

Process-Oriented Guided-Inquiry Learning In Financial Literacy Education

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Abstract

This project describes the implementation of Process-Oriented Guided-Inquiry Learning [POGIL] in a financial literacy-themed first-year orientation course and compares the learning gains from this method vs. traditional lecture. Students enrolled in four sections of the course received instruction either through lecture or POGIL. Results revealed that controlling for pre-existing mathematical literacy, students' scores on daily quizzes, major assignments, and course examinations were not significantly different between the two methods. However, analysis of course evaluation scores revealed a strong student preference for traditional lecture. These findings are interpreted both within the context of prior research on POGIL in other disciplines and the only prior publication on POGIL in financial literacy education.

Keywords

financial literacy, process-oriented guided-inquiry learning, teaching method

Introduction

The average American college student enters college without having ever been solely responsible for their own personal finances (Kezar 2010; Nellie Mae 2002), carries a credit card debt of more than \$3,000 (Chu 2009), and graduates owing more than \$23,000 in student loans (Student Loans 2006). Further, the average college student scores only slightly above 60 percent correct on tests of basic financial literacy (JumpStart 2008). College students report problems using and managing credit effectively (Joo et al. 2003) and either fail to budget or fail to stick to a budget, leaving them "vulnerable to financial crisis" (Henry et al. 2001, 246). Additionally, students with lower levels of personal financial knowledge are more likely to engage in risky credit card behaviors (Robb 2011) and less likely to budget and save appropriately (Gutter and Copur 2011).

Many college campus leaders and administrators have expressed concern over students' lack of financial literacy and their problematic financial behaviors (Kezar 2009; Supiano 2008, 2009). To address this situation, colleges and universities have increasingly begun incorporating

financial education into the college experience (Supiano 2010). Even though there is controversy regarding the effectiveness of financial education (McCormick 2009), generally, it has been found that participation in college-level personal finance classes is related to better financial knowledge (e.g., Peng et al. 2007; Lai et al. 2010). However, there is no approach clearly or widely accepted as the “best” one for providing financial education to college students. Options have included one-on-one peer counseling, short on-line courses, semester-long elective classes, and optional content for required first-year orientation courses (Supiano 2008). Further complicating these programmatic efforts, as the U.S. Department of Treasury has noted, is that “there is little research on successful methods for financial education” (2006, xi).

Kezar (2010) has argued that any efforts to increase students’ financial literacy must be fully integrated into the formal college curriculum, cautioning that, “as long as it is marginalized in the occasional workshop, financial education will never get the time and attention it needs to fundamentally change students’ knowledge and understanding.” Specifically, Kezar has advocated including the information in either university-wide general education requirements or required first-year orientation courses. This last approach is also recommended by the federal Credit Card Accountability Responsibility and Disclosure Act (2009). What remains to be seen is which method(s) of teaching financial literacy in these settings would be most effective.

This project proposes and evaluates Process-Oriented Guided-Inquiry Learning (POGIL) as a learner-centered approach to teaching financial literacy in a first-year orientation course. Originally developed for the natural sciences and funded by the National Science Foundation (NSF), POGIL was created to develop instructional materials to assist college faculty in adopting a learner-centered approach (Hanson 2006).

“A POGIL classroom or lab consists of any number of students working in small groups on specially designed guided-inquiry materials. These materials supply students with data or information followed by leading questions designed to guide them toward formulation of their own valid conclusions — essentially a recapitulation of the scientific method. The instructor serves as facilitator, observing and periodically addressing individual and classroom-wide needs.” (POGIL.org n.d.)

POGIL promotes student learning through the implementation of the Learning Cycle (Abraham 2005; Karplus and Their 1967; Piaget 1964). This cycle has three phases: (1) exploration (2) concept invention/formation or term introduction and (3) application. This cycle mimics the process of the scientific method. In the exploration phase, students receive a model to investigate and critical thinking questions designed to guide their investigation of the model in a specific way to help them reach correct conclusions. In the concept invention phase, students are presented with the name for the concept or term that they have explored in the first phase. That is, rather than first presenting students with the name of the term or concept, and then providing

examples illustrating it (as is common practice when lecturing), students get to explore the material and inductively “build” the concept, only learning its name after they have discovered it. Finally, in the application phase, the students’ understanding of the new concept they have discovered is applied to similar contexts through exercises or new contexts through problems. It is here that both students and instructors can get a feel for students’ understanding of the new concept and if they have learned to think critically about it rather than just regurgitating a memorized definition.

In the POGIL classroom, students are typically assigned to groups of four, with each student receiving an assigned role that rotates on a regular basis (Hanson 2006). The roles are (1) Manager (administrative responsibilities, keeping team on task, ensuring full participation); (2) Presenter (contributes group findings to the class); (3) Recorder (keeps a record of what the group has done); and (4) Reflector (identifies what the group is doing well and what needs improvement). Students work as a group on the learning materials and models they receive.

The instructor has four roles (Hanson 2006): (1) Leader (creating instructional materials, setting learning goals, assigning groups); (2) Monitor/Assessor (circulate among the groups to identify individual and group progress); (3) Facilitator (intervening when groups are stuck by asking questions designed to call the students’ attention to the relevant information); and (4) Evaluator (evaluating both individual and group efforts, products, and effectiveness).

Research on POGIL in the natural sciences has revealed it to be a highly effective and advantageous pedagogy. Compared to lecture classrooms, POGIL classrooms have significantly higher exam averages (Hanson and Wolfskill 2000), significantly lower rates of students earning Ds, Fs, or Withdrawals (Farrell, Moog, and Spencer 1999), and significantly lower absenteeism (Eberlein et al. 2008). Although faculty in other disciplines have recently begun to adapt POGIL to fields as diverse as accounting, construction management, foreign languages, and marketing (Frost et al. 2011; Hale and Mullen 2009), research on its effectiveness in those disciplines is limited. Further, to date, only one empirical evaluation of POGIL’s effectiveness in teaching financial literacy been published (Maurer in press).

Maurer (in press) used a mixed within-groups and between-groups design to compare the effectiveness of POGIL with traditional lecture in teaching a sophomore-level introductory course in financial literacy. One group received all instruction via lecture. The other group received instruction on half of the course topics via lecture and half of the course topics via POGIL. His results offered limited support for the effectiveness of POGIL over lecture. Specifically, the students who received instruction via lecture and POGIL outperformed the students who received instruction only through lecture by nearly 7 percent across five common course assignments. Additionally, within the group that received instruction via both lecture and POGIL, students’ scores on exam questions based on POGIL material were

approximately 13 percent higher than their scores on exam questions based on lecture material. However, this study had several significant limitations. Nearly all of the students in his sample were female and his pattern of results may not extrapolate to male students. His course was a sophomore-level financial literacy course, not a first-year orientation course, so it is unknown if the pattern of results would hold for orientation courses. Further, the investigation used both a between-groups and within-groups design. Rather than teaching one group via lecture only and one group via POGIL only and comparing the two groups on all course assessments (assignments, exams, quizzes, etc.), one group was taught via lecture only and the other group received both lecture and POGIL, which both limits the effectiveness of any comparisons and prevented many between-groups comparisons (e.g., on exams). Finally, Maurer (in press) reported a significant drop in course evaluation scores for the students who received instruction via both methods, suggesting that this increase in student learning came at a cost.

This project seeks to expand upon Maurer's (in press) work and compare the effectiveness of POGIL with traditional lecture in required first-year orientation courses. Specifically, two sections of the course that receive instruction entirely via lecture will be compared with two sections that receive instruction entirely via POGIL. I will compare (1) average daily quiz scores, (2) average assignment scores, (3) average exam scores, and (4) course evaluation scores. Based on Maurer's (in press) findings and those of the POGIL literature in other disciplines, I hypothesize the following:

H1: Compared to the students in the lecture sections, students in the POGIL sections

- a. will score higher on daily quizzes
- b. will score higher on assignments
- c. will score higher on exams

H2: Compared to the students in the lecture sections, students in the POGIL sections will report lower (less positive) course evaluation scores.

Method

Participants

Participants were 88 first-year students enrolled in one of four sections of a thematic first-year orientation course taught by the author in Fall 2011 and Fall 2012. Approximately half of the sample were enrolled in one of the two 9:05 a.m. sections and half were enrolled in one of the two 10:10 a.m. sections. No demographic data were collected from participants, but more than

95 percent were “traditional” college students and the gender distribution was 50 males (56.82 percent) and 38 females (43.18 percent). Because course evaluations were anonymous, it was not possible to link participant data from the learning assessments to their data on course evaluations, so missing and excluded data differed slightly for each set of analyses.

Student learning analysis sample. Of the 88 students, 21 were excluded from the data analysis on student learning. Nine were excluded because they did not complete the basic math skills assessment on the second day (two in the POGIL sections, seven in the lecture sections). An additional 12 were excluded because they either missed more than one of the four course examinations or more than one of the three major course assignments, or both (eight in the POGIL sections, four in the lecture sections). This left a final sample size of 67 for the student learning analyses, representing an inclusion rate of 76.14 percent and similar to the pass rate for the course.

Course evaluation analysis sample. Of the 88 students, 16 were excluded from the data analysis on course evaluations because they did not complete evaluations (11 in the lecture sections, 5 in the POGIL sections). This left a final sample size of 72 for the course evaluation analysis, representing an inclusion rate of 81.82 percent.

Measures

Basic math skills assessment. The instructor developed a 10-item assessment consisting of word problems to test students’ existing abilities with respect to the basic math skills that would be necessary in the course. Each of the items was scored “0” for incorrect or “1” for correct, yielding a potential range of 0-10 for the measure. No items required skills beyond the level of basic pre-algebra.

Daily quizzes. The instructor developed 15 daily quizzes, each covering one day’s content material. Topics ranged from future value/present value to balance sheets to auto financing. Each quiz was worth 10 points and students could receive partial credit for partial solutions according to a predetermined rubric. Students were required to show all their work/calculations and all their steps. The number and format of questions varied by the topic the quiz covered, but typically fell into one of two categories: (1) classification of up to 10 items based on categories to be recalled from memory; and (2) solving 1-2 word problems involving one or more formulae to be recalled from memory. The average percentage correct across all 15 quizzes was computed for each student, yielding a potential range of 0-100 percent for this measure.

Major assignments. The instructor developed three major assignments for the course: (1) Setting and correctly classifying personal financial goals; (2) Completing a personal net worth

statement; and (3) Researching buying and financing an automobile. Each assignment was worth 100 points and students could receive partial credit for partial completion according to a predetermined rubric. Students were required to show all their work/calculations and all their steps. All three assignments required students to apply the course material they had learned about each topic. A sample item from the auto assignment was, "Calculate a loan on this vehicle for 48 months at 7 percent interest with 20 percent down. What would your monthly payments be?" The average percentage correct across all three assignments was computed for each student, yielding a potential range of 0-100 percent for this measure.

Exams. The instructor developed four non-cumulative course examinations, each covering approximately one-fourth of the content in the course (roughly two weeks' worth of material). Each exam was worth 100 points and students could receive partial credit for partial answers according to a predetermined rubric. Students were required to show all their work/calculations and all their steps. Similar to the quizzes, the number and format of questions varied by the topics the exam covered, but typically included classification and/or application/solution problems. All formulae were provided on the first page of the exam, but not a key explaining what each variable in the formulae represented; that had to be recalled from memory. The average percentage correct across all four exams was computed for each student, yielding a potential range of 0-100 percent for this measure.

Course evaluations. Course evaluations were a 25-item university developed and mandated questionnaire. Two items were open-ended questions and were not used in this investigation. Two items requested demographic information about whether or not the course was required and if it was in the student's major, but as the course in this investigation was a required core course, neither of these items were used. Of the remaining 21 items, seven concerned the course, 11 concerned the instructor, two assessed pre-/post-course interest in the subject matter, and one item inquired about expected grade in the course. All items were measured on a five-point scale. The first six course items asked students to compare the course to other courses of similar credit value and were measured from "1" = "Much Less" to "5" = "Much More." The seventh course item and all 11 instructor items were measured from "1" = "Very Poor" to "5" = "Very Good." The two interest items were measured from "1" = "No interest at all" to "5" = "Very interested." The expected grade item was measured from "1" = "A" to "5" = "F." The exact wording of each item appears later in Table 2. An additional seven items about the orientation portion of the course were added to the common evaluation for all orientation courses, but those items were not used in this investigation.

Procedure

Background. This Institutional Review Board - approved research was conducted at a rural, southeastern, doctoral university with an enrollment of 20,000 students. At this institution, all

students who matriculate with fewer than 30 credit hours are required to take a thematic, two-credit-hour first-year orientation course in their first semester. Students are free to select from more than 100 different themes that are offered, one of which is financial literacy and is taught by the author. The course description (to which students have access when they are choosing their section) read:

“Financial literacy is the ability to make informed judgments and to take effective actions regarding the current and future use and management of money. This section will explore basic concepts in financial literacy including but not limited to net worth, cash flow, budgeting, and major purchases. Emphasis will be placed on relating financial literacy concepts to students' personal situations. This is a math-intensive course. Working knowledge of basic algebraic concepts is required.”

All orientation courses have a common core content related to orientation that comprises approximately one-fourth of the course time and material (e.g., time management, academic integrity) and a theme set by the instructor that accounts for the remaining three-fourths of the course time and material (e.g., financial literacy). Thus, all students enrolled in the sections in this project were required to take an orientation course, but all of them chose to take one with the theme of financial literacy. All sections of the course in this project met on Mondays and Wednesdays for 50 minutes each.

The instructor assigned one section each year to the lecture condition and one section to the POGIL condition. This was counterbalanced across class time such that in Fall 2011, the lecture condition was the 9:05 am class and the POGIL condition was the 10:10 am class, whereas in Fall 2012 they were reversed. The course material and assessments in both sections were the same. Students in the lecture sections of the course received lectures every period on the course material. In these lectures, the instructor demonstrated problem-solving solutions to prepared examples. The examples/problems demonstrated were identical to the ones used in the POGIL sections that students had to solve in their groups. For the POGIL sections, the author developed POGIL materials for the course. See Appendix for an example of part of one of the POGIL worksheets.

POGIL sections. For each of the four major units in the course, students in the POGIL sections were assigned to a group of four with whom they would work every day in the unit. There were either five or six groups each unit, depending on course enrollment. If the enrollment number was not evenly divisible by four, several groups of three were created. For the first unit, students were assigned to groups based on their scores on a 10-item basic math skills assessment. Student scores on the assessment were split into quartiles and one student from each quartile was placed in each group. For the remaining units, students' scores on the exams were used instead of the

math skills assessment. Whenever possible, students were assigned to work with new group members when starting new units.

When students arrived to class each day, they would see a map of their groups (for assigned seating) on the board. The students assembled into their groups and (after their quiz) received a folder with the day's materials from the instructor. The folder contained copies of the day's learning materials for each student, various elements of administrative paperwork (e.g., a record for attendance, a form on which to write questions to the instructor at the end of the lesson), and a description of the four group roles (Manager, Presenter, Recorder, Reflector). The roles rotated clockwise on each subsequent day so that all students participated in all roles.

Once the instructor handed the folder to the group manager, that student passed out the materials in the folder to the members of the group and began following the provided instructions to lead their group through the exercise. The instructor circulated among groups, observing their work, responding to questions, interjecting observations or hints, and checking student answers. When the group had finished the assigned materials, or when the class period was over, students placed the administrative materials back in the folder (keeping their copy of the day's learning materials) and returned it to the instructor.

Math skills assessment. At the start of the second day in the course, after disseminating and discussing the syllabus, the instructor administered the math skills assessment. Students were given 20 minutes to complete it. Students were informed that the math skills assessment would not influence their grade, but would only be used to give the instructor an idea of where they each stood with respect to their math skills. After they completed the assessment, they traded with a neighbor and the instructor led the class through the solutions to each item. When finished, students passed in the scored assessments, which the instructor double-checked after class. Students were encouraged to meet with the instructor if they had struggled with or missed any of the items on the assessment.

Daily quizzes. At the start of each class period after a content day, students were given 5-10 minutes (depending on the content and difficulty) to complete the daily quiz. Students were required to recall any classification schemes or formulae from memory for these quizzes. There were four quizzes each for the first three units and three quizzes for the fourth unit.

Course evaluations. Course evaluations were administered and collected on the next-to-last day in the course by a student assistant assigned by the campus Office of First-Year Experience. The instructor left the room for the 10 minutes during which evaluations were administered.

Results

Preliminary analyses

Descriptive statistics for the math skills assessment, daily quiz average, assignment average, and exam average appear in Table 1. Descriptive statistics for the 21 course evaluation items appear in Table 2. A correlation matrix was computed for each set of variables and both matrices revealed significant correlations. As a result, multivariate analyses were chosen to control for the shared variance and to reduce the Type I error rate.

Table 1. Student Performance on Course Assessments by Condition (N = 67)

[Table 1 Summary: Student Performance on Course Assessments by Condition (N = 67)]

Condition						
Assessment	Lecture (N = 31)			POGIL (N = 36)		
	M	SD	Range	M	SD	Range
Math skills assessment	5.45	2.57	0.00-10.00	5.69	2.39	1.00-10.00
Quiz average	72.06 percent	17.19 percent	30.00-99.33 percent	68.76 percent	14.30 percent	31.33-90.00 percent
Assignment average	84.28 percent	16.44 percent	47.00-99.00 percent	80.84 percent	16.47 percent	40.00-100.00 percent
Exam average	85.38 percent	15.12 percent	50.00-100.00 percent	86.66 percent	12.01 percent	44.00-100.00 percent

Table 2. Course Evaluation Scores by Condition (N = 72)

[Table 2 Summary: Course Evaluation Scores by Condition (N = 72)]

Item	Condition						F (1,70)	p	partial eta-squared
	Lecture (N = 31)			POGIL (N = 41)					
	M	SD	Range	M	SD	Range			

How much effort did you put into learning the material covered in this course?	3.32	1.01	1-5	3.34	1.06	1-5	0.01	.940	—
How much did you learn in this course?	4.23	0.96	2-5	3.44	0.98	2-5	11.68	.001	.14
To what degree were you intellectually challenged in this course?	3.48	1.03	1-5	3.22	1.24	1-5	0.93	.338	—
How often did you seek outside help with this course?	2.19	0.98	1-4	2.05	1.07	1-5	0.35	.558	—
How difficult was this course?	2.61	1.15	1-4	3.22	1.13	1-5	5.03	.028	.07
How was the workload of this course?	4.13	0.81	2-5	4.17	0.83	2-5	0.05	.832	—
Overall, how would you rate this course?	4.29	0.82	3-5	3.34	0.97	1-5	19.31	.000	.22
The degree to which important points were stressed in this course was	4.55	0.62	3-5	4.24	0.70	3-5	3.67	.060	—
The instructor's preparation for this course was	4.90	0.30	4-5	4.37	1.02	1-5	8.07	.006	.10
The instructor's encouragement of class participation, discussion, or questions was	4.52	0.77	2-5	3.88	0.98	1-5	8.96	.004	.11
The organization of course material was	4.65	0.99	1-5	4.17	0.97	1-5	4.16	.045	.06
The clarity of the presentation of the course material was	4.68	0.83	1-5	3.68	0.93	2-5	21.96	.000	.24

The degree to which tests and other graded activities reflected course content was	4.77	0.62	3-5	4.02	1.11	1-5	11.50	.001	.14
The instructor's availability to students was	4.42	0.85	2-5	3.49	1.00	2-5	17.35	.000	.20
The instructor's helpfulness to students was	4.32	0.83	3-5	3.15	1.01	1-5	27.62	.000	.28
The degree to which the class stayed focused on course objectives was	4.65	0.66	3-5	4.44	0.71	3-5	1.58	.213	—
The instructor's interest in the content (or material) of this course was	4.77	0.67	2-5	4.29	0.75	3-5	7.98	.006	.10
Overall, how would you rate this instructor ?	4.68	0.48	4-5	3.71	0.91	1-5	29.62	.000	.30
What was your level of interest in this subject matter <u>before</u> taking this course?	2.45	1.15	1-5	2.63	1.34	1-5	0.37	.545	—
What was your level of interest in this subject matter <u>after</u> taking this course?	4.13	0.81	2-5	3.15	1.09	1-5	17.92	.000	.20
What grade do you expect in this course?	1.71	0.94	1-5	2.15	1.13	1-5	3.04	.086	—

Multivariate analyses

Student learning analyses. To assess differences between the lecture and POGIL conditions, a Multivariate Analysis of Covariance (MANCOVA) was conducted with the average quiz scores, average assignment scores, and average exam scores as dependent variables, condition as the independent variable, and score on the math skills assessment as the covariate. A significant model emerged, Pillai's Trace = 0.89, $F(3, 62) = 170.54$, $p = .000$, partial $\eta^2 = .89$. The math

skills assessment emerged as a significant covariate, Pillai's Trace = 0.12, $F(3, 62) = 2.87$, $p = .044$, partial $\eta^2 = .12$. However, condition was not significant, Pillai's Trace = 0.04, $F(3, 62) = 0.78$, $p = .51$. Follow-up univariate tests revealed a significant model for the average assignment score and a significant model for the math skills assessment on that variable, but as that assessment was a covariate and results are in the direction that would be expected, further details will not be presented here. Power analyses for condition revealed observed power statistics of 0.21 for the multivariate analyses. For the univariate analyses, observed power statistics for condition were: quiz average = 0.16, assignment average = 0.17, and exam average = 0.06.

Course evaluation analyses. To assess differences between the lecture and POGIL conditions, a Multivariate Analysis of Variance (MANOVA) was conducted with the 21 course evaluation items as dependent variables and condition as the independent variable. A significant model emerged, Pillai's Trace = 0.99, $F(21, 50) = 378.02$, $p = .000$, partial $\eta^2 = .99$. Condition also emerged as a significant multivariate predictor, Pillai's Trace = 0.57, $F(21, 50) = 3.20$, $p = .000$, partial $\eta^2 = .57$. Univariate analyses of variance revealed significant models for 13 of the 21 dependent variables. In every case, student ratings were better for the lecture sections than the POGIL sections. See Table 2.

Discussion

This project sought to expand upon Maurer's (in press) work and compare the effectiveness of POGIL with traditional lecture for teaching financial literacy in required first-year orientation courses. Unfortunately, the results obtained appear to suggest that lecture may be a preferable format for teaching financial literacy in this setting. Hypotheses 1a, 1b, and 1c were not supported, contrary to both Maurer's (in press) own findings and the results of research on POGIL in other disciplines (Hanson and Wolfskill 2000). Students in the lecture sections and students in the POGIL sections performed equally well on daily quizzes, assignments, and exams. Additionally, in support of Hypothesis 2, students in the POGIL sections gave less favorable course evaluations than students in the lecture sections on 13 of 21 assessed items. That is, although students in the POGIL sections learned just as much as students in the lecture sections, they rated both the course and the instructor less positively.

Although these results may appear to suggest that lecture may be a preferable format for teaching financial literacy in this setting (insofar as the learning gains are equivalent but the course evaluations are higher), there are several important project limitations that should be noted. First, and most importantly, is the extremely low statistical power to detect significant effects due to small sample size. Because of missing data and smaller course caps, there were fewer than 40 students in each of the two conditions. Power analyses suggest that to detect a difference in assignment scores similar to that Maurer (in press) reported (with a Beta level of 50 percent) would require over 150 participants in **each** of the two conditions. Assuming a data

inclusion rate of 75 percent (as observed in this investigation and as is typical attrition for these courses), this would represent 10 sections taught via lecture and 10 sections taught via POGIL, well beyond the capacity of a small-scale investigation to obtain. Thus, future research investigating the efficacy of POGIL in teaching financial literacy skills in required first-year orientation courses may require significant commitment of financial and logistical resources. Additionally, the reason power was lower in this investigation may also be a contributing factor to the observed differences — much smaller class sizes. Maurer (in press) reported an average class size of 40. Here, average class size was nearly half that, barely above 20. It may be possible that the smaller class size here enabled more one-on-one attention and communication with struggling students, negating the learning advantage POGIL provides.

Structural differences between this course and Maurer's (in press) may also have contributed to the lack of observed differences between conditions. Maurer's course was a sophomore-level introductory course on financial literacy that included a focus on how to help others with financial literacy. This course was a financial literacy-themed required first-year orientation course that did not cover as many complex financial literacy topics (e.g., how to calculate the inflation-adjusted value of a raise). Maurer gave his students practice problems on review sheets before their exams and required students to recall all formulae from memory for the exams. In this course, students were provided all formulae on the exams and were given identical practice exams (with only the values/items changed) instead of review sheets. Maurer reported average exam scores of less than 60 percent. In this investigation, average exam scores were 85 percent. This data suggests that direct comparisons between the studies may be problematic.

Still, the fact that course evaluations were lower for the POGIL sections is consistent with both Maurer's (in press) findings and those of POGIL researchers in other fields (Frost 2009; Frost and Goodson 2007), who report that students who have experience with lecture-based methods are more likely to resist alternative approaches. In fact, course evaluation scores for the POGIL sections in this investigation were even lower **in the same ways** that Maurer reported.

Specifically, scores for the “clarity of presentation” and “instructor helpfulness” items were significantly lower for the POGIL sections in both investigations. That is, students in the POGIL sections found the course content less clear than students in the lecture section. This is actually evidence that the POGIL materials were designed appropriately, as POGIL content is not supposed to be “clear”; it is supposed to be thought-provoking. Further, students perceived the instructor facilitation of POGIL to be less helpful than lecture. Again, this is evidence that POGIL is being administered appropriately, as instructor responses to questions in a POGIL classroom should consist of feedback, hints, or additional probing questions designed to direct them to the solution rather than a “correct answer.” These findings suggest that the POGIL sections were being administered as designed and intended, with all the attendant “collateral damage” to course evaluations that have been reported in the prior literature. The fact that these

similarities to the prior literature were observed suggest that more research is needed, especially with much larger samples, to uncover the conditions and circumstances under which POGIL produces better student learning outcomes than traditional lecture in teaching financial literacy.

Of particular interest for future research would be ways of increasing student “buy in” to POGIL, or at least of decreasing student resistance toward it. In both this, and Maurer’s (in press) investigation, these classes were students’ first exposure to POGIL. As Frost has documented (Frost 2009; Frost and Goodson 2007), students new to POGIL often resist it more than students experienced with it. Future research should examine multi-course sequences where POGIL is used in each course to explore if it is the “newness” of POGIL that is specifically off-putting to students or if it is some other factor, such as the rigor and cognitive challenge, that is the cause of student resistance.

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Appendix

Budgeting Activity

[Exploration phase] Cash flow statements summarize past income and expenses. Balance sheets summarize the present financial situation. Budgets project, organize, monitor, and control future income and expenditures. That is, budgets indicate where you want to go financially in the future. It is important to remember that budgets are narrower in scope than financial planning, as they are one piece of financial planning. In this activity, you will investigate and learn how to create, evaluate, and change budgets.

Learning goals

- Students can identify the budgeting guidelines made by Family Economists.
- Students can apply those budgeting guidelines to create a budget, to evaluate a budget, and to change a budget, to meet financial goals.

Model 1: Budgeting guidelines

Family Economists have created a general set of guidelines for household budgets based on costs of living that will enable families to meet modest financial goals. These guidelines will vary based on life situation (e.g., the budget for a family of four looks different than the budget for a single person) and financial goals (e.g., someone who is trying to pay off student loans ASAP will be spending a lot more on debt than someone who is debt free). Because all household expenditures come out of the same pot of money (i.e., **household disposable income**), it is important to recognize that these guidelines are flexible. If a person needs to spend a little more in one area, they can spend a little less in another and it will all even out. The table below shows Jane Doe's annual budget which conforms to the guidelines of Family Economists based on her annual disposable income of \$22,000. That amount is roughly equivalent to what a single person making \$24,000/year (i.e., \$12/hour) would have to live on. To get the monthly budget, you would divide all numbers by 12.

Category	\$	% of Disposable Income	Category	\$	% of Disposable Income
Housing (rent or mortgage)	\$5,500		Clothes, Personal, Misc.	\$1,320	
Transportation (gas, repairs, loans, insurance)	\$3,300		Household (cleaning, repairs, furnishings)	\$1,100	

Debt Payments	\$3,300		Healthcare (excluding insurance)	\$660	
Food	\$2,200		Entertainment	\$660	
Insurance, Pension, Savings	\$2,200		Education (excluding loans)	\$440	
Utilities	\$1,320		Total:	\$22,000	100%

Critical Thinking Questions

1. Fill in the table by calculating the “% of Disposable Income” for each of the 11 categories. That will give you the guidelines recommended by Family Economists. Double-check your numbers by making sure they add up to 100%. **[Guidelines represent Concept Invention Phase]**

Exercises [Application Phase]

1. Consider the budget of the following family of five, which has a disposable household income of \$30,000. Fill in the % of Disposable Income cells.

Category	\$	% of Disposable Income	Category	\$	% of Disposable Income
Housing (rent or mortgage)	\$6,000		Clothes, Personal, Misc.	\$1,200	
Transportation (gas, repairs, loans, insurance)	\$3,000		Household (cleaning, repairs, furnishings)	\$300	
Debt Payments	\$6,000		Healthcare (excluding insurance)	\$1,500	
Food	\$3,000		Entertainment	\$1,500	

Insurance, Pension, Savings	\$600		Education (excluding loans)	\$5,700	
Utilities	\$1,200		Total:	\$30,000	100%

- a. In what categories are they spending no more than the recommended guidelines?
 - b. In what categories are they spending more than the recommended guidelines?
 - c. What might be some possible reasons why their budget is out of sync with the recommended guidelines?
2. Use the recommended guidelines to create a budget based on a disposable income of \$50,000.

Category	\$	% of Disposable Income	Category	\$	% of Disposable Income
Housing (rent or mortgage)			Clothes, Personal, Misc.		
Transportation (gas, repairs, loans, insurance)			Household (cleaning, repairs, furnishings)		
Debt Payments			Healthcare (excluding insurance)		
Food			Entertainment		
Insurance, Pension, Savings			Education (excluding loans)		
Utilities			Total:	\$50,000	100%