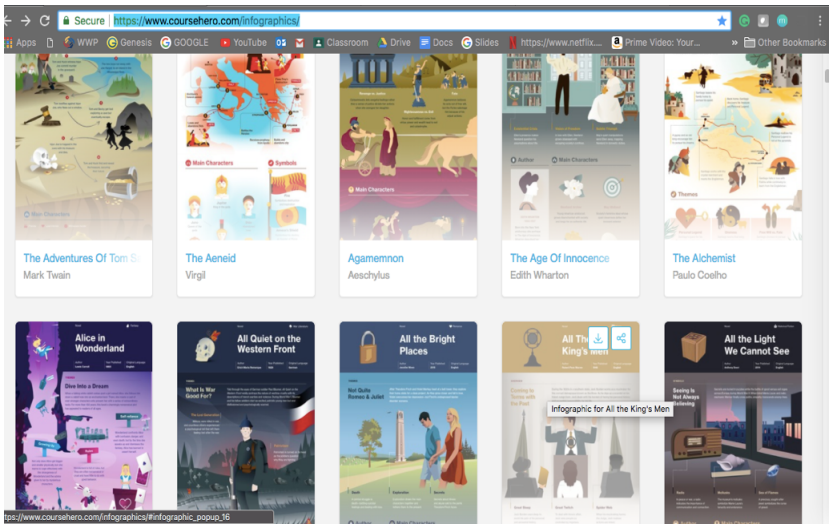
Zayan, M. (2015) Create compelling infographics." *Quill 103(1)*, 31.

APPENDIX 1: A SAMPLE INFOGRAPHIC ON INFOGRAPHICS

SOURCE: http://www.infographicsshowcase.com/wp-content/uploads/2010/03/Use-Infographics.jpg



APPENDIX 2: A SCREENSHOT OF HOW COURSE HERO USES INFOGRAPHICS IN TEACHING LITERATURE



DeVry University Journal of Scholarly Research (2018) / Volume 4, Number 2

PRESERVING THE PAST IN BRUGES

De Roeck, H. and Nosow, R. (2009). *Life, Music, and Art in 15th Century Bruges: Giovanni di Arrigo Arnolfini.* Brugge, Belgium: Druk Beyaert Press, 106 pp. $19.95

SHAWN SCHUMACHER
COLLEGE OF LIBERAL ARTS & SCIENCES

Reviewer Note: Shawn Schumacher is a Senior Professor of English and Humanities at DeVry University, Addison, IL.

Earlier this summer, my wife and I treated ourselves to a 20th anniversary gift: a vacation to the Netherlands, Belgium, and France. During our trip, we had a two night's stay in Bruges, which is the capital and largest city in the province of West Flanders and arguably one of the most romantic and culturally significant cities in Europe.

While in Bruges, we stayed at the historic Hotel Lucca, a few blocks north of the architecturally dramatic Markt in the city center, and had the good fortune to meet Hans De Roeck, owner and operator of the hotel. De Roeck, a classically trained organist, has traveled the world and studied music in the United States. He, along with friend and colleague, Robert Nosow, a composer and music instructor from North Carolina, co-authored the non-fiction piece, Life, Music, and Art in 15th Century Bruges: Giovanni di Arrigo Arnolfini, published locally by Druk Beyaert Press.

De Roeck and Nosow's text is noteworthy due in large part to the sharp historical examination of the life and times of Giovanni di Arrigo Arnolfini, who is considered one of the most famous and successful Italian merchants in Bruges in the 15th century. In addition, the text delves into the life and works of Arnolfini's portrait artist, Jan van Eyck, who lived in Bruges and was one of the founders of Early Netherlandish painting and is considered one of the most significant painters of Northern Renaissance art. The intersecting lives of Arnolfini and van Eyck, along with their enduring legacies to the realms of business and the arts throughout central Europe, are thoughtfully and richly captured throughout the text.

The authors accurately identify the key players in Arnolfini's wealthy family, who like Arnolfini himself, were keen merchants in pursuit of fortune, fame, and power in 15th century Italy, France, and Flanders, the region encompassing Bruges and current day northern Belgium. De Roeck and Nosow precisely detail Arnolfini's travels through central Europe and contractual dealings with the Burgundian court, which included luxury clothing and tapestries created from damask silk in brilliant shades of violet, blue, black and grey; black satins and velvets; cloth of silver; scarlet and gold cloth; and velvet with gold brocade.

Interspersed with aspects of life among the influential merchants and political populace in 15th century Bruges are tales of Arnolfini's interaction with Louis, the Dauphin of France, the son and heir of King Charles of France. Due to his expert handling of Louis of France's

finances, Arnolfini was appointed Receiver General of Normandy and General of Finance upon the death of Charles VII, as Louis XI ascended the throne. As the authors distinctly convey, Arnolfini flourished in his position, and Louis XI rewarded Arnolfini by knighting him in 1462.

The latter chapters of the text review and analyze the cultural aspects of Arnolfini's life in Bruges, one of the leading centers of music in Europe during the 15th century. Here, De Roeck and Nosow illustrate the architectural designs of local churches, along with the sacred and secular music performed at the time. As accomplished musicians themselves, the authors effusively describe the churches' ceremonial hymns and motets and earthly chansons and fanfares. Additionally, the authors skillfully introduce significant pieces of 15th century Bruges literature, along with the intriguing connection between Arnolfini and Jan van Eyck, a court painter to Philip the Good, Duke of Burgundy. Van Eyck, influential through his techniques and style, painted both secular and religious subjects and moved to Bruges in 1429, where he lived until his death in 1441. De Roeck and Nosow ascertain that while in Bruges, van Eyck befriended Arnolfini and later was commissioned to paint two portraits of the merchant as well as The Arnolfini Marriage, a full-length double portrait of Arnolfini and his wife in their home in Bruges.

As a first-time visitor to Bruges, I was captivated by the grand culture of the city, and after several dynamic discussions with De Roeck, whose profound passion for the history of the people of Bruges and the arts and businesses they created was monumental, I found his and Nosow's text to be an enchanting post-trip reading experience, wishing I had taken more time to research Bruges and its absorbing people prior to my arrival.

Correspondence regarding this book review should be addressed to Shawn Schumacher at sschumacher@devry.edu

DeVry University
Keller Graduate School of Management

DEVRY UNIVERSITY JOURNAL OF SCHOLARLY RESEARCH

CALL FOR PAPERS, SUMMER 2019 ISSUE

The *DeVry University Journal of Scholarly Research* (DUJOSR) continues to expand its pages to include a variety of publishing opportunities for faculty. Academic scholarship remains a staple for the journal, but new categories include Case Studies, Book Reviews, Letters to the Editor, and a "From the Classroom" section, in which faculty can share vital experiences and best practices. These categories of submission are fully described below. Specific deadlines and instructions for submission conclude this "Call for Papers."

ACADEMIC SCHOLARLY ARTICLES

For the Summer 2019 issue, we continue to solicit "working papers" (3000 to 5000 words) in our scholarly article category.

Papers of all types are welcome including theory, empirical, or methodology papers, as well as literature reviews, from both positivist and naturalistic traditions. Research- and evidence-based papers emphasizing practical relevance that resonate with our readers are preferred. We regard submissions as "working papers" that can be submitted to other journals for consideration (but have not been previously published elsewhere).

The review process requires that each paper is coded and blind reviewed by two peer reviewers with expertise in the author's discipline. Faculty volunteers (for whom profound gratitude is expressed) comprise the peer review board. Final publication decisions are made by the editorial board, consisting of College and Managing Editors.

Authors who have previously submitted academic scholarly papers for past issues are encouraged to re-submit their revised papers. Papers should be sent with an additional document that specifies detailed responses to reviewers' and editors' feedback.

CASE STUDIES

DUJOSR solicits case studies (ranging from approximately 500-word short cases, to 1000 to 3000-word long cases) that have not been published elsewhere, but are considered "working papers." The purpose of this initiative is to create a repository of case studies that can be used by faculty to teach DeVry University graduate and undergraduate courses. Our aim is to provide students with a unique and valuable learning experience that has been generated by our faculty.

Case studies of all types are welcome, including multi-media. We would prefer case studies that emphasize practical relevance that resonate with our faculty and students. Case study submissions must also be supported by a set of directions, i.e., Faculty Teaching Notes. The teaching notes must indicate the relevant courses and TCOs associated with the case study, as well as suggested question strategies and pedagogical practices.

DEVRY UNIVERSITY JOURNAL OF SCHOLARLY RESEARCH

The case study should be, significant, complete, compelling, inclusive of alternative perspectives, qualitative, sufficiently evidenced, aligned with one or more Course Objectives, and written with accuracy and relevance.

The review process for case studies is the same as for academic scholarly papers. Case studies will be evaluated on the following criteria:

- Timeliness of case & relevancy (tied to 1 or more Course Objectives),
- Theoretical framework, and practical applications
- Case development (including discussions if applicable),
- Case notes for faculty,
- Study results,
- Opportunity to expand knowledge,
- Implications to field of studies,
- Writing quality: Clarity, conciseness, and organization, grammar and mechanics,
- APA format, including in text citations and reference page.

There is no submission deadline; case studies will be accepted on an ongoing basis.

BOOK REVIEWS

Book reviews continue to be a regular feature in the journal pages. They are an important part of scholarly life. They alert colleagues to new developments in the academy, foster discussions that can lead to new scholarship, and ultimately provide us with both a broader and deeper view of the world, which we in turn can share with our students.

Reviews of either fiction or non-fiction works should adhere to the following publication guidelines:

1. Reviews should be between 500 to 1000 words in length, double spaced, and include the following: author, title, place of publication, publisher, year, price, page length (including introduction and text), and International Standard Book Number (ISBN).
2. Reviews should include a brief summary of the scope, purpose, content of the work, and its significance in the literature of the subject. Reviews should evaluate the strengths and weaknesses of the work as well as attend to its use of sources, including documentation, methodology, organization, and presentation.
3. Reviews should be fair, balanced, and treat authors with respect.
4. A signed permission form to publish a review is required.

LETTERS TO THE EDITOR

Letters to the Editor are a welcome addition to the journal pages. Letters that reply to or extend academic scholarship published within DUJOSR pages are particularly welcome, as these add rich texture and dialogue to ideas presented. Letters should be professional, well-tempered, and engage with content meaningfully. Letters that do not necessarily attend to previously published work, but are timely and relevant are also welcome.

DEVRY UNIVERSITY JOURNAL OF SCHOLARLY RESEARCH

Letters responding to published articles in DUJOSR should identify the month and year of the article, review, or previous letter on which it is commenting. The full title of the article, review, or letter as well as the author(s) name(s) should be included. Letters should be double-spaced and 500 to 1000 words in length. Letters may express well-tempered opinions, but should include citations in cases where academic integrity requires documentation. Letters should be fair, balanced, and treat authors with respect.

FROM THE CLASSROOM

This section of the journal is newly offered to faculty who have rich pedagogical experiences worthy of sharing with a larger audience. Papers in this category may use research to support ideas, but may also consist of valuable experiences about which research may not have yet caught up. Well-crafted papers that demonstrate increased student engagement in the classroom are particularly prized. In this category, the recommendations for length are 750 to 1000 words, but longer papers of exceptional quality and relevance will be considered. Content should seek to express pedagogies that transcend the commonplace or that provide an interesting new spin on well-trod best practices.

EDITORS' INSTRUCTIONS FOR SUBMISSION AND DEADLINES

All submissions are expected to follow the APA style sheet. Templates and APA source materials are available through the DeVry Commons intranet community site, DeVry University Journal of Scholarly Research, under the following headings:

- Guide to APA Research Writing and Formatting Template Revised Nov 2013
- Guide to APA Research Writing and Formatting Revised Nov 2013
- DeVry University APA Handbook
- APA 6th Guide to Citing Sources

The submission deadline is March 31st, 2019. Please submit work in any category to Managing Editors, Deborah Helman and Michael Bird, at DUJOSR@devry.edu.

The Managing Editors reserve the right to edit all submissions in any category of submission for length, tone, and content, over and above recommendations made by peer reviewers and College Editors.

DeVry University
Keller Graduate School of Management

DeVry University Main Campus
3005 Highland Pkwy, #100
Downers Grove, Illinois 60515
877.388.3374

devry.edu

For comprehensive consumer information, visit devry.edu/studentconsumerinfo

In New York State, DeVry University operates as DeVry College of New York.