The Risks and Opportunities Associated with Weak Arithmatic Skills of Accounting Students[1]

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ABSTRACT

This paper explored the authors concerns about students enrolled in their introductory accounting course. Anecdotal evidence suggested that students struggle with basic arithmetic concepts that underlie basic business transactions even though their math placement and ACT scores are high. A survey of 125 students in a first accounting course was conducted in the spring of 2010 to assess the basic arithmetical skills. The results indicated that the ACT scores and math placement tests do not reveal weakness in basic arithmetic. We find that faculty and students will experience frustration due to the impaired arithmetic ability. By taking for granted that students possess basic skills in arithmetic faculty will exclude exercises from the curriculum that will build the kind of arithmetic abilities students need to think on their feet about basic business transactions. We conclude by arguing that making curricular accommodations to cope with the deficit in arithmetic is not in the student's best interest. A competitive advantage for students can be created by addressing the deficit head on rather than adjusting the curriculum to work around the problem.

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Introduction

This paper was prompted by a shared complaint and frustration with the apparent inability of undergraduate students to do basic arithmetic. Class sessions are interrupted because students cannot follow the arithmetic that underlies basic business transactions. Faculty would like to assume that students possess basic arithmetic abilities and then become frustrated when the students fall short of this desire. That frustration leads the faculty involved away from responding to the environment they encounter with an intention to create opportunities for the students to gain a competitive advantage through skill development. So this paper explores the issue of student's struggling with basic arithmetic concepts.

The impact of the seemingly reasonable assumption about arithmetic is quite serious. It has even reached a level of concern that comments have appeared in the Accounting Review. Kaplan (2011, page 380) noted the following shocking outcome:

> "I learned earlier this year that a major bank employs 500 accountants to mark its entire global portfolio of securities to fair value each day. The chief accounting officer told me that they cannot hired graduated from U.S. accounting departments for this task. The students so not know sufficient economics, mathematics, and statistics to perform the fair value calculations. This deficit is a direct result of accounting scholars not doing research on fair value measurement and therefore not being able to teach our students how to perform such calculations."

Aside from the Bankers exaggeration we are not willing to assume the cause of the problems are with research. We

train students in a long list of contemporary issues that is growing faster than the available contact hours. How do we cope, if not by letting something go? We would argue it is equally plausible that the cause is the shift away from arithmetical processes, they are assumed to be within the student's grasp.

So when Kaplan criticizes the academy stating " by responding slowly, if at all to major (page 370) new challenges and opportunities in the environment in which accounting is practiced, accounting scholars have become less familiar with emerging professional challenges and opportunities." Our concern regards a view of what the "environment" is. As the business curriculum has shifted we would argue there has been an over-response to the environment. In addressing new issues we have created yet another. We forgot the role of a sound, guttural sense of arithmetic in the full range of business transactions and processes. This territory, assumed to be below our threshold of concern, is now therefore an issue.

So, now the professional environment includes weak ability to perform basic arithmetic. Increasingly incorrect or inappropriate decisions flow from the lack of appreciation of basic arithmetic relationships. (Moore, 2009) Put another way the language of arithmetic has been lost. Since arithmetical ability is taken for granted it is not necessarily included in the tests that focus on mathematical preparedness for College. So, this paper explores our frustration arising from encounters with students who earned good scores on math placement tests and yet they struggle to process the arithmetical relationships in common business transactions. Specifically, we explore the nature of arithmetic assessment in testing and preparation of a first course in accounting.

The American College Testing program (ACT)

The American College Testing Program (ACT) was founded in 1959 by E. F. Lindquist and is a not-for-profit organization headquartered in Iowa. At that time the first of the Baby Boom generation was approaching college age and higher education institutions were planning significant increases in their enrolment numbers. The existing Scholastic Aptitude Test (SAT) had been in use since 1926 and was designed to measure a student's overall aptitude for learning. The ACT was developed on a different philosophical model and has always intended to measure a student's ability to do first year college-level work based on what they have learned in a typical high school college preparatory curriculum. The emphasis therefore is on what they learned already, not their innate ability to learn in general. (Atkinson, 2009)

The authors' anecdotal experience indicates that the basic arithmetic competencies of business students are relatively low, when arithmetic competencies primarily represent the four basic functions. At the same time, the average ACT mathematics profile for these same students remains relatively strong. Are we becoming grumpy old men or is there another less disturbing explanation? The purpose of this paper is to determine if the anecdotal evidence can be supported with more objective measures. The arithmetic skills of students present a significant teaching constraint. We cannot pretend to give effective education in financial reporting in the absence of fundamental prerequisites. Specifically, the authors briefly explore answering these two questions:

1. Can students learn, to some reasonably satisfactory degree, in a first course in accounting, with the apparent lack of mastery of basic arithmetic skills (i.e., addition, subtraction, multiplication, and division), critical thinking, and analytical reasoning skills?

2. What does the math section of the widely used ACT purport to measure and what does it appear not to measure?

The Program of International Student Assessment (PISA) is conducted by the Organization for Economic Cooperation and Development (OECD). PISA is an annual assessment of problem solving skills and the degree of applied learning on a national scale. The USA's participating students have slipped from a position of global leadership to rankings of 25th in terms of mathematics and 24th in terms of science. The report noted:

> "Several other facts paint a worrisome picture. First, the longer American children are in school, the worse they perform compared to their international peers. In recent cross-country comparisons of fourth grade reading, math, and science US students scored in the top quarter or the top half of advanced nations. By age 15 these ranking drop to the bottom half. In other words, American students are furthest behind just as they are about to enter higher education or the workforce." McKinsey, pg 8, 2009

The current situation changes the intellectual place where university accounting educators first meet accounting students in an introductory or principles of accounting course. It is their responsibility to take their students from that place of first encounter to one of global competitiveness. In his recent book, Academically Adrift: Limited Learning on College Campuses, Arum and Roksa (2011) noted that university business majors average 9.55 hours of study per week. Since this is not enough to recover

from their relatively poor high-school preparation in reading comprehension, writing and, in particular, basic arithmetic skills, the impact of their reduced skill sets and competencies must affect the scope of their university curriculum.

All business students, regardless of their specific major, will benefit from good numerical literacy. The daily process of critical thinking and analytical reasoning is essential for academic and subsequent business success. Successful students must think on their feet and be clever and entrepreneurial enough to detect opportunities for growth and profit. Some entrepreneurial aspects should be embedded into almost every part of the undergraduate business curriculum. There are limited opportunities for an individual faculty member to remediate for prior academic (elementary, secondary or collegiate) weaknesses, so we surmise that accommodations are made — leading to further faculty angst. Generally, our colleges admit based on reported psychological test scores (e, g., ACT, SAT) well-qualified students, but they have a decreasing facility with "basic street math" (arithmetic). Arithmetic for the authors' purpose in this paper, consist of the basic four operations: addition, subtraction, multiplication and division.

Along with the reported relative declines in this nation's overall education (competencies, not grade levels and/or degrees achieved), the continuing decline in our native students' mathematical literacy will likely have a slow but progressive negative impact on the national level of managerial productivity. A previous study explored the relationship between the ACT test and success (grades earned) in the first accounting principles course (Yunker and Krull, 2009). This study explores anecdotal experiences that the decline in practical arithmetic skills may not be captured in the reported ACT math scores.

The ACT's emphasis on Algebra, Geometry, and Calculus may no longer be a good measure of arithmetic preparedness for the study of the first course in accounting. It seems good students now simply learn how to do well on the ACT. Many take ACT prep or review courses to improve their ACT scores. Do the reported math scores mean the participants have arithmetic competencies? This dynamic muddies the water making it harder to fulfill our social responsibility as accounting educators. The sum of our individual decisions, grounded in a rational sense of moral hazard will not be known for many years to come.

Is it worth stating or speculating that there are perhaps no apparent consequences on the CPA exam—perhaps because it is not tested there either.

Building on Previous Studies

There is a large body of research that documenting the exploration of factors that will indicate student success. The work of the Pathways commission is a possible framework for building this analysis. As a general observation there is a weak correlation between various entrance examinations and success in a post-secondary program. It seems that there is some overriding dynamic that has yet to be articulated.

The origin of this paper was to re-visit the frustration over arithmetic weakness by extending the work of Yunker, and Krull (2009) in their study entitle "The influence of mathematics ability on performance in Principle of Accounting." They found that ACT and math placement scores were weaker predictions of success than a simple test of basic arithmetic. In looking at their finding it seems, students have learned how to do well on placement tests without, remarkably, having a good grasp of the underlying arithmetic. This gives us further evidence that the ACT assumption that higher mathematics requires sound arithmetic has uncoupled.

In their paper, Yunker, Yunker, and Krull (2009) built on a series of papers that have in turn advanced the research into mathematical preparations. These started with Pritchare, Romeo, and Saccucci (2000) who looked at the connections with mathematics and a success in a principles of accounting class. Ballard and Johnson (2004) did a similar study with economics students. Yunker, Yunker and Krull used the Ballard and Johnson testing instrument to tie the studies together, as does this paper.

The big discovery was that the placement tests were not capturing a weakness that was predictive of success became the focus of the next layer of studies. So, for example, Folley, Peres, and Poirier (2008) found the SAT to be a poor predictor, math assessment to be a bit better and so postulated that pre-requisite curriculum in mathematics needed further exploration.

A related set of developments can be traced in the efforts of the American Accounting Association to ensure accounting education is responding to changes in the professional environment. For them this encompasses the ongoing state of curriculum, recruitment, and testing methods. There are some unfortunate conflicts between the professional and academic expectations as evidenced in the Kaplan (2011) commentary. Black (2012) summarized 30 years of progressive studies into educational reforms, the most recent of which is the Pathway's Commission.

A particularly interesting aspect of the Pathway's Commission (Behn, 2010) is their recommendation for a new

model of curriculum. In broad terms there is a concern that what goes on in the classroom is directed towards the issues to be faced. However, taking an open systems approach we cannot assume the inputs, that is students arriving on campus, are a consistent commodity.

Consideration of this previous work helps us ferret out a more specific purpose for this paper. That is to explore the extent and implications of the changes in mathematical emphasis in schools. Consider if Manchester United announced that entry into its development program will be heavily influenced by a players speed. This will cause coaches, who want their athletes to succeed, to favor speed training at the expense of other developmental activities. Why? Regardless of their belief in a well-rounded athlete, time away from "speed" training diminishes their player's chance of being promoted to the program. So the coach then has an incentive to shift time to away from skill development and give that time to speed training.

The extension of this analogy points to opportunities that may arise from this research. Emphasis on the ACT, SAT, and math placement tests has an inevitable impact on the coaches (teachers) upstream from the universities. A good high school will emphasize the calculus, geometry, and advanced algebra that are predominant in in these admissions tests. They have to do it because they are now hurdles in the admissions process. We postulate this shift is at the cost of time spent emphasizing arithmetic. So to bring this together, one can see that the ACT and SAT will not be good predictors of arithmetic since they do not include those items.

Post-secondary education that is in tune with the contemporary environment will adjust to the current strengths and weaknesses of freshmen arriving on campus. So, rather than complain about a skill deficiency, an opportunity exists to rely on the new strengths of students and shift time back understanding arithmetic at the college level. In consideration of the environment there is a bias towards factors that students will face at the expense of what they went through to be admitted to university.

Our Study

The business core at Bradley University (Bradley) includes two freshman level accounting courses: ATG 157, Accounting Principles-Financial, and ATG 158, Accounting Principles-Cost Management. The design of the ATG 157 course presumes the students possess basic elementary-school arithmetic skills. For enrolling freshman in their required university mathematics courses of their general education requirements, Bradley uses the reported ACT math score in conjunction with its own designed math placement test to measure essential mathematical reasoning. Any student with an adequate combined score on the ACT mathematics component and the Bradley math placement test may take ATG 157 in their first semester, while others must wait until a lower-level math course is completed, such as Math 109 College Algebra.

Anecdotal observations by the Bradley Department of Accounting reveal a general concern about the lack of students' arithmetic ability, regardless of their combined ACT math and Bradley math placement scores. Consequently, many students struggle with the arithmetic needed to do calculations supporting basic business transactions covered in ATG 157. The anecdotal experiences do not seem to connect with students' reported ACT math scores and Bradley's math placement scores. A trial survey of students at Bradley's summer freshman orientation in July 2009 lent credibility to this concern. This current study was undertaken to gain more insight into the practical arithmetic skills and various other competencies associated with students' performances in ATG 157. The study will enable the Bradley accounting faculty to examine its concerns regarding its students' mathematical reasoning with a view to curriculum revision.

Students registered in ATG 157, Accounting Principles – Financial, in the spring semester of 2011 were surveyed. Four sections were offered that had 135 registrations at the time of the survey. (32, 35, 30, and 38, respectively). A total of 125 students were present and elected to take the special survey on the first day of classes. To maximize analytical flexibility, some students were excluded where their data such as the ACT math scores, Bradley Math Placement Scores, and demographic data were missing. That leaves us with 89 students for which we have individual full data sets.

Twelve of the 89 students withdrew from ATG 157 before earning an overall course grade. The 77 students that completed the course achieved an overall GPA of 2.8 on a 4.0 scale for ATG 157. That group was made up of 52 male students and 37 female students. They had considerable diversity in their academic experiences. Their average semester credit hours completed before the Spring, 2011 semester were 37, while the least experienced had seven hours and the most experienced had 125 hours. Bradley has five undergraduate colleges and a "university" college where undecided students may reside until they choose a college major. Table 1, at the top of the facing page, profiles the students in four ATG 157 sections, categorized by their chosen college of origin with abbreviated names ease of reading.

The students were asked to answer twelve basic arithmetic questions with a ten minute limit. A copy of the survey is provided in Appendix A. These questions were split between basic adding or subtracting, multiplication, and

Table 1

College of Record	Student Count	Withdrew	GPA[1]	ACT (Math)	Bradley Math (PLlacement)
Business[2]	35	6	2.7	23.7	20.5
Communications[3]	13	3	2.4	23.2	16.0
Engineering[4]	17	0	3.2	28.1	29.9
Education[5]	1	0	4.0	28.0	31.0
Arts/Science[6]	4	0	3.0	23.5	22.3
Exploration[7]	19	3	2.5	24.7	24.0
TOTAL	89	12	2.8	24.7	22.6

word problems involving a simple linear relationship. Calculations were kept very simple, and the students were not permitted to use their calculators. This enabled the faculty to prohibit calculator based prompts to compensation for an inability to mathematically describe and arithmetically complete the sort of basic arithmetic computations underlying many basic business transactions. The survey was administered on the first day of class. There is a risk the test was not taken seriously that may be offset by a desire to do well at the first meeting of a course.

Hypopthesis Development

In step with the first small data set at this point in time, our teach experience and building upon previous studies it is possible to develop five hypothesis out of this study. Previous studies all point to the weak predictive value of the ACT/SAT. This study points to the need to explore the gap predictive gap along a new line of consideration as follows:

H1: There is an overall weakness in arithmetic skill that the ACT does not capture effectively.

Following along this we will again look to gain validity by aligning with previous studies (Yunker, Yunker, and Krull, 2009)) which affirm that arithmetic is an important factor in predicting success in Accounting 157. By isolating the arithmetic this effect is predicted to be statistically strong.

H2: The arithmetic Quiz will be a better predictor of ATG 157 success than the ACT mathematics score.

Our anecdotal experience with students points to an inability to understand arithmetic relationships. The language of math is missing. It is very hard for many therefor to translate words into quantitative relationships. As a result we expect exposition problems to me the most problematic and therefor the most predicative.

H3: Arithmetic problems presented in a word exposition format will be more difficult than other formats.

The significance of the problems grew exponentially with the ATG is a sound predictor of success in business studies. If we build on the idea of Accounting as the language of business, there has to be a positive correlation, arithmetic perhaps become that alphabet of that language.

H4: There is a strong connection between arithmetic, ATG 157 and success in business studies.

Our final concern is that individual faculty can make little changes to the system. As discussed teachers, like coaches have to respond to the admissions criteria. Changes to admission processes, like reliance on the ACT, has implications on the skill set of the incoming class.

H5: Faculty responses to the lack of basic arithmetic enable students to proceed in spite of a skill deficit, needed for professional progress.

STREET MATH RESULTS

The overall average percentage score on the twelve item survey was 54 percent, of which about half (27 percent of the 46 percent missed resulted from wrong answers. The remaining incorrect responses (nineteen percent) resulted from questions that were left blank.

Table 2

Question	1	2	3	4	5	6	7	8	9	10	11	12	ALL
Correct	96%	90%	38%	83%	53%	42%	56%	11%	87%	48%	28%	17%	54%
Wrong	4%	10%	60%	16%	25%	51%	26%	52%	9%	21%	19%	28%	27%
Blank	0%	0%	2%	1%	22%	8%	18%	37%	4%	30%	53%	55%	19%

The performance deteriorates as the survey progresses. Only 1 percent of the responses to the first 3 questions were left blank. This grew to 46 percent of the responses for the last three questions. One could ask if the ten minute limit was too short a period of time for the students to demonstrate their competencies. This was also observable when questions were similar. Question 7 asks, "Last year, Jake's salary was $58,000. At the end of the year, he received a 10% increase in salary. What is his salary this year?" Question 10 asks, "Take 62% of $12,000. The result is?" However, 56 percent were able to answer question no. 7 correctly, while only 48 percent were able to answer question no. 10. This may indicate the questions, shown in Appendix A, were perhaps too difficult for the students to manually answer with the pressure of a ten-minute time limit. Of course, this assumes that all the participating students worked diligently to answer all of the survey items.

ATG 157 does not make use of any advanced mathematics, just basic arithmetic. However, the Bradley accounting faculty has repeatedly experienced unequal arithmetic abilities across ATG 157 students when it comes to their analyzing basic business transactions requiring arithmetic manipulation. The students' unequal abilities create a stressful classroom dynamic. The survey revealed pronounced differences across the five colleges and the undecided majors.

Table 3
Average Survey Results by College

College of Record	Number of Students Male – Female	Portion Correct Male – Female
Business	21–14	51%–57%
Communications	3–10	33%–41%
Engineering	15–2	62%–88%
Education	0–1	NA–83%
Arts/Science	2–2	50%–50%
Exploration	11–8	57%–52%
TOTAL	89	54%

In addition to the differences across the colleges, we found a significant gender gap. Males produced eight of the top ten math placement scores. Females produced seven of the bottom ten Bradley math placement scores. Recall, there were 52 and 37 male and female students, respectively. These scores point to some perplexing questions as to why the majority of accounting majors are female.

The gender gap is significant in some of the specific questions. Question 7 stated: "Last year, Jake's salary was $58,000. At the end of the year, he received a ten percent increase in salary. What is his salary this year?" Only 56 percent of the students provided the correct answer. However, only 32 percent of the females answered correctly as compared to 73 percent of the males. One would assume that a prerequisite to closing the national salary gender gap will be an ability to compute salary changes!

In addition to a possible revealed gender gap performance, we see that business students were slightly less able to demonstrate competency in computing a salary increase. Only 49 percent of the 35 business students were able to answer question 7 correctly. When split by gender, we found that 62 percent of the males registered in business could answer the question. The numbers are small, but it is still noteworthy that only 29 percent of the fourteen females registered in business could answer the same question. This is a distressing gap in arithmetic ability for students that have selected into a College of Business major.

We expected basic profit relationships would fall within the natural area of interest, especially for business students. Question 3 asked the students: "If a television costs $500 and the sales tax is $25, what is the local sales-tax rate in percentage terms?" Whereas question 8 asked the students: "XYZ company's profits this year are $2,500,000. Its profit rate on sales (in ratio terms) is 0.10. What are its sales this year?" Both questions required arithmetic manipulation of a basic ratio. It was a surprise that business students scored about the same as the overall group. 63 percent of the business students determined an incorrect tax rate and 46 percent calculated an incorrect sales amount.

This of course leads back to the Bradley Accounting faculty's angst over the use of ACT scores to assess basic mathematical ability in the admission process and mathematics course enrollment. How is it possible that 89 percent of the surveyed students with a relatively strong ACT math profile could not determine the correct sales figure for question 8? We noted that 43 percent of the business students did not even attempt this straightforward question. In terms of ACT scores, the top ten students in this study had an average ACT math score of 28.5. That places those ten students a bit above the 90th percentile of all their peer high school graduates. It is a shock to note that five of these top students were unable to answer question 8 correctly.

These arithmetic survey results support the ATG 157 faculty concerns that students lack basic arithmetic competencies and the applied, practical functionality to process basic business transactions. They have serious deficiencies in the basis functional life skills. No wonder the USA cannot compete even against the developing global economies and jobs continue to move overseas! As a group, the

surveyed students are not ready to think about business on their feet or apply critical judgment to financial assertions. However we have a puzzling reality. Previous studies (Yunker, et. al., 2009) indicate that the ACT and the math survey may be reliable indicators of potential success for university level learning.

Indicators of Success.

The surveyed population of 89 students had an average ACT math score of 24.7. An ACT math score of 24.7 is impressive. According to the ACT interpretation guide, this is around the 80th percentile for recent high school graduates. It is reasonable to conclude that such a selective group will be successful in their undergraduate education studies. Many previous studies have indicated that the ACT math score, math placement tests, and credit hours provide some indication of future success. Here are the results from our 89 survey subjects.

Table 4

ATG 157 Course Grade	W/F/D	C	B	A
Grade Frequency (89)	19	22	29	19
ACT Mean Math Score	23	23	25	28
Mean Math Placement	19.1	18.3	22.9	30.6
Mean Semester Credits	26.3	29.6	36.3	53.9

Our subjects produced a result consistent with previous studies. The higher grades in ATG 157 were consistent with higher ACT math scores, higher math placement scores, and greater university experience. But good students prepare for the ACT and math placement test. Good students are persistent and form more productive study habits as they gain post-secondary experience. However, good students prepare for these exams so overall they do well. We can also see that academic experience improves performance. This too makes sense as better students will persist and improve their study skills.

Table 5

ATG 157 Final Grade	W/F/D	C	B	A
Grade Frequency (89)	19	22	29	19
Survey Grade	47%	49%	55%	58%

Previous research showed the math survey we used is a reasonable predictor of success. The table above reveals this was also true with this group. However, this observation is not satisfactory when we see that students earning an overall course grade of an A averaged only 58 percent on this measure of basic street math. Our focus is on professional studies and yet we are attracting students with a relatively weak arithmetic skills profile. We are left to wonder what systemic accommodations have crept into the curriculum to accommodate this arithmetic weakness.

There is a major validity issue here in light of the 89 participants' overall weak arithmetic competencies. It seems we find a way to allocate grades that is consistent with the various achievement measures. Perhaps all we are doing is validating that good students get good grades.

The crucial need for competent women in business merits an additional look at the data. In terms of our population, nine of the top ten ACT reported math scores were male students with a mediocre average grade of 78 percent on the math survey. The comparative math average for the top ten females is 58 percent. This represents a massive recruiting error. Why are we not attracting equally capable women? It is encouraging to note that the females earn a higher overall GPA in the ATG 157 course 2.9 versus 2.7 for the men. Despite their lower overall demonstrated arithmetic competencies on the survey, they earned a significantly higher rate of "A" grades. In subsequent work on this topic, the authors will consider why women are apparently more willing to apply themselves to their ATG 157 studies than the men are.

Findings and Conclusions

The purpose of this paper was to explore faculty frustration with their students' inability to process the arithmetic behind basic business transactions. The apparent disconnect between sound ACT-MATH scores and classroom performance did not make sense to us. Without some understanding of the underlying phenomena, faculty are at a loss to respond of show due empathy. So, specifically we set out to explore arithmetic skills as the variable which may explain much of this contradiction.

A significant body of research exists on the topic of standardized tests that has had limited applications to accounting educations. Harper (2009) provides a reflection from two experienced professors who retook the SAT so they could better understand a child's experience. The surprise was the marginal increase in their score, indicating their much improved understanding was not being measured. It becomes more obvious in admission decisions, for example Kolluri, Singamseth, and Wahab (2010) that the assumptions of ability, based on scores are not well established. Instead Harper realized that good students train for the test and do well, so the results are more of an indication of access to good test preparations.

So we can see that the development and convenience of tests like the ACT had some unintended consequences for

accounting educators over the last 30 years. Initially these tests gave a measure of mathematics in the context of a curriculum where students had solid skills in arithmetic. As the tests importance to in the admissions process increased, relative to the GPA, school promoting university-admissions would naturally track the tested topics. We see now that this also would make arithmetic less important too, and easy to enable with increasingly available technology. The assumption that is now appears to be an error about arithmetic, as the mathematics on the ACT can be handled with minimal use of basic arithmetic. Our problem then becomes, the arithmetic needed to think on one's feet and negotiate typical business transactions, is no longer available.

This leads to our concern about how the ACT-dependent admissions process may affect the decisions of students interesting in our profession. We can start by considering that the ACT is an early filter in the educational process of entering the profession. The profession needs entrants who understand financial transaction, can think on their feet, to audit or negotiate transactions. Good arithmetic skills are crucial to many aspects of this entrepreneurial process. It is a great impairment to the profession if member are weak in this skill as found in this study.

Are there substantial numbers of high-school seniors that have good arithmetic skills, but lack access to ACT preparation, or seniors that lack an interest in mathematics? For example their experiences with work have them able to make change but have left them with no skill or interest in calculus. We know from this study that there is a group that do well in mathematics but do poorly with arithmetic. Given that, perhaps there a strong possibility that there is a good sized group of seniors that are good at arithmetic but show poorly in mathematics—especially those topics emphasized on the ACT/SAT test. The size of this group should be investigated along with the ways our use of the ACT test discourages them from entering the education stream feeding the profession.

We see in the math education literature an additional filtering concern. We have found that good students will succeed by preparing for the ACT-exam but that does not mean they have that they have good sense for basic arithmetic relationships. But, faculty adjusts so that these students can still succeed (Ehlert, 2005). We know from other research these students avoid quantitative approaches by suppressing adaptive activities that could change the situation. (Siegel, Galassi, Ware, 1985) (Pajares, Miller, 1994) We propose that a good area for future research could examine how this reduces or correlates with the capacity to design, prepare and utilize analytical procedures in both controllership and audit functions. Again pointing to how we maybe enabling a skill set to be neglected that has been an historic strength or an accounting education.

In conclusion we feel that our exploration of our frustration with our student's apparent inability to do arithmetic adds an extra dimension to Kaplan's (2012) commentary. Kaplan warned that our scholarship should reflect more awareness of the environment. While he did not say so explicitly, the environment includes the skills and aptitude of those entering the profession. Today's students are no doubt as motivated as previous generations. Their strengths should not be assumed to be the same as earlier cohorts. Individually we cannot the use of the ACT or similar instruments. However, we can adjust our time and emphasis to show we understand who is in our classroom and down-stream professors they will have. A better emotion than frustrations would be to embrace the opportunity and provide incentives for our excellent students to gain a competitive advantage.

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(Footnotes)

1 GPA of students completing the course.

2 Foster College of Business Administration.

3 Slane College of Communications and Fine Arts.

4 College of Engineering and Technology.

5 College of Education and Health Sciences.

6 College of Liberal Arts and Science.

7 University Exploration Program (students who have yet to identify a college and major).

Appendix

ID Number: _____

This is not a placement test. Your scores here are being used for research purposes only. You will have 10 minutes to answer the 12 questions listed. Calculators are not permitted. Please use the space provided on the front and back to make any necessary computations.

Your College:

- ☐ Foster College of Business
- ☐ Communication & Fine Arts
- ☐ College of Education & Health Science
- ☐ College of Engineering & Technology
- ☐ College of Liberal Arts & Sciences
- ☐ Academic Exploration Program/University Program (UNV)

You are entering as a:

- ☐ Freshman
- ☐ Transfer student

11. 122,302 + 652,365 = ? _____

22. 861,365 – 241,211 = ? _____

33. The formula for calculating sales tax is $S = A \times r$, where:

S is the sales tax

A is the cost of the product

r is the sales-tax rate

If a television costs $500 and the sales tax is $25, what is the local sales-tax rate in percentage terms? _____

44. The cost of a long-distance phone call is 15 cents for the first minute, and then 3 cents per minute for every additional minute. How many cents would a 24 minute phone call cost? _____

55. By the end of the year, the population of Galesburg is expected to increase 2% from the current population of 45,000. If this prediction is accurate, what would be its new population at the end of the year? _____

66. 56.7 x 3.1 = ? _____

77. Last year Jake's salary was $58,000. At the end of the year he received a 10 percent increase in salary. What is his salary this year? _____

88. XYZ company's profits this year are $2,500,000. Its profit rate on sales (in ratio terms) is 0.10. What are its sales this year? _____

99. If Janice has 12 quarters, 3 dimes, 6 nickels and 7 pennies, how much money does she have? _____

110. Take 62 percent of $12,000. The result is: _____

111. 12,000 x .03 x 2/3 = ? _____

112. On the first of January the local bank agrees to lend you $20,000 for college tuition, room, and board. They charge you 6% interest per year payable on a monthly basis. How much interest must you pay at the end of January? _____