

Original Article

A Technology-Based Experiential Learning Model for Portfolio Management

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Abstract: *This paper describes an experiential learning model for portfolio management that I've been using for 10 years with moderate success. All course lectures, discussions, homework, and exams center around a semester-long group project in which four-person student teams manage a portfolio of assets and endeavor to generate positive alpha relative to known benchmark security, which is priced daily. The project attempts to replicate the experience of an asset manager employed by a mutual fund or hedge fund. It leverages several web-based technologies: a virtual trading platform with real-time security prices, various databases, and several analytical models to value and examine securities. The project allows for a wide variety of investment strategies that can satisfy the preferences of students with varied interests and investment knowledge. Students produce research to support security selection and trading activities; they also compute portfolio statistics, such as alpha, tracking error, and turnover. This course design improves student engagement and learning outcomes. Moreover, on average, the students generate respectable alphas.*

Keywords: Undergraduate Teaching, Pedagogy, Virtual Trading, Databases, Mutual Funds, Hedge Funds.

JEL Classification: A22, G230.

I. INTRODUCTION

I have been teaching an undergraduate course in portfolio management for about 15 years now, and I think I have found a way to maximize student learning and engagement. The course uses an experiential learning model, wherein students manage portfolios and engage in all the activities that professional money managers do. The class project is very flexible: students can manage either a mutual fund or a hedge fund. The universe of investable securities can be limited to an industry or expanded to include multiple asset classes. The investment strategies driving security selection can be tailored to include different types of fundamental and technical analysis. One key feature of the project is that students are incentivized to maximize their portfolio alpha, the difference between the return they generate and the return on a benchmark that matches their fund type. A portion of a student's grade is related to alpha. I have found that this project feature taps into the competitive impulses that motivate students to work harder.

The project leverages various web-based technologies: a virtual trading platform with real-time security prices, various databases and several analytical models to value and examine assets. These are detailed in Table 1 below. Note that all the data is publicly available at no cost, with the exception of lseg.com, which provides the company with historical financial data. Low or no-cost alternatives to lseg.com are available.

Table 1: Web-based Platforms, Databases and Analytical Models

Web Address	Content
stocktrak.com	Virtual trading platform; real-time security prices
etf.com	Screener for exchange-traded funds
lseg.com	Stock and market data; historical financial data
fred.stlouisfed.org	Federal Reserve Economic Data
finviz.com	Stock screener
finance.yahoo.com	Stock price data; company data
tipranks.com	Corporate earnings data
msci.com	International ETF performance data
portfoliovisualizer.com	Portfolio Optimization; Correlation calculators
cnbc.com	Market data
worldgovernmentbonds.com	Government bond yields



Before developing the class project that this paper describes, I followed the standard textbook approach for this material. Lectures explored the universe of investment management companies, including mutual funds, closed-end funds, exchange-traded funds, REITs, pension funds and hedge funds. We examined the compensation (fee) structure of these funds, the asset classes that these funds invest in and the clientele they serve. We analyzed various investment strategies and explored the full spectrum of fundamental and technical analysis that can be used to motivate investment decisions. Here, I found that most students lost interest because they didn't recognize the value of the research effort. Finally, students learned about portfolio optimization. By that point, most of the students had disengaged from the class, and their interest in the subject had hit rock bottom. Very few students were interested in pursuing careers in fund management.

The key insight that inspired me to try a new approach was the observation that students in the class repeatedly said they had been really looking forward to the course of their investments (a pre-requisite for portfolio management), and they were extremely disappointed that in the course of their investment, they did not learn how to pick stocks. At first, I would give the standard defense that they did, in fact, learn how to pick stocks in their investments class; they just didn't make the connection. That fell on deaf ears. So, I decided that I would try to satisfy the large clientele of students who were interested in learning how to pick stocks.

The newly designed course in portfolio management gives students an opportunity to pick stocks based on sector rotation strategies, discounted cash flow analysis, technical analysis, expected earnings announcements, corporate events, macroeconomics news, monetary and fiscal policies and world events. It also provides an opportunity to move beyond stocks and learn more about bonds, real estate, commodities and currencies. Based on the fund types that students choose for their project, the time spent on these other asset classes can shrink or grow. The project draws on my experiences working in the industry as a portfolio manager at a buy-side firm.

Using the project as the primary vehicle for teaching these subjects has resulted in excellent learning outcomes, as measured by student performance on exams. Student effort and engagement are significantly higher compared to a pure lecture and exam-based course. Each year, approximately 20% of the students in the class end up pursuing careers in fund management or a related area (e.g., venture capital, private equity or fund services). I've kept in touch with many of these students and watched them climb the ladder of success. They almost always say that the class helped them decide that they wanted to work in asset management. This is one additional benefit of structuring the course using an experiential learning model.

II. LITERATURE REVIEW

The creation of knowledge through the transformation of experience is known as experiential learning (Kolb, 1984). Concrete expertise, thoughtful observation, abstract thinking, and active experimentation are the four essential components of the learning cycle. A project can be truly experiential if teachers are trusting, respectful, open and concerned for the well-being of their students and if students find the project meaningful and engaging, not just at an intellectual level, but also tapping into their feelings and personalities (Andresen, Boud and Cohen, 2000). Stock market trading simulations can satisfy these criteria and result in increased student engagement and learning experiences that are "valuable, enriching and meaningful" (Marriott, Tan and Marriott, 2015).

In the last twenty years, many universities have developed student-managed investment funds to supplement investment education (see, for example, Mallett, Belcher and Boyd, 2010). These funds can be linked to economic and fundamental analysis (Dolan and Stevens, 2010) and generally facilitate the acquisition of financial knowledge (Hysmith, 2020). About half of these funds are embedded in finance courses (Todd and Velarde, 2024). These vehicles can complement and supplement the project described in this paper.

III. RESULTS AND DISCUSSION

Undergraduate courses at my university use a semester calendar with 14 weeks of instruction and one week of final exams. During the first two weeks of class, I ask the students to form four-person teams, select a job function for each team member, choose a fund type and benchmark, and compose bylaws. The four job functions mirror roles in the fund management industry: portfolio (project) manager, lead strategist, lead analyst and head trader. Job descriptions for these roles appear in Table 2.

Table 2: Portfolio Management Job Functions

Role	Description
Portfolio (Project) Manager	Oversees all aspects of the fund's strategy, research, and trading; makes sure the rules are followed; computes and keeps track of fund performance data.

Lead Strategist	Decides on the fund's investment plan; keeps an eye on financial and economic events; oversees staff members' industry, field, and business cycle analyses.
Lead Analyst	Determines which assets are available for purchase or sale and oversees the work of team members who do asset analyses.
Head Trader	Oversees all trading operations and guarantees the correctness of pricing data.

Students are aware that choosing whether to manage a hedge fund or a mutual fund should come first before choosing teammates. Mutual fund investment techniques have limitations. For instance, the majority of equities mutual funds have restrictions on their use of leverage and are unable to conduct short stock positions. There are no restrictions on hedge funds. I encourage students to select mutual funds if they are particularly grade-conscious, risk-averse or if they are first-time investors. On average, 75% of the students choose to manage mutual funds.

Within the universe of mutual funds, there are four general fund types, classified by market cap (size), style (value versus growth), sector (or industry) and geography. A partial list of fund types appears in Appendix 1. For each fund type, there is an associated benchmark security. All of the benchmarks are exchange-traded funds (ETFs). There are at least three advantages to using ETFs as benchmarks. First, ETFs are priced continuously, making alpha computation simple. Second, ETFs update their holdings each day; students can examine those holdings and use them as a guide to initialize their portfolios. Third, more than 3,000 ETFs currently trade in the US, offering students a very diverse map of fund types.

Within the universe of hedge funds, three different fund types are viable: global macro, long/short equity and merger arbitrage. Appendix 1 lists the benchmarks for these hedge funds. In each case, the benchmark is an exchange-traded fund that is actively managed. Students are encouraged to examine the contents of their benchmarks as they formalize an initial investment allocation. Most students are confused by the different hedge fund categories, so it's helpful to encourage them to first decide if they want to learn more about bonds, commodities, currencies and real estate. If they find these other asset classes interesting, then the obvious choice is global macro. Most of the students who select hedge funds choose either global macro or long/short funds. Once students find an appealing fund type, they are encouraged to form teams composed of common interests (fund type) and diverse skill sets (job function).

By the end of week two, students must submit bylaws for their funds. Bylaws identify the investment strategy and the benchmark. They also describe the universe of investable securities and place restrictions on fund holdings and trading. A sample of the bylaws appears in Appendix 2. I've discovered that students don't appreciate the importance of benchmarking performance until they compose fund bylaws. Many think they can use benchmark assets that are completely unrelated to their investment strategy. Most students don't appreciate that the benchmark can provide guidance as to how to allocate capital until they identify a valid benchmark.

The bylaws specify limits on holdings, leverage, derivative securities, short positions, and foreign investments. These restrictions should comply with industry standards and should be approved by the instructor. I also require all bylaws to include a procedure for hiring and firing team members, having learned that students will only take responsibility for group work if they have some control over the team. Fired workers can try to find a new team or they can complete the project from scratch, independently. The threat of this outcome reduces the amount of free riding that occurs in most undergraduate group work. With this procedure, no more than one or two students get fired in a typical semester.

Once bylaws are approved, a team must register for a Stocktrak trading account. Stocktrak offers a first-rate virtual trading platform for students around the world. The company provides real-time pricing for publicly traded companies, as well as pricing for many futures and option contracts on stocks, indexes, commodities and currencies. For businesses based in the United States, Mexico, and Canada, stock coverage is comprehensive. The stocks listed below can be covered in full or in part. These exchanges include Argentina, Chile, Amsterdam, Athens, Berlin, Brussels, Budapest, Denmark, Dusseldorf, Frankfurt, Hamburg, Finland, Hanover, Ireland, Lisbon, London, Munich, Paris, Stuttgart, Sweden, Spain, Norway, Milan, Hong Kong, Kuala Lumpur, New Zealand, Shanghai, Shenzhen, Mumbai, Tokyo, Jakarta, Bangkok, Sydney, and Tel Aviv. Stocktrak allows instructors to customize trading accounts, commissions, borrowing costs, volume constraints and other features. I typically disallow day trading and long/short positions in stocks trading below \$3 per share. Commissions and borrowing costs should be set equal to the prevailing rates for institutional investors. I also place a limit on trading size equal to 25% of the total volume. This forces groups to think seriously about liquidity when they trade.

During the semester, each student must complete four trade reports. The trade reports provide opportunities for students to engage in abstract conceptualization and active experimentation, key elements of experiential learning. There are five

possible topics with 5 corresponding submission dates. The first report requires a valuation analysis using the dividend discount model. Table 3 lists all topics.

Table 3: Trade Reports

Report #	Topic
1	Company analysis: stock valuation – dividend discount model
2	Company analysis: stock valuation – free cash flow model
3	Analysis of economic data, monetary policy, interest rates or business cycle
4	Company analysis: relative value (pairs trading) or earnings analysis and analyst forecasts
5	Technical analysis or convergence trade

The trade reports are first circulated among the members of a group and checked for accuracy. Revised reports are submitted to the instructor five days later and graded. Students receive full credit for a trade report if the following conditions are met:

1. The report is submitted on time.
2. The analysis is thorough and appropriate for the given subject.
3. No trade report analyzing the same asset is submitted by any other team member.
4. The student suggests purchasing an undervalued stock that is identified in the report. Hedge funds are exempt from this since they are allowed to take short positions in assets that are overvalued.
5. The trade recommended in the report was executed after the group reviewed the trade and no more than two days after it was submitted.
6. The trade puts at least 1% of the fund's capital at risk.

Condition 3 forces each four-person team to analyze at least 16 trades. Condition 5 ensures that trades are executed after they are analyzed and reviewed by team members. Condition 6 guarantees that there is skin in the game, and trade analysis isn't an afterthought. I've found that these conditions encourage students to take the research process seriously and devote a good amount of time and effort to analysis.

During the semester, I spend approximately 25% of class time discussing trade ideas. Table 4 summarizes some of the topics that can be covered.

Table 4: Trade Idea Topics

Number	Topic
1	Initial holdings
2	Price targets; stop-loss orders
3	Leverage
4	Economic news
5	Portfolio insurance
6	International stocks
7	Currency and commodity play
8	Earnings plays
9	Responding to analysts' forecasts
10	Relative value (pairs) trades
11	Convergence trades
12	Yield curve arbitrage
13	Merger arbitrage

For example, you might explore how a mutual fund can purchase downside protection using put options on a relevant index of stocks. The cost of insurance will impose a drag on performance but will protect the fund from sector or market declines. In class, you can examine the mechanics of the trade and compute the costs based on real-time prices. Alternatively, you might examine the market for crude oil and how short-term supply or demand shocks might raise or lower the price of oil. Mutual funds can hedge oil price risks, and global macro funds can speculate on oil price shifts. In each case, it is useful to explore specific trades that the funds can make. These discussions encourage students to explore new trade ideas and actively experiment, a key element of experiential learning.

At the end of the course, each group submits a final report that includes performance statistics such as the portfolio return, the benchmark return, alpha, the standard deviation of returns, tracking error and turnover. I also ask each student to reflect on their project experience, a key element of experiential learning. For each team, raw alphas are adjusted to reflect penalties that are imposed for various infractions. Penalties accrue if tracking error is too high, cash levels exceed a ceiling

rate, or bylaws are violated. Each fund must remain fully invested throughout the semester. A fund is fully invested if its cash holdings are less than 10%. The purpose of the fully invested rule is to dissuade teams from hoarding cash and not investing their capital as per their bylaws. If the fund breaks the fully-invest requirement on any trading day, it will be penalized with 25 basis points, for each 5% that the fund's yearly tracking inaccuracy is above 20%, there is a 1% penalty. A penalty of 25 basis points is assessed for every violation of the fund's bylaws. Alphas, adjusted for penalties, determine a fund's performance grade. The scale that maps a fund's adjusted alpha to a performance grade appears in Table 5. The total bonus points a person has received on quizzes combined with the team's performance grade are used to calculate their individual performance grade.

Table 5: Fund Performance Grades

Adjusted Alpha	Grade	Adjusted Alpha	Grade
> + 5%	100	- 1%	83
+ 4%	95	- 2%	81
+ 3%	91	- 3%	79
+ 2%	89	- 4%	77
+ 1%	87	- 5% or less	75
0%	85		

Students often obsess about performance grades and get very upset when they see that they are lagging their classmates in other funds. Eventually, they learn that absolute performance is irrelevant, that each team is competing against its own benchmark and that generating alpha is a primary goal for each fund. I've found that assigning the performance grade weight of 25% in the computation of course grades is optimal. It provides sufficient incentives for students to behave like portfolio managers and minimizes the bad feelings resulting from poor performance, either due to poor skills or bad luck.

Reflective observation is one of the key elements of experiential learning. I schedule three performance reviews during the semester. These take the form of "roundtable" discussions, allowing each group to examine performance statistics, discuss strategy and hear feedback from the instructor on what is working and what is not working. I've found that students find these conversations extremely helpful.

I believe the project described above produces a variety of successful outcomes. Here, we can focus on four areas: student engagement, teaching evaluations, learning and fund performance.

At the end of each semester, I poll students to determine their level of engagement. The surveys are anonymous, encouraging students to answer honestly. Each student estimates the average number of hours per week spent outside of the classroom working on the project. The estimate should include time spent reading the financial news, working on trade reports, meeting with group mates, researching trade ideas and similar activities. I typically use the following scale: (0, 1), (1, 2), (2, 3), . . . (9, 10) and 10+ hours per week.

Over the last ten years, student engagement in the course has averaged 5 – 6 hours per week. The National Survey of Student Engagement (NSSE) publishes data on student engagement. Between 2010 and 2019, approximately 60% of all undergraduate students spent fewer than 15 hours per week on all coursework. This includes all time spent studying, reading, writing and doing homework; class meeting times are excluded. Currently, the average undergraduate business student spends approximately 12 hours per week on all coursework, excluding class meeting times. It's reassuring to learn that students are spending half of the typical business student's total effort on the portfolio management course.

My university uses a 5-point rating scale for student evaluations of teaching (SETs). A score of 1 (5) denotes very ineffective (effective) performance. For courses taught in the finance department, the average course rating is 4.1, and the average instructor rating is 4.1. Over the last ten years, ratings for the portfolio management course have averaged 4.5 (course) and 4.5 (instructor). SETs poll students about learning outcomes. For the question "amount of material learned in the course", 3.6 is the average score for finance courses, while 4.2 is the average score for the portfolio management class.

I've taught the course 12 times over the last ten years. I don't curve exams and have always used the same grading scale. Class score averages have ranged from 80 to 91. The time-series average is 85, which is equivalent to a grade of B.

I've kept in touch with students who have taken the course. Every year, about 20% of the students are placed at firms that engage in asset management activities. These include venture capital, private equity, insurance, and real estate firms, as well as banks, mutual funds, hedge funds, pension funds, closed-end funds and asset management firms. Many of the students have flourished in industry.

I keep detailed records of fund performance. Pooling the data yields 156 funds over the last ten years. The most common fund types are: Global Macro (29), Large Cap (28), Technology Sector (14), Mid Cap (13), Large Cap Value (11), Long/Short Hedge (8), Consumer Discretionary Sector (5) and Real Estate Sector (4). Raw alphas for the funds over the 11-week trading period range from -78.00% to 50.43%. The average alpha is +0.44%, which is not statistically different from 0%. This result is surprising. Class performance is similar to the average performance of mutual funds and hedge funds post-fees (see, for example, Farnsworth, Ferson, Jackson and Todd, 2002 and Fung, Hsieh, Naik and Ramadorai, 2008). Yet the students are averaging less than 10 hours per week on class and out-of-class activities, whereas professional money managers routinely work 4 – 7 times harder. Drilling further into the performance statistics, 3 of the 156 funds completely violated their bylaws, and their performance numbers should be thrown out. The remaining 153 funds generated an average 11-week alpha of +1.03%. This is consistent with non-zero (positive) performance (p-value = 2.85%).

IV. CONCLUSION

Many instructors use Stocktrak in their Investments and Portfolio Management courses; some faculty have been very creative in designing courses that integrate fundamental analysis and trading. What's special about the project described in this paper is that it attempts to replicate the experience of an asset manager employed by a mutual fund or hedge fund. The course design taps into the competitive impulses of students. It is important for students to believe they can outperform their benchmark. Hope is critical to their research effort. We know that harping on the efficiency of capital markets can be counter-productive to the learning experience.

All lectures, discussions, homework and exams are directly related to the project. The project allows for a wide variety of investment strategies which can satisfy the preferences of students with varied interests and investment knowledge. Students compose bylaws that delineate how assets are screened for research and investment decisions. These bylaws also place restrictions on the use of leverage, derivative securities and international assets. Research production motivates trades: each student completes four trade reports that are directly tied to investment and trading decisions. Each group receives a performance grade that is directly tied to the fund's alpha, with penalties for excessive tracking errors and bylaw violations. Course grades are partially determined by performance grades, creating incentives for students to engage with the project. The benchmark security is completely observable, and initial holdings can be chosen so as to replicate the benchmark. Moreover, a competitive market for student laborers ensures that free-riding behavior is limited; groups are responsible for their success and generally perform well.

Student engagement is related to a school's culture. The project described in this paper might not be appropriate for certain audiences. This course uses an experiential learning model. Not all students learn by doing. Some students prefer a standard lecture/exam course. Experiential learning can have a positive effect on the attitudes and beliefs of students (Shu, Tan, Wang and Yu, 2022), but virtual trading may amplify anxiety or stress in certain individuals. The course may also affect a student's career choice.

The course imposes certain set-up costs and requires at least moderate instructor effort. However, it does get easier when we teach it regularly. The project is ideal for a class size of 20 to 50 students. Smaller or larger class sizes may introduce additional complications.

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- [10] <https://nsse.indiana.edu/research/annual-results/past-annual-results/index.html>
- [11] Teams of five or six students also work fine. Two students on a team can share a role.
- [12] The first actively managed global macro exchange traded fund was issued in 2009. Hedge fund performance is benchmarked at www.hfr.com; however the data are only updated monthly.

[13] See www.stocktrak.com.

[14] Annual data on student engagement can be found at the following link: <https://nsse.indiana.edu/research/annual-results/past-annual-results/index.html>

Appendix 1: Fund Types

Mutual Funds

Size

Fund Type	Benchmark Ticker	~ # of Assets in Benchmark
Large Cap	OEF	105
Mid Cap	JKG	191
Small Cap	JKJ	264

Style

Fund Type	Benchmark Ticker	~ # of Assets in Benchmark
Value	IVE	428
Growth	IVW	238
Mid Cap Growth	IJK	250
Small Cap Value	IJS	474
ESG	SUSA	188

Sectors

Fund Type	Benchmark Ticker	~ # of Assets in Benchmark
Basic Materials	XLB	28
Consumer Non-Cyclical	XLP	33
Consumer Cyclical	XLY	62
Energy	XLE	28
Financials	XLF	68
Health Care	XLV	62
Industrials	XLI	69
Technology	XLK	68
Utilities	XLU	28

Industries

Fund Type	Benchmark Ticker	~ # of Assets in Benchmark
Aerospace & Defense	ITA	35
Banks and Insurance	IAI	28
Biotechnology	IBB	221
Consumer Services	IYC	169
Food	PBJ	32
Healthcare Providers	IHF	49
Home Construction	ITB	48
Leisure	PEJ	32
Media	XHB	36
Medical Devices	IHI	62
Oil Equipment & Services	IEZ	41
Oil & Gas Exploration & Prod.	IEO	59
Pharmaceuticals	IHE	45
Real Estate	IYR	118
Retail	XRT	88
Telecommunications	IYZ	44

International

Fund Type	Benchmark Ticker	~ # of Assets in Benchmark
China	FXI	52
Spain	EWP	24
Sweden	EWD	34
Italy	EWI	26

Latin America	ILF	45
Switzerland	EWL	41
Mexico	EWV	57
Germany	EWG	67
Australia	EWA	71
France	EWQ	81
Brazil	EWZ	57
South Korea	EWY	116
Canada	EWK	91
United Kingdom	EWU	99

Hedge Fund Types

Fund Type	Benchmark Ticker	~ # of Assets in Benchmark
Global Macro	MCRO	57
Long/Short Equity	FTLS	144
Merger Arbitrage	MNA	49

Sources: www.ishares.com, etf.com, www.sectorspdr.com

Note: # of assets describes the total number of unique assets in the benchmark.

Appendix 2

Team Bylaws - Sample

Piggybank Capital - Bylaws

Fund Type:

Sector - Financial

Benchmark:

Dow Jones U.S. Financial Sector Index - IYF

Investment Strategy:

Piggybank Capital will invest at least 90% of its assets in the common stocks of companies in the following industries: banking, insurance, real estate and diversified financial. Assets for consideration may be screened based on value prospects, such as dividend yields, price-to-earnings and price-to-book ratios. Assets will be selected based on fundamental and technical analysis. We will research all factors that affect value, including earnings, dividends, interest rates, the macro- econothe, exchange rates, industry competitiveness and demographic trends. We may also consider management, governance, technological, regulatory and legal issues.

Limits on holdings:

No more than 20% of total assets may be invested in any one company.

Leverage constraint:

Piggybank Capital may borrow up to 10% of total assets to take leveraged (margin) positions.

Use of futures/options:

No more than 5% of total assets may be allocated to cover the margin requirements on futures and option positions.

Short positions:

Piggybank Capital may not take short positions in common shares.

Foreign holdings:

No more than 10% of total assets may be allocated to foreign assets.

Hiring and Firing Procedure:

Team members may be hired or fired based on a majority vote. In the event of a tie, the team agrees to defer to the portfolio manager.

Operations:

Comment on team meetings, communication and control issues

Personnel:

The management team at PiggyBank Capital includes:

Portfolio Manager:	SL
Lead Strategist:	ST
Lead Analyst:	LH
Head Trader:	TN