

An Exploratory Study of *Color Accounting*: A New Way to Teach and Learn Accounting

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This study examines one facet of a new teaching system, Color Accounting, which utilizes color and a tactile model to enhance financial acumen by using color to link the concepts, meaning and application of accounting information. Research in other disciplines suggests a strong link between color, attention level and retention. This study extends these findings to accounting pedagogy. We test the Color Accounting model's ability to assist with accounting comprehension and retention using a post-test assessment with experimental and control groups. An additional follow-on study will be conducted to test differences in long term retention of accounting knowledge and concepts.

INTRODUCTION

Accounting is the language of business; therefore, a basic understanding of it is important for all business professionals. As an essential part of the business curriculum, accounting professors must train all students, some with a disparate level of interest and inherent biases. Moving beyond preconceived ideas like “accounting is boring” and “I am not good with numbers/math” is vital for real understanding and retention to begin.

The accounting program at our AACSB-accredited business college has the reputation of being forward-thinking, technically rich, and professionally oriented. Its graduates are in high demand as evidenced by exceptional placement rates. However, even with our sterling reputation, the thought of becoming an “accounting major” or even taking a required course in accounting does not often engender strong, positive emotions. This is often the case because students form a negative view of accounting after suffering through their first course in accounting which, for many, confirms their negative paradigms and stereotypes about the discipline.

In its seminal piece, the Pathways Commission (2012) implores accounting educators to make changes to how we teach accounting fundamentals lest we lose our ability to attract high-potential, diverse entrants into the accounting profession. Specifically, Objective 5.2 states to “transform the first course of accounting [and] go beyond the technical nature of accounting to more completely discuss the role accounting and accountants play in society...”. Further, “without engaging teaching approaches and materials, the first course remains an area to be addressed in effective curricular models... In the worst case, it may perpetuate a negative image of our profession and the possibilities within our profession; in the best case, it constitutes a missed opportunity to attract students interested in meaningful and challenging work to accounting” (Pathways Commission, 2012).

We firmly agree with Pathways’ statement that the “first course in accounting is clearly a critical pathway to attracting students into the study of accounting and the accounting profession. Without a clear role and **engaging learning approaches**, this course may negatively influence students...” (emphasis added). Finally, the report further states, under Action Item 5.2.4., to “incorporate engaging materials that demonstrate the role accountants play in society [and] questions and problems that need solving...” (Pathways Commission, 2012). Thus, beyond accounting majors, it is important for all business professionals to understand and be knowledgeable about accounting statements and reports.

The intent of our study is to explore the efficacy of the *Color Accounting* learning system for undergraduate business accounting education. Specifically, we set out to investigate whether the use of color to teach accounting can increase students’ comprehension and retention of accounting principles and concepts. Research in other disciplines such as education, training and development, marketing, business communication, and medicine that is grounded in the psychology of color suggests a link between color and comprehension, attention level, and retention (Dzulkifli and Mustafar, 2013; Jones, 1997; Myers, 2004; Sullivan, 2008; Otto, 2013; Longo, 2001)

In the following sections, we discuss the *Color Accounting* learning system, relevant research from other disciplines, and our exploratory study and findings. Finally, we present implications and plans for future study.

BACKGROUND

Color Accounting

Color Accounting is revolutionary in that it dispenses with teaching how accounting works using debits and credits, instead replacing this approach initially with a three-color **balance sheet-income statement** (“BaSIS”) storyboard and color-coded “buckets” (accounts) and “tickets” (transactions). Transaction tickets are placed in the bucket accounts on the basis of how they affect the buckets that are positioned on the storyboard. In this way, accounting concepts are taught using color and tactile props to aid students’ visualization of the logic of fund flows. A video showing how the *Color Accounting* learning system works can be viewed at <http://www.accountingschool.com/>. *Color Accounting* is heartily endorsed by such corporate powerhouses as Goldman Sachs, Caterpillar, and Chesapeake Energy, not to mention at least three of the Big 4 accounting firms, the U.S. Government Printing Office, and a Harvard Business School professor.

Theoretical Framework

Beyond the *Color Accounting* learning system, we explored the current research that investigates a link between the psychology of color and learning comprehension, attention level and retention. We identified some relevant findings in other disciplines, such as education, training and development, marketing, business communication, and medicine. A brief synopsis of these findings follows.

Color Enhances Arousal: Sedighian and Sedighian (1997) studied the aesthetic needs of learners by compiling children’s reactions to color and graphics compared to black-and-white educational computer programs. They found that the students felt that colorful pictures made learning fun, more enjoyable and added flavor to the learning activity. This suggests that emphasizing that beauty and aesthetics should be taken seriously in the design of interactive learning environments.

Longo (2001) states that “The role of the senses is involved in concept formation since perception and cognition are now viewed as a continuous and co-extensive process. What is critical for classroom experiences is to have a diverse number of multi-modal (auditory, visual, and tactile) learning tasks for the acquisition, representation, and assessment of knowledge. These multi-modal experiences will then continue to strengthen the internal connections between the distributed forms of knowledge. Perhaps assessment then can be viewed as authentic with respect to the modality in which the learning experience occurred.” What happens when color is included in the learning task? According to the author, the use of color promoted the formation and recall of knowledge from memory, improvement in both pencil-and-paper and think-out-loud problem solving, and long-term meaningful learning of earth-science knowledge.

Color Enhances Memory and Retention: Smilek et al (2002) examined the extraordinary memory for numbers of one student who, in her mind, saw digits in highly specific colors which occurred automatically and whose pairings with digits did not change or diminish over time. When asked how she remembered so many digits, she reported that for her, each digit has a specific color, and it is the colors that make it easy for her to remember the digits. Similarly, Sullivan (2008) states that color “has an immediate, associative response in the brain”, lending additional support to the idea that color presented when teaching numerically-based concepts may lead to an association in the brain between the colors and the numbers to which the colors are paired.

In an article about enhancing memory and retention with color, Myers (2004) states that “color influences the way we see and process information; it can improve our ability to remember both words and pictures,” and that other studies that she references suggest that “color is a vital factor in retention.” Color is also used extensively in the Montessori systems of teaching.

Finally, a review of the research on the influence of color on memory performance found that increasing attention can improve recall and reaction time, and that color can improve memory by increasing attention levels via enhancing the level of arousal when viewing objects in color (Dzulkipli and Mustafar, 2013).

Comprehension Complexity: In a study of whether the use of varying degrees of color had any effect on the levels of learning objectives that were achieved, Alemar and Dwyer (1993) set up several groups who received different treatments of color intensity to aid in the learning of the complex concepts related to the cardiac cycle. Additionally, some groups were not treated with actual color, but rather with black, gray, and white. When the black, white and gray treatment was utilized, the important concepts were bolded to direct the attention of students to important information. The authors discovered that there was a correlation between color and learning. In even the moderate-color treatment group, students scored higher on the terminology test than those treated with the black, gray, and white model.

Similarly, Farley and Grant (1976) evaluated nursing students’ remembrance of material presented in a color multimedia presentation compared to the same presentation presented in black and white, with results supporting the authors’ hypothesis that remembrance over one week is greater for multimedia presentations made in color.

Otto (2013) studied the use of color to teach English and stated that color-coding and color choice add interest to written text and make communicating written information more effective, compared to undifferentiated [black and white] text, which lacks interactive elements to aid interpretation of the written content. Moreover, she cites research which indicates that adding color results in the chunking of information into organized, manageable units, providing universal connections to people of differing backgrounds and eliminating confusion among parts, structures, and divisions of the writing process.

Key Literature Themes

The themes that surface from the literature review provide support for the depth of learning achieved with the *Color Accounting* learning system. First, there is support for better comprehension and retention when learning aids are presented to students in color rather than in black and white. Second, studies indicate that students perform better on both recall and problem-solving assignments after using color learning tools, and they retain information longer. Third, learning may be facilitated when color is

introduced, perhaps due to color's associative response in the brain, its ability to grab our attention, or its influence on how we see and process information. Finally, color facilitates the organization and categorization of information into manageable elements and helps to reduce confusion in disciplines where there are a variety of parts and structures to keep track of. With these themes in mind, we were able to formulate two hypotheses about how using *Color Accounting* to teach accounting principles would affect the students exposed to this learning system.

Hypotheses

Though the visual and tactile features of *Color Accounting* lend themselves well to a variety of research questions, due to the exploratory nature of our study, we opted to do small-scale, preliminary testing of only two hypotheses. These hypotheses are directional in nature; that is, we will predict not only that the null hypotheses ("no change") are not supported, but also that the actual values of the independent variables, in our case, exceed the values of the null hypotheses. Directional hypotheses are generally based on the results of prior studies, theory, experience, or some other pre-established baseline.

First, since *Color Accounting* uses color as a way to organize complex accounting concepts and structures into manageable, understandable elements, we expect that students exposed to *Color Accounting* would be more interested in the subject matter, would more easily understand the accounting principles presented by it, and would consequently score higher on an accounting principles assessment exam.

H1. Color Accounting students will earn higher scores than non-Color Accounting students on an accounting principles assessment exam taken at the conclusion of their financial accounting principles course.

Second, since information learned through the use of color in the *Color Accounting* learning system should be better understood and should leave a more lasting impression on students, we expect that students exposed to *Color Accounting* would retain for a longer time period the information presented through it, and would consequently score higher on an accounting principles assessment exam taken at a significant length of time after initially learning the material.

H2. Color Accounting students will earn higher scores than non-Color Accounting students on an accounting principles assessment exam taken long after the conclusion of their financial accounting principles course.

METHODOLOGY

In this section, we describe how we designed our exploratory study within the constraints under which we had to proceed, as well as how we collected our data and how we acquired and used our assessment instrument. The section concludes with a discussion about our analysis methods.

Research Environment

In the late summer of 2013, the accounting faculty at our university were charged with exploring ways to reinvent the business college's accounting principles courses in the spirit of the Pathways Commission's report's recommendations. In this vein, while preparing materials for a financial accounting principles course section slated to begin in the fall semester of 2013, quite by accident, we stumbled upon a revolutionary method of enhancing financial acumen that was being used in the corporate and nonprofit world, called *Color Accounting*.

We discussed the attractiveness of this method and invited one of the *Color Accounting* founder-creators to campus to present *Color Accounting*, and to certify one of our accounting professors as a *Color Accounting* trainer. We were excited and intrigued by the method and wanted to get started with it right away. Since the semester was about to start and book orders had been placed months prior, it was

not feasible to require students to order the *Color Accounting* kits at that time. Instead, one of us used a tiny *Color Accounting* companion book, *Accounting Comes Alive - The Color Accounting Parable* (Robilliard and Frampton, 2010), and adapted all of her financial accounting lectures to incorporate the BaSIS storyboard, bucket, ticket, and color-coding concepts in diagrammatic form on paper without using the tactile kits.

Data Collection

In the fall of 2013, Due to our eagerness to test the effectiveness of *Color Accounting* for potential use in the redesign of our accounting principles courses, we made the decision to move forward with an exploratory study, in spite of some inherent limitations, with the objective of collecting data and obtaining some preliminary results.

The convenience sample was made up of students in all financial accounting principles course sections at a small, private AACSB-accredited university and included a random mixture of 79 accounting majors, other business majors, and non-business majors; most were sophomores. The majority of students in all three sections had not had any exposure to accounting prior to their taking the financial accounting principles course. Though there were different instructors involved, both instructors are known for teaching excellence, similar active-learning teaching style and pedagogical aids used, concern for and commitment to students, and other similar instructional traits. We taught one section of “*Color Accounting*” and two sections of “traditional accounting; both instructors conducted post-tests at the end of the fall term.

The paper-based assessment instrument used was obtained from Accounting Comes Alive International (ACA International), and is the same one that ACA International uses at the conclusion of its corporate *Color Accounting* training courses. This assessment instrument has not been subjected to a pilot study or other means of testing its validity or reliability by ACA International.

Data Analysis Techniques

We graded the post-test assessments and assigned a score based on the number of questions answered correctly. The small sample size and section allocation constraints limited our analysis potential. Consequently, we limited our data analysis to calculating means and percentage changes due to the probable lack of statistical significance and reliability that arises from small sample sizes. However, since the purpose of our study is simply to explore the potential effectiveness of using *Color Accounting* to enhance interest in and comprehension of college accounting course work, and since ACA International had shared with us that no other colleges were using *Color Accounting* at the time, we think the findings are of consequence.

RESULTS

The results of the post-test assessment were encouraging. A comparison of the average assessment score (number correct) for *Color Accounting* students to the average assessment score for non-*Color Accounting* students is shown in Table 1. The *Color Accounting* students’ average post-test score was 13.29 compared to the average non-*Color Accounting* students’ average post-test score of 13.07. Although the difference between the two sets of scores is small, we also did not test the “full-blown” *Color Accounting* learning system, since the students did not have the storyboard, bucket, and ticket tactile tools to combine with the use of color, as the system is intended to be used. We anticipate that the difference in scores would be more pronounced with the full array of system tools in use.

TABLE 1
POST-TEST COMPREHENSION
AVERAGE SCORES OF FALL 2013 ACCOUNTING PRINCIPLES STUDENTS

	n	Post-Test Number Correct
Color Accounting Students	28	13.29
Non-Color Accounting Students	51	13.07
Percent Difference		1.63%

In addition to the favorable post-test score results, comments received from students on the *Color Accounting* trainer-instructor's general, open-ended course evaluation questions were also generally favorable.

The *Color Accounting* trainer-instructor introduced *Color Accounting* in similar fashion to her junior-level management accounting students and her senior-level governmental accounting students in the 2013 fall semester and has continued to use it in every subsequent semester, by adapting her lectures to include *Color Accounting* concepts on paper without the actual storyboard, buckets, and tickets. Similarly to the comments received in her accounting principle section, the majority of students who mentioned *Color Accounting* in their general, open-ended course evaluation question responses commented about the method in a positive way.

We have presented and demonstrated *Color Accounting* to other academic instructors at the high school and college levels and it has been received with significant interest. This is consistent with the use of *Color Accounting* with South African tenth graders, who find it overwhelmingly popular from the standpoint of enhancing the comprehension of accounting principles concepts, and simply being fun to use. ACA International has actually received fan mail from many of these students. Unfortunately, no studies have been done yet with the South African high school students to measure the level of improvement in comprehension or retention that has been achieved with *Color Accounting*.

The combination of the fall, 2013 post-test assessment results and the course evaluation comments lead us to cautiously affirm H1; however, we will rerun the experiment using larger sample sizes and other methodology enhancements starting in the fall of 2015, as described in the last section of this report.

In order to further test the robustness of the *Color Accounting* learning system, we conducted two additional assessments in the following 2014-15 academic year, to observe *Color Accounting*'s possible impact on students' retention of accounting principles concepts. The first retention assessment was an accounting principles assessment which was given at the beginning of the fall, 2014 semester in the first term of the *Color Accounting* trainer's junior-level management accounting course, which consisted of almost all accounting majors. Of the students entering the course, approximately 75 percent had not been exposed to *Color Accounting*, and 25 percent had been exposed to it in the previous year's fall semester. The questions on the fall, 2014 assessment covered material commonly known to be on the ETS Major Fields Test in the accounting subject area. The number of correct answers was calculated for the *Color Accounting* students and the non-*Color Accounting* students. The average score for the *Color Accounting* students, as shown in Table 2, was approximately 83 correct, compared to the average score for non-*Color Accounting* students of approximately 78 correct, a difference of almost six percent higher for the *Color Accounting* students. Thus, though overall all accounting majors retained significant knowledge of accounting principles concepts, those who learned the principles using *Color Accounting* appear to have a somewhat higher retention rate than those who were not exposed to *Color Accounting*.

TABLE 2
RETENTION AVERAGE SCORES
FALL 2014 INTERMEDIATE MGMT. ACCOUNTING STUDENTS

	n	Fall 2014 Avg Retention Score
Color Accounting Students	10	82.58
Non-Color Accounting Students	28	77.99
Difference		5.89

The second retention assessment that we conducted was done at the end of spring semester, 2015, and was open by invitation to any students who had taken accounting principles in the fall semester of 2013, three semesters earlier. Of the 79 students who initially took the assessment, roughly one-third of each original group returned to take the reassessment (9 color + 15 non-color = 24 reassessment participants). The students who accepted the invitation were primarily non-accounting business majors. This was a random group of students in both the *Color Accounting* and non-*Color Accounting* student groups, representing both accounting and non-accounting majors within each group. This retention assessment was of particular interest to us due to an ongoing issue that we have been faced with as a college: unsatisfactory ETS Major Fields Test scores earned by non-accounting business majors in the accounting discipline area. By carrying out this assessment, we were able to gather data that enabled us to conduct two analyses – the first was to compare the 2013 post-test scores to the 2015 retention scores to see whether there was a difference in 16-month retention rates for *Color Accounting* students versus non-*Color Accounting* students, and the second was to compare 16-month retention scores between *Color Accounting* students and non-*Color Accounting* students directly. The assessment tool that was used was the same instrument that the students were given in their 2013 comprehension post-tests, so that results could be compared directly. Due to low sample sizes and the exploratory nature of our study, we again chose to limit our analysis to basic percentage changes; nevertheless, we are very encouraged by the results of these analyses.

The results of the first analysis, as shown in Table 3, reveal that the 2015 average retention scores compared to the 2013 average comprehension post-test scores *improved* for *Color Accounting* students by almost five percent, whereas the same comparison for non-*Color Accounting* students *declined* by just over five percent, indicating at least in part that *Color Accounting* students, whether accounting majors or non-accounting majors, appear to have retained the knowledge that they learned with *Color Accounting*, and were able to build on that knowledge in the 16 months since they took their 2013 comprehension post-tests, compared to non-*Color Accounting* students, whose retention of accounting principles concepts declined over the same time period.

The second analysis, also shown in Table 3, indicates that the 16-month retention scores of *Color Accounting* students compared directly to those of non-*Color Accounting* students are approximately 12 percent higher. These results are very encouraging, particularly if *Color Accounting* students who are non-accounting business majors can continue to retain their accounting principles knowledge for another six months, when most of them would be taking the ETS Major Fields Test in the fall of their senior year.

TABLE 3
SIXTEEN-MONTH COMPARISON OF POST-COURSE ASSESSMENT SCORES

	n	Fall 2013 Principles Post-Test Number Correct	n	Spring 2015 Principles Post-Test Number Correct	Percent Change 16 Months
Color Accounting Students	28	13.29	9	13.89	4.54%
Non-Color Accounting Students	51	13.07	15	12.4	-5.15%
Percent Difference		1.63%		12.01%	

Given the results of the two retention analyses, we cautiously affirm H2, but again are eager to retest using larger sample sizes in the fall of 2015 and 2016.

CONCLUSION, LIMITATIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

We are pleased that the results of our informal, exploratory study of the effectiveness of a portion of the *Color Accounting* learning system's use in the college classroom support and provide preliminary evidence to corroborate the immense success that *Color Accounting* has enjoyed worldwide in the corporate world, as well as in the high schools of South Africa. We conclude that the results of our study support prior research indicating that teaching accounting principles with the addition of color can make learning this complex subject easier to comprehend, retain, and possibly even enjoy for many more students of all disciplines: non-business students, non-accounting business students, and accounting students. This outcome has the potential to contribute to attracting more students, including more talented students, into the study of accounting as a major and ultimately, into the accounting profession.

We are impressed enough with *Color Accounting* that we plan to deploy a full-scale integration of the complete visual/tactile learning system into our newly-reinvented accounting principles course in the fall of 2016. We will implement the new accounting principles course in the fall of 2015 without *Color Accounting*, and then use the same curriculum with the same instructor in the fall of 2016 with *Color Accounting*, which will allow us to improve upon our current study in a number of ways. First, it will provide adequate sample sizes for a control group (fall, 2015) and an experimental group (fall, 2016). Second, both groups will use the same curriculum, with the exception of the addition of *Color Accounting* in the latter group. Third, both groups will be taught by the same instructor. Last, we will make improvements to and will pilot test our assessment instrument to enhance its validity and reliability.

Since all of our accounting instructors, including those not included in this study, recognize the value of the *Color Accounting* learning system, we will all experiment with incorporating the *Color Accounting* pedagogy into every instructor's upper-level accounting courses so that it is woven throughout our entire undergraduate accounting curriculum, providing additional opportunities for us to conduct more robust longitudinal studies into the effectiveness of *Color Accounting* for enhancing the comprehension and retention of accounting knowledge throughout our accounting curriculum.

We hope that the results of our preliminary work will encourage other schools to consider using *Color Accounting* to enrich their accounting courses and welcome the opportunity to collaborate with instructors at other schools to get them trained to use *Color Accounting*, or with *Color Accounting* trainer-instructors in industry on joint research projects to further support the use of this effective and fun way to learn and understand accounting. In addition, we feel that more in-depth research into using color in the study of accounting can provide additional support for the effectiveness of using color to enhance comprehension, learning, and retention across a diverse variety of disciplines.

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