



The Impact of Writing Assignments on Student Learning: Should Writing Assignments Be Structured or Unstructured?

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Abstract

This action research project investigates whether writing assignments are associated with improved student performance in terms of lower-order learning and higher-order learning as defined in Bloom's taxonomy of educational objectives. The impact of explicitly structuring the learning environment on student performance is examined.

We find that structured writing positively impacts students' performance on lower-order (knowledge and comprehension) assessments. However our findings suggest that structure only weakly enhances the performance of students on higher-order skills assessments.

Accordingly, we recommend that structured writing assignments, particularly those designed to develop higher-order learning objectives, be introduced earlier into the economics and business curricula.

Introduction

The Association to Advance Collegiate Schools of Business (AACSB) has accredited 504 institutions worldwide. Many other schools seek accreditation for their programmes. To achieve accreditation, AACSB requires that schools demonstrate and document 'assurance of learning.' Thus many colleges of business must determine how to deliver content in the most pedagogically appropriate way to

ensure demonstrable student learning. The purpose of this paper is to address this problem by testing the following question: how does the extent of structure with respect to student writing impact student learning? We ultimately hope to learn how best to bring students from mastering 'knowledge telling' (the skills of recall and comprehension) to mastering 'knowledge transforming' (the skills of analysis, synthesis and knowledge creation through self-directed or self-regulated learning).

The present paper continues a larger research project. The first part of the project explored Greenlaw's (2003) hypothesis concerning student writing. Greenlaw tested whether incorporating writing assignments into Principles of Macroeconomics courses promoted learning. He concludes that the writing-augmented section in his experiment demonstrated greater learning.

We conducted a similar action research experiment during the spring 2005 semester in which we tested whether writing matters for student learning. We found that students who complete regular writing assignments have statistically significantly improved performance on a multiple-choice final examination (close to five points, or half a letter grade) relative to those students who do not complete regular writing assignments (Dynan and Cate, 2005). Our findings thus support Greenlaw's finding and add to existing evidence in support of student writing to enhance student learning.

From these findings two related questions emerged. First, was it the exercise of writing itself that improved course performance, or was it the additional guidance (structure) that the professor offered (directing students to specific areas of importance, for example) that yielded the observed improvement? Secondly, could the exercise of writing improve student performance with respect to relatively higher-order learning as well as lower-order learning? The subsequent action research project seeks to answer these two questions.

In spring 2006, the action research project was conducted in a structured learning environment in two class sections of the same course. In this environment, students' ability to self-define their work was limited by design. Students were given explicit, detailed instructions, and specific questions for successfully completing each of their weekly writing assignments and their semester projects.

The fall 2006 action research project was conducted in an unstructured learning environment in two sections of the same course as the spring experiment. In this environment students were given the opportunity to self-define the ways by which they chose to complete each of their weekly assignments and semester project. For example, rather than having explicit and detailed instructions or a specific question

for completing weekly assignments, students were given open-ended questions (based on a syllabus by Richard Locke of MIT) that asked them to address:

- 1 ideas and arguments in the readings that the student found important, interesting, or stimulating;
- 2 questions, concerns, or disagreements the student has with claims or ideas presented in the assigned material;
- 3 connections among the material, lectures and experiences the class has explored for this course.

With respect to the semester project, students were asked to choose one of five possible reading assignments (as they were also given opportunity to do in the structured semester). The 'unstructured' student then had an opportunity to self-define a project for the reading he or she had chosen.

In the present paper we explore 1) the impact of regular (weekly) student writing (both structured and unstructured) on student performance compared to the performance of students without regular written assignments and 2) the potential links between writing assignments (both structured and unstructured) and Bloom's taxonomy of educational objectives (1956). Multiple choice examinations, our measure of student learning from our earlier research efforts, are often limited to demonstration of mastery of 'lower-level' learning associated with Bloom's taxonomy of educational objectives such as knowledge, comprehension and (simple) application. Most colleges and universities, however, are likely to have higher goals for their graduates than mastery of course content at lower levels of learning. Yet, multiple-choice type assessments remain prevalent, particularly in lower-level courses. Upon enrolling in courses that emphasise higher-order learning – (complex) application, analysis, synthesis and evaluation – students struggle because they do not possess the requisite skill set for higher-order learning.

We document this lack of higher-order skills in another study associated with this project (Dyner, Cate and Rhee, 2008). The subjects of this study were in a junior-level (300 level) course, but populated in the main by *senior-level* students. In this study we found that the majority (60%) of these students (in a large, public, metropolitan university) is not ready for 'self-directed learning', that is learning that requires the higher-order skills as identified in Bloom's taxonomy. Further, we find evidence that students in a structured learning environment improved their 'readiness for self-directed learning' to a greater extent, on average, than students in an unstructured learning environment. Accordingly, we recommend changes in the four-year curriculum to address this alarming 'lack of preparedness'.

In what follows we examine the relationships between the extent to which the students' learning environment is structured and students' performance. We use multiple measures of structure (no writing, structured writing assignments and unstructured writing assignments) to assess the impact of the extent of structured writing exercises on student learning as demonstrated through multiple choice examination (lower-order learning such as knowledge and comprehension), and essay-style examination and project work (somewhat higher-order learning such as application and analysis). The higher order skills of synthesis and evaluation are more likely to be demonstrably assessed in capstone-type courses or senior projects rather than in content-specific courses.

The research presented in this study received the approval of an institutional review board (IRB). The IRB required voluntary participation by the subjects. The students were accordingly informed that they were to be the subjects of a study. All semesters achieved 100% participation. Students with missing or incomplete data were removed from the sample.

The following section assesses the literature on student writing and learning. This is followed by the development of the questions that our action research project addresses, a discussion of the data, description of the methods for analysing the data, and the findings that emerge from our analysis. The paper concludes with some observations on our findings and suggestions for future research.

Literature on writing in economics

This brief overview of the literature is divided into three parts. The first part summarises the research supporting the incorporation of writing assignments into a course's set of assessment activities as a measure of student learning. The second part presents evidence from the literature that writing assignments improve student learning of economic principles. A third part links these ideas to a broader literature of writing as learning and writing as a tool to learn, and attempts to synthesise some of our understandings that emerge from this literature.

Incorporating writing assessments

Pedagogical research since the 1950s has suggested a need to increase the variety and frequency of activities designed to assess student mastery of factual information in economics. One reason to enhance the variety of assessment activities is because the profession of economics has become increasingly dominated by jobs that require factual understanding, written and oral communications skills, and analytical reasoning skills, such as teaching, policy making and government. Thus, a number of suggestions with respect to alternative

assessments have been put forth. Becker (1997) suggests that writing assignments in the form of one-minute papers can be used as '...alternative measures of educational outputs...' (Ibid. p. 1348). Walstad (2001) suggests that economics teachers use written and oral assignments to measure [student] learning (p. 281). Emig (1977) lays the groundwork for writing to be a learning tool in his 'principle' which asserts that students must learn to write in order to write to learn.

Writing to improve student learning

Emig's principle finds support in Walvoord and Anderson's (1998) suggestion that every reading assignment must be linked explicitly to a writing assignment to enhance student learning. Earlier work by Hamlin and Janssen (1987) argues that when students are 'active learners' that is, when students are asked to write in conjunction with reading, lecture or other material presentation, they are better able to integrate the material because they more clearly see connections. Crowe and Youga (1986) state that '[students] need to be active in the learning process, and this means they should be making their own connections – in writing (p. 218)'. They advocate the use of short writing assignments, '...usually five- or ten-minute writings done in class (p.219)'. Simpson and Carroll (1999) conclude that [short] papers and analyses of class readings were judged as best in preparing students for graduate programs and future occupations. Quantitative research papers, followed by short papers and analyses of class readings, were considered the best way to enhance student learning of economics' (p. 405).

Work by Dynan, Cate and Rhee (2008) explores how regular, structured writing assignments can successfully be part of a learning environment designed to enhance student ability to engage in self-directed learning, a skill necessary for life-long learning. Self-directed learning requires a set of skills that roughly corresponds to the skills associated with the higher-order learning skills as described in Bloom's Taxonomy (1956).

In particular, Dynan, Cate and Rhee (2008) find that matching the type of learning environment (structured or unstructured) to students' initial scores on a self-directed learning readiness assessment (Guglielmino, 1977) enhances self-directed learning skills. They further find that courses designed to enhance students' readiness for self-directed learning can do so (p. 5). Structured writing assignments play a key role in developing a structured learning environment. This paper seeks to extend the original analysis of Dynan, Cate and Rhee by examining whether structured writing assignments can also enhance student *performance* with respect to lower-order learning assessments, higher-order learning assessments, or both.

Links between writing as a learning tool and writing as a learning process

These comments on writing in the economics literature must be placed in a larger context – the literature on the writing-learning nexus. From the perspective of the writing-learning nexus, three observations can be made. First, the conclusions associated with writing as a cognitive process (Hayes and Flower, 1980; Hayes, 2000) and the conclusions from the information-processing models of self-regulated learning approach (Bangert-Drowns *et al.*, 1991; Butler and Winne, 1995; Winne, 1997, 2001) are consistent. Both sets of conclusions point to the overarching finding that student writing enhances student learning. Second, Langer and Applebee (1987) find that all types of written work improve student performance to a greater extent than reading alone. Alternatively, Applebee (1984) finds that the characteristics of the writing assignments (scope and frequency, mental operations, interest of the writer) influence the acquisition of knowledge [learning].

While the articles reviewed argue for the inclusion of writing assignments across disciplines, and into economics classes in particular, to improve students' thinking and learning, these articles do not explicitly link writing assignments to Bloom's taxonomy of educational objectives. Weinstein and Mayer (1996) identify four categories of cognitive learning strategies that facilitate learning and are reinforced through the writing process and could be linked to Bloom's taxonomy. These strategies are rehearsal, elaboration, organisation and comprehension monitoring. Rehearsal emphasises the repetition of content. Elaboration and organisation emphasise linking new understanding of content to previous understanding of content. Comprehension monitoring evaluates the content that has been acquired. Two studies have shown that these cognitive learning strategies can improve academic success (Hattie, Brigg and Purdie, 1996; Paris and Paris, 2001). Thus we argue that the skill sets associated with Bloom's higher-order learning objectives and cognitive learning strategies need to be incorporated in curriculum design and course development processes. Further, the skills associated with the above learning strategies can be cultivated in students whose skills are weak, or who lack such skills altogether, through structured student writing assignments.

In particular, short writing assignments and analysis of class readings can be linked to the lower-order learning objectives of knowledge and comprehension, or in the terminology of Bereiter and Scardamalia (1987) 'knowledge telling'. Likewise, Bloom's lower-order learning objectives of knowledge, comprehension and simple application may be linked to the cognitive learning strategies of rehearsal, elaboration and organisation that can be reinforced through structured writing assignments. The cognitive learning strategy of comprehension-monitoring along with longer writing assignments, essay writings and research papers for example, should build on the short assignments and be linked to the higher-order learning

objectives of complex application, analysis, synthesis and evaluation, or ‘knowledge transformation’ (Bereiter and Scardamalia, 1987). Knowledge transformation builds on the basic skills associated with knowledge telling, although it need not be a linear process. Both skills – knowledge telling and knowledge transforming – are necessary to the development of self-directed learning (a goal which we hold for our graduates).

In Figure 1 we summarise our view of how writing promotes knowledge building. In particular, we try and match different language in the literature to draw explicitly linkages between what we believe to be essentially similar concepts.

This brief review of the literature focused on three aspects of the literature on writing. First it summarised the support for writing assignments to be incorporated into a course’s set of assessment activities. It summarised the findings from the literature that writing assignments improve student learning of economic principles. Then we attempted to synthesise the literature that discusses writing as a tool for learning and developing specific skill sets. We next analytically explore how writing assignments, and how structured writing assignments within a structured learning environment in particular, impact student performance on lower-order and higher-order assessments.

Figure 1: Linking the literature: knowledge building through writing

Equivalent skills	Strategies to acquire skill	Assessment activities	Authors
Knowledge Telling= Bloom’s Lower Order Learning Knowledge, Comprehension, and Simple Application (Langer and Applebee – recall and argumentation)	rehearsal elaboration organisation	multiple choice short answers information essay	Klein Hayes & Flower Bereiter & Scardamalia Weinstein & Mayer
Knowledge Transforming= Higher Order Learning Complex application, Analysis, And Synthesis	Reflection problem spotting resolving contradiction	essays projects research papers insight/ connection	Klein Tynjala Tynjala et al Bereiter & Scardamalia
Can include knowledge telling Can be recursive	revision comprehension monitoring		Weinstein & Mayer

Questions to be addressed

The authors developed and implemented several action research projects over four semesters (spring 2005 to fall 2006). The research activities were implemented in ECO 305: The International Context for Business. This course is required for all majors in the College of Business where the authors work. It is a junior-level course open to both juniors and seniors in the College of Business.

One goal of the course is to develop skills that will enable students to integrate and assess information when they leave school and can no longer rely on textbooks that typically have done this for them (with end of the chapter summaries, important content highlighted throughout the texts, for example). To provide students with an opportunity to practise this skill, the course is not organised around a textbook. Rather, the course requires substantial reading from multiple sources, some of them nontraditional in a business curriculum, such as human rights documents, works of fiction and poetry. To ensure consistency of coverage across the sections, all sections of the course have two common features. First, all syllabi for the course contain a section entitled Common Topics. (See endnote for a list of these topics.) Regardless of the books selected by the individual instructors, these topics must be covered. (Note all sections of the course included in the present experiments had the same professor using the same texts.) Second, all sections of the course take a common multiple-choice final examination that assesses the students’ mastery of the concepts, principles and theories that are contained in the list of common topics stated on the course syllabus. The results of this examination are used as part of the documentation associated with the assurance of learning requirements mandated by the college of business and AACSB.

In this analysis our hypotheses are designed to empirically test (1) whether the exercise of writing itself improved performance compared to not writing (compares non-writers to writers), (2) whether the writing activity by itself improved performance or if the additional guidance that the professor offered in the structured environment was what impacted measured improvement (compares non-writers to writers in a structured environment; non-writers to writers in an unstructured environment; and estimates the impact of a structured environment relative to an unstructured environment among writers only) and (3) whether the exercise of structured writing improved student performance with respect to higher-order learning or are structured writing assignments appropriate for reinforcing recall and memory related tasks but not at developing higher-order learning skills such as analysis and evaluation (estimates the impact of the structured environment relative to the unstructured environment among writers only for the higher-order assessments).

We are interested in whether a structured environment enhances student performance on higher-order assessments relative to an unstructured environment because we have found (Dyan, Cate and Rhee, 2008) that among students who are not well-prepared for 'self-directed learning' their ability to engage in self-directed learning is enhanced when they are exposed to a structured learning environment relative to an unstructured learning environment. However, for students who are prepared for self-directed learning, an unstructured environment is more appropriate. (In the unstructured group, initial high scorers on the self-directed learning readiness assessments excelled, while low scorers struggled bifurcating the distribution.) Among our students, the majority (roughly 60 per cent) has been assessed as unprepared for self-directed learning. Hence our question is: among these students does a structured environment enhance, not just preparedness for self-directed learning, but average performance on higher-order assessments too?

Hypothesis 1: Writing will improve student performance on all assessment activities (lower order and higher order) relative to students who do not complete regular writing assignments.

Hypothesis 2: Average class performance on lower-order learning assessments will be better in a structured (questions generated by instructor) learning environment than in an unstructured (student generated questions) learning environment because poorer performing students will have greater direction and support in working with the assigned readings or other materials.

Hypothesis 3: Students in the structured environment will perform better on higher-order assessments activities than students in the unstructured environment because of the practice they have had in patterning the inquiry skills of the instructor.

Data and method

To test our hypotheses, data from six sections of ECO 305 'The International Context of Business', approximately 210 students, were collected. One section in spring 2005 had no weekly writing assignments. One section in spring 2005 and two sections in spring 2006 were conducted in a structured learning environment. Two sections in fall 2006 were conducted in an unstructured learning environment as discussed above. Students across all sections of the course were evaluated with four performance measures: a midterm examination (consisting of short essays and problems); a book project – with a due date in the next to last week of class (week 14), an empirical exercise (known as AOL) – due week 7; and a common, cumulative, multiple-choice final examination (week 16).

Numerous control variables thought to impact performance such as age, sex, major, number of hours employed per week, grade point average (GPA), and number of dependants for example were collected by survey in the classes during 2006 – but not during the 2005 experiment. Other explanatory variables include indicator variables for the learning structure, whether the class was a day (two meetings per week for 1.5 academic hours each) or evening class (one 3 academic hour meeting per week), and student major. The hypotheses are tested using both univariate analyses (difference in means) and multiple regression analyses.

Results

Table 1 presents the mean values or sample proportions for both the dependent and independent variables included in the analysis for the structured and unstructured samples from the 2006 action research projects. The results of difference-in-means tests across the two samples are also presented in Table 1.

The characteristics of the spring and fall sections of the course are quite similar. Several significant differences, however, should be noted. There was some variation in students' characteristics across the structured and unstructured learning environments. First, the mix of student major across the semesters differed, with a statistically significantly larger share of economics and finance majors in the structured (spring 2006) semester compared to the unstructured semester (fall 2006). Average GPA was statistically significantly higher in the unstructured sections than in the structured sections. In terms of performance, midterm performance differed significantly between the two environments with students in the structured setting achieving higher grades than in the unstructured environment (despite the higher average GPA among the students in the unstructured setting). Students in the structured environment completed, on average, fewer assignments than those in the unstructured environment although both groups had the same number of assignments. With these exceptions, the student populations were roughly similar across semesters. The preponderance of students in both semesters was seniors. However, imminent graduation distractions impact both semesters because graduations take place in both the spring and fall.

Table 1A presents difference in means for the dependent variables (project score, midterm examination score and final examination score) between students who were assigned writing exercises (both structured and unstructured) against student who were not assigned writing exercises. These difference-in-means tests find significantly higher scores for writers on both the project and final examination, but not the midterm.

Table 1: Difference in means/sample proportions for the structured and unstructured samples

	Mean structured	Mean unstructured	Difference in means	Significance p-value
Final	82.7	82.8	0.06	0.97
Project	87.96	87.78	0.18	0.89
Midterm	87.7	82.5	5.18	0.01*
AOL	86.69	84.09	2.60	0.22
Night	0.47	0.48	0.01	0.90
Male	0.59	0.46	0.13	0.19
Age	25.0	25.8	0.76	0.48
GPA	3.06	3.23	0.17	0.04**
No. of Dependents	0.24	0.44	0.20	0.82
Hours Paid Work	26.36	29.5	3.10	0.22
Years in College	5.36	5.95	0.59	0.37
IFS	0.08	0.13	0.05	0.44
Accounting	0.15	0.17	0.02	0.82
Econ/Fin	0.20	0.07	0.13	0.06***
Management	0.21	0.19	0.02	0.81
Business Administration	0.14	0.20	0.06	0.42
Marketing	0.27	0.22	0.06	0.24
Num Assignments	7.35	8.28	0.93	0.00*
Senior	0.94	0.96	0.02	0.57

Note: *indicates significance at <1%; ** indicates significance at <5%, *** indicates significance at <10%. The final, project, midterm, and AOL are scored on a 100-point scale; GPA is measure on a 4-point scale; and Number of Assignments is out of ten.

Table 1A: Differences in means writing (structured and unstructured) and non-writing samples

	Mean writing	Mean no writing	Difference in means	Significance p-value
Project	87.089	85.167	1.923	0.0716***
Midterm	84.33	83.33	0.997	0.620
Final	82.77	77.81	4.962	0.007*

Note: *indicates significance at <1%; ** indicates significance at <5%, *** indicates significance at <10%. The final, project, and midterm are scored on a 100-point scale

Hypothesis 1: Writing will improve student performance on all assessment activities (lower order and higher order) relative to students who do not complete regular writing assignments.

Students completed weekly writing assignments in five out of six classes. Three sections had structured assignments and two sections had unstructured assignments as discussed above. One section did not have weekly writing assignments. In the analyses below, the lower-order learning assessment (final examination) is regressed on writing, measured as an indicator variable with one identifying a student who wrote, zero otherwise. Other control variables such as student major (with marketing as the reference major), whether the student was a senior, and whether the class was during the day or at night are also included.

The results presented in Table 2 suggest that writing matters for lower-order learning as evidenced by the positive and significant coefficient on writing in the full sample in the first column. Writing improves the score on the final examination close to 3 points on a 100-point scale. However, the results further suggest that it is the structured writing assignments (where additional guidance by the instructor is given) that are the source of the additional learning, improving the score on the final examination by about three and a third points on average (as evidenced by the positive and significant coefficient in the structured subsample test). Unstructured writing, although positive, fails to achieve significance. It could however be that the difference in sample sizes between the structured and unstructured group is driving this finding. To check this, the regression was also run restricting the structured sample to include only the students in the 2006 experiment, yielding a sample size of 106. The 'writes' coefficient is positive (3.75) with $p = 0.043$, suggesting that the significance found in the structured group is not driven by difference in sample size between the structured and unstructured groups. Another source of potential difference between the structured and unstructured classes is that the structured classes were held in the spring while the unstructured classes took place in the fall. However, as table 1 above indicates, the students were fairly similar across the two semesters on our measured characteristics. Additionally, the university has graduations in both fall and spring for seniors. We have no strong indication that student performance would differ across the semesters by season.

An alternative understanding of the lack of significance on the unstructured coefficient has to do with the increased variation in performance relative to the structured environment. When the students are in the structured learning environment, the lower performing students are 'pulled up' by the additional guidance, compressing the distribution. In the unstructured environment, high

performers excel, but low performers fail to do well thus resulting in a wider dispersion in performance, hence the insignificant finding.

Interestingly, the class format, meeting twice weekly during the day versus a single three-hour night class, was statistically significant as well in a way that reinforced the structured environment compared to the unstructured one. That is day students in the structured environment performed close to three points (3%) better

Table 2: Dependent variable = Final examination score

Explanatory variables	Coefficient full sample	Coefficient no writing v unstructured	Coefficient no writing v structured
Intercept	73.12* (0.000)	69.69* (0.000)	74.54* (0.000)
Writes	2.93*** (0.076)	3.06 (0.140)	3.34*** (0.070)
Accounting	2.22 (0.225)	2.82 (0.312)	1.50 (0.478)
Finance	0.33 (0.850)	1.83 (0.488)	-1.11 (0.568)
Management	-1.74 (0.301)	-1.81 (0.454)	-0.34 (0.862)
IFS	0.34 (0.867)	1.07 (0.704)	0.99 (0.682)
Economics	-0.52 (0.855)	7.42 (0.209)	-0.92 (0.741)
Bus. Admin	2.20 (0.270)	4.52 (0.132)	0.39 (0.879)
Day	3.08* (0.014)	3.24 (0.128)	2.65*** (0.093)
Senior	4.74*** (0.068)	7.37 (0.222)	3.36 (0.123)
Sample	204	99	141
Adj R2	0.082	0.111	0.062
F-stat	3.007 (0.002)*	2.358 (0.019)**	2.045 (0.039)**

Note: p-values are in parentheses; * indicates significance at <1%; ** indicates significance at <5%; *** indicates significance at <10%. Final examination is scored on a 100-point scale.

on average than the night students in the structured environment. Similar regressions were run for the higher-order assessments (midterm and project). In these regressions writing, either structured or unstructured, failed to achieve significance at conventional levels for the higher-order assessment instruments. These findings may suggest that structured writing, particularly if structured assignments are enhancing performance among poorer students, may be suited to developing lower-order skills.

In our next analysis, we examine the impact of the *amount* of writing completed (up to ten assignments) rather than simply whether the student was in the writing group or not. Students in the writing sections turned in between four and ten assignments over the course of the semester as follows:

Table 3: Assignments submitted out of ten

Number assignments	Percent of students
4	0.6
5	0.6
6	5.4
7	10.1
8	17.9
9	19.0
10	46.4
Total	100

The final examination score was regressed on the number of assignments submitted and the same set of control variables as in the previous regression. The results in Table 4 suggest that more writing statistically significantly improves the final examination score by a little over one-third of a point (on a 100-point scale) on average per assignment completed in the full sample (no writing, unstructured writing, and structured writing). However if we separate the structured from the unstructured sections, the findings suggest that it is the structure that is yielding the positive impact on the lower-order assessments – in this case close to half a point is gained on the final examination per assignment completed.

Perhaps what is yielding the positive relationship between writing and performance is that students who are required to write and submit assignments on a regular basis have greater accountability and incentive to keep up with the class work rather than putting off the course until the night before the midterm or final examinations. However, the results presented in both Table 2 and Table 4 suggest

otherwise. The relationship between writing and performance and between the number of assignments and performance fails to achieve statistical significance when analysing students who write in an unstructured setting and students who do no writing. The significance is achieved only when the learning environment provides structure for the students' assignments. This statement is softened by the alternative explanation offered above for the lack of significance for the

Table 4: Dependent variable = Final examination score

Explanatory variables	Coefficient full sample	Coefficient no writing v unstructured	Coefficient no writing v structured
Intercept	72.75* (0.000)	69.63* (0.000)	73.79* (0.000)
No. of Assignments	0.37** (0.042)	0.306 (0.225)	0.46** (0.021)
Accounting	2.08 (0.254)	2.77 (0.325)	1.27 (0.543)
Finance	0.34 (0.845)	1.97 (0.458)	-1.19 (0.538)
Management	-1.76 (0.294)	-1.47 (0.539)	-0.65 (0.738)
IFS	0.34 (0.866)	1.30 (0.645)	0.79 (0.743)
Economics	-0.56 (0.842)	7.24 (0.223)	-1.06 (0.703)
Bus. Admin	2.24 (0.258)	4.52 (0.132)	0.15 (0.953)
Day	2.63** (0.047)	3.31 (0.135)	1.89 (0.245)
Senior	5.07** (0.052)	7.32 (0.223)	3.96 (0.189)
Sample	204	99	141
Adj R2	0.082	0.104	0.078
F-stat	3.007 (0.002)*	2.261 (0.025)**	2.310 (0.019)**

Note: p-values in parentheses; * indicates significance at <1%; ** indicates significance at <5%; *** indicates significance at <10%. The final examination score is out of 100 points. The number of assignments turned in is out of ten. The non-writing group turned in zero assignments.

unstructured writing environment – the structured environment may be supporting the poorer performing students, leading to the significant coefficient as the performance distribution is compressed. In a class where many of the students are strong (honors sections of classes or elite universities), an unstructured environment may also lead to statistically significant improvement in performance relative to no writing.

Finally, although similarly tested, statistically significant results were not found for the higher-order assessment measures. (Note that the number of assignments used was not out of ten, but out of the total number assigned up to the test date or due date of the assignment in these analyses.) However, if the story is really about the mixed ability composition of the class, unstructured writing may enhance the performance of higher-order learning among high performing students.

Hypothesis 2: Lower-order learning will be greater in a structured (instructor-generated questions and projects) learning environment than in an unstructured (student-generated questions and projects) learning environment because poorer performing students have greater support in working with the assigned reading or other materials.

To test this hypothesis, we restrict the sample to writers only. We regress the lower-order final examination assessment on the learning environment (structure = 0 for an unstructured environment; structure = 1 for a structured environment). The results of the test of this hypothesis are presented in Table 5. Among the writing sections (spring 2006 and fall 2006), a fuller set of explanatory variables is available for inclusion in the analysis. Among writers only, a structured learning environment improves lower-order skills on average as measured on the multiple-choice final examination relative to an unstructured learning environment, just achieving statistical significance of 9.98% (reported as 0.100 in the first column of Table 5). This again may be a result of the dispersion in performance being compressed as poorer students perform relatively better under the structured environment than under the unstructured environment.

Hypothesis 3: Students in the structured environment will perform better on higher-order assessments activities than students in the unstructured environment because of the practice they have had in patterning the inquiry skills of the instructor.

Table 6 below presents the results of regressions of higher-order assessments (AOL, midterm examination and project) on the structure indicator variable (0 = unstructured, 1 = structured) and a set of control variables.

Table 5: Dependent variable = Final examination

Explanatory variable	Coefficient structured and unstructured samples
Intercept	54.57* (0.000)
Structure	2.51*** (0.100)
Night	-1.83 (0.179)
Male	-0.71 (0.638)
Age	-0.13 (0.435)
GPA	8.48* (0.00)
No. of Dependents	0.84 (0.416)
Hours Work	-0.03 (0.618)
Years study	0.26 (0.356)
IFS	-3.34 (0.198)
Accounting	0.32 (0.887)
Fin/Econ	-0.912 (0.706)
Management	-3.18 (0.119)
Bus. Admin.	3.38 (0.111)
No. of Assignments	-0.49 (0.415)
Senior	9.14* (0.005)
Sample	102
Adj R2	0.313
F-Stat	4.0965 (0.000)*

Note: p-values in parentheses; *indicates significance at <1%; ** indicates significance at <5%, *** indicates significance at <10%. The final examination is out of 100 points. GPA is on a four-point scale. Number of assignments is out of ten.

Table 6: Higher order learning assessments – structured and unstructured samples

Explanatory variable	Dependent variable: AOL		
	Coefficient	Midterm Coefficient	Project Coefficient
Intercept	85.98* (0.000)	72.25* (0.000)	74.06* (0.000)
Structure	3.20 (0.131)	8.68* (0.000)	1.84 (0.206)
Night	0.98 (0.442)	-2.32 (0.191)	-0.56 (0.668)
Male	-0.43 (0.192)	0.01 (0.997)	0.73 (0.615)
Age	-0.14 (0.598)	-0.53** (0.018)	-0.08 (0.610)
GPA	-1.66 (0.517)	10.16* (0.00)	4.42* (0.007)
No. of Dependents	5.32* (0.001)	1.27 (0.960)	0.26 (0.792)
Hours Work	0.02 (0.776)	-0.05 (0.465)	0.07 (0.177)
Years study	-1.39* (0.002)	0.81** (0.027)	0.35 (0.194)
IFS	0.016 (0.997)	-6.149*** (0.071)	-0.97 (0.697)
Accounting	3.42 (0.321)	3.41 (0.247)	1.64 (0.449)
Fin/Econ	-3.65 (0.325)	-7.94* (0.013)	-6.14* (0.009)
Management	0.722 (0.816)	-2.19 (0.408)	1.08 (0.578)
Bus. Admin.	1.93 (0.553)	-0.304 (0.912)	0.56 (0.783)
No. of Assignments	1.81 (0.261)	-1.014 (0.198)	0.08 (0.891)
Senior	2.46 (0.615)	-1.911 (0.645)	-3.55 (0.246)
Sample	103	103	103
Adj R2	0.162	0.336	0.101
F-Stat	2.319 (0.007)*	4.448 (0.000)*	1.763 (0.053)**

Note: *p-values in parentheses; indicates significance at <1%; ** indicates significance at <5%, *** indicates significance at <10%. The dependent variables are scored on a 100-point scale. Number of assignments is the number of assignments submitted at the time the dependent variable assessment was due.

The results in Table 6 provide some evidence to support the hypothesis that regular structured writing assignments improve student performance on assessments of relatively higher-order (analysis and application) learning such as the essay and problem-oriented midterm examination, given the significant coefficient on structure in the midterm regression. It may be because the structured assignments give students a better sense of the professor's style of questions that might appear on the midterm, an advantage not available to the students in the unstructured section. That students do not ratchet-up effort until they perform poorly on the midterm would, most likely, equally affect both groups (structured and unstructured) of students and thus not explain the difference in performance and significance between the structured and unstructured groups.

Much weaker evidence that structure enhances higher order learning is provided by the positive impact of structure on the empirical assessment activity (AOL) and semester project.

Conclusions and comments

The evidence suggests that writing assignments improve student performance. It further suggests that structured writing assignments serve to improve student performance on lower-order learning assessment (the multiple-choice examination), particularly among the students studied who were in the main not well prepared for self-directed learning. These results may differ depending on the ability composition of the class.

Evidence regarding the impact of a structured learning environment on student performance at different levels of learning as defined by Bloom's taxonomy of educational objectives is mixed. Structure positively impacts the performance on the lower-order assessments (the multiple choice examination) used in our analysis, and achieved significance for only one of the higher-order assessments – the midterm examination – in the regression analysis. Thus structure may be only weakly claimed to enhance the performance of students on higher-order assessments. This might be in part because the structured weekly writing assignments were more like the questions that would appear on the midterm examination and did not require the skills the students needed to demonstrate in the empirical exercise and project.

Our finding suggests that instructors should carefully assess the ability level of their class. Meeting the class where it is, the instructor can define the learning level he or she expects his or her students to achieve and design regular writing assignments that allow students to practise both lower-order and higher-order skills. If the

students are similar to the ones in our samples, then strong structures and guidance will enhance student performance on average.

We further note by way of observation that higher-order assessments of student learning are fairly limited prior to this level of course work. Most 200 and many 300-level courses commonly use multiple-choice assessments of lower-order learning. Thus, it may be argued that the weak support for higher-order learning is because of students' relative inexperience with such skills and with assessments of those skills. This leads us to recommend the inclusion of more rigorous assessment activities to enhance higher-order learning skills much earlier in the curriculum if we hope to graduate students capable of such learning. In the language of our literature review, knowledge telling skills should be the focus of principles level courses, with assignments and assessment activities building up to knowledge transforming skills as students progress through the curriculum. This will provide students with greater opportunity to succeed at self-directed (or self-regulated) learning. We further suggest that such higher-order learning skills are essential to the future of our students but they must be built into the activities and assessments over the four-year curriculum as suggested in Figure 2. (Of course, this

Figure 2: Linking the literature: knowledge building through writing through the curriculum

Equivalent skills	Strategies to acquire skill	Assessment activities	Authors
<i>Freshmen and Sophomore</i>			
Knowledge Telling= Bloom's Lower Order Learning Knowledge, Comprehension, and Simple Application (Langer and Applebee – recall and argumentation)	rehearsal elaboration organisation	multiple choice short answers information essay	Klein Hayes & Flower Bereiter & Scardamalia Weinstein & Mayer
<i>Junior and Senior</i>			
Knowledge Transforming= Higher Order Learning Complex application, Analysis, And Synthesis	Reflection problem spotting resolving contradiction	essays projects research papers insight/ connection	Klein Tynjala Tynjala <i>et al</i> Bereiter &
Can include knowledge telling Can be recursive	revision comprehension monitoring		Scardamalia Weinstein & Mayer

may be modified to meet the need of a particular student population. For example, well-prepared students may be ready for knowledge transforming activities at sophomore level.)

Moreover, although the limited evidence that regular structured writing and more structured assessment activities are weakly linked to improvements in student performance at progressively higher-order learning levels, students throughout the experimental semesters demonstrated a strong preference for structure. Student evaluations of the course, and comments related to the course were much more positive in the structured setting. During the course of the unstructured semester, student anxiety and dissatisfaction with lack of strong, explicit guidance was evident – both for high performing students and for students who performed less well.

Further research into the types of assignments that further higher-order learning skills in students of economics is necessary. If we successfully implement curricular change within our university, it may become possible for us to test whether an unstructured environment can significantly improve student performance with respect to higher-order assessments among students who are better prepared to engage in self-directed learning. We encourage other researchers currently situated to explore this hypothesis to do so.

Note

The list of Common Topics includes the following items: principle of comparative advantage; exchange rates; domestic and international accounts; institutions and nongovernmental organisations that affect trade, economic growth and development; factors [cultural, economic, environmental, political, social] that affect trade and economic growth and development; general concepts from comparative economics [transitional economic systems], economic development and international trade; sustainable development; evidence of environmental degradation [rules of ecology, world environmental status, major sources of pollution]; macroeconomic policies: fiscal policy, monetary policy, strategic trade policy; views of human rights; convergence hypothesis.

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Assessing An Economics Programme: Hansen Proficiencies, ePortfolio, and Undergraduate Research



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Abstract

Numerous sources calling for more accountability in higher education are putting increased pressure on many economics departments to develop assessment plans. This paper discusses a set of principles for programmatic assessment gleaned from the assessment literature, while highlighting one US economic department's journey to develop an assessment of student learning outcomes based on Hansen's proficiencies. We explain the curriculum reforms that culminate with independent undergraduate research as suggested by the highest level of Hansen's proficiencies. We describe ePortfolios which showcase student abilities and integrate evidence of student learning across the curriculum. For departments without direct guidance from accreditation boards or other agencies, we put forth a process of forming programmatic assessment in economics.

Introduction

Changes in assessment practices are driven by three forces: greater demands for accountability from institutions of higher education, new developments in learning theory, and the rapid pace of technological change. The economics profession in the United States has no required content or assessment standards. By contrast, other countries such as the United Kingdom¹ have a much more developed set of content standards and assessment processes. Our department, located in the Midwest of the United States, has developed and implemented a new assessment process based on a set of principles for programmatic assessment which uses both the Hansen proficiencies and ePortfolios. Our purpose is to provide insights that