

Teaching the Bloomberg financial information system using online videos: an action research study

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Abstract

This paper discusses an Action Research approach to the teaching of the Bloomberg financial information system, within a Master's level Portfolio Management module for accounting and finance students. Bloomberg was used to help deliver a 'fantasy fund manager' investment simulation which aims to teach macroeconomic forecasting, portfolio analytics and employability skills. I discuss the challenges and benefits of teaching Bloomberg using online videos, and how successive cycles of action research were used to improve the module and promote deep learning. This resulted in better delivery of the intended learning outcomes: survey evidence showed that students were achieving deeper learning as they engaged with the online videos, and the group coursework reports showed an increase in higher-order learning, with students using Bloomberg for themselves in creative and unexpected ways. I draw lessons about creating online videos in the teaching of accounting information systems, especially where teaching resources are constrained.

Keywords

Bloomberg, action research, asynchronous video, active learning, simulation

Introduction and project approach

This paper describes the process of developing an assessed, practical, investment simulation project as part of a large postgraduate level Investment Management module, which is taught at a large UK higher education institution. The project's learning objectives state that on completion, students should be able to use industry-standard financial data systems, to

research and make macroeconomic forecasts, to create their own portfolios, and to evaluate risk and return using industry-standard analytics.

This development process is framed as representing two cycles in an ‘Action Research’ (Kember & Kelly, 1993; Kemmis, McTaggart, & Nixon, 2013) approach to teaching. The first action research cycle involved two issues: the first concerned a re-evaluation of the module’s investment simulation project, which I had inherited on moving to the institution, to more closely align the structure and aims of the project with the course learning objectives (Biggs & Tang, 2011). The second issue involved identifying the best platform on which to operate the revised investment simulation project. Simulations have been widely used in the teaching of accountancy and finance, due to their perceived usefulness in promoting deep learning (Cebula & Toma, 2000; Coval, Gadzik, & Stafford, 2007; Morley, 2016), but reflection on the prior state of the project revealed that simulations are not necessarily a guarantee of deep learning, and need to be deliberately aligned with course learning objectives.

The first action research cycle also identified Bloomberg as the platform on which to run the simulations, with two key advantages: firstly, as a system, its portfolio construction and analytics functions make it very well-suited to running investment simulations, being designed explicitly to allow industry professionals to do these; and secondly, Bloomberg is a key information source and analysis tool in many businesses, financial services organisations, research bodies and government units, being ubiquitous in the financial markets (Loomis, 2007). Becoming an expert user of Bloomberg is therefore in itself a useful employability skill for many accounting and finance students, with obvious careers benefits for students who acquire these skills.

Once the decision had been taken to use Bloomberg as a simulation platform, the next key decision involved how best to teach students to use it. While Bloomberg may be thought of popularly as a tool of ‘high finance’, it can be regarded in function as an accounting information system (AIS) (Hurt, 2016), and the teaching of Bloomberg can be usefully analysed in the wider context of the teaching of accounting information systems (Bromson, Kaidonis, & Poh, 1994; Doost, McCombs, & Sharifi, 2003; Stanley & Edwards, 2005; Badua, Sharifi, & Watkins, 2012). One unspoken assumption of most studies in the AIS

literature is that IT teaching resources are not constrained, and that each student can sit at their own computer in a computer laboratory while learning the relevant IT system. By contrast, the licensing restrictions of Bloomberg mean that there are far more students than number of Bloomberg terminals the university rents. Resources are therefore severely limited in the teaching of Bloomberg, and this drove a search for most effective way to teach, given these constraints.

For the first year, an attempt was made to teach Bloomberg using non-interactive classroom demonstrations. However, student feedback indicated that this was not a satisfactory method of teaching Bloomberg, and the coursework project tended to indicate that this classroom situation did not produce effective deep learning (Marton & Saljo, 1976).

The second action research cycle was therefore a response to the challenges of teaching the use of Bloomberg effectively. After consideration of the various options, the issue was addressed by creating videos to deliver Bloomberg training for the module, which could be viewed asynchronously through the university's podcast system, and which students could use to teach themselves how to use Bloomberg in their own time. These were then supplemented by one-to-one clinics, in which students' outstanding queries could be worked through. The creation of video as an instructional medium is time-consuming, but does have some advantages over more conventional teaching methods, including the ability for students to rewind and rewatch a video as their own learning needs require (Spannaus, 2012).

Once these online videos had been developed and then deployed, this raised the question of how students used these in their learning, and whether they were effective in promoting the deep learning desired. In *Constructive Alignment* (Biggs & Tang, 2011), the focus of teaching shifts from what the teacher does to what the student does, and hence it was useful to analyse the ways in which students used the videos in practice. To this end, a detailed survey was taken at the end of term, which yielded unexpected details on how students had used them in teaching themselves. Furthermore, evidence of the project reports submitted that year provided additional evidence on the promotion of deep learning.

Contributions

This paper makes three main contributions. Firstly, it describes an account of the use of Bloomberg to run investment simulations; in the previous accounting education literature, bespoke applications and Microsoft Excel have been described as platforms for simulation, but not Bloomberg; and Bloomberg has been analysed as a source of data and in ‘trading room’ situations, but not as a platform for investment simulations.

Secondly, this paper contributes to the literature on the teaching of information technology in accounting courses in general, and of accounting information systems in particular, by reflecting on the creation and use of online videos in the teaching of IT, as a solution to resource constraints. One previous study in the accounting education literature (Convery & Swaney, 2012) does mention the creation of videos to teach Excel where instructor resource was limited, but it does not describe or reflect on the process of producing the videos, nor on their usage by students.

Thirdly, this paper contributes to the teaching literature by reporting the results of a detailed survey on how students used these online videos in teaching themselves, thus providing a window into how students learn using these resources. These insights were used to improve the resource in question in subsequent cycles of reflective practice, and may be of interest to other teachers considering whether to make their own, asynchronously-delivered video teaching resources.

Literature Review

The present study is informed by multiple strands of educational research, summarised briefly below: teaching Bloomberg as an employability skill for accounting and finance students; the conceptualization of Bloomberg both as an Accounting Information System and a programming language; the use of Bloomberg in teaching and learning; the use of simulations in the teaching of accounting and finance; the production of media for use in teaching in general; and the use of asynchronously-delivered video to teach Accounting Information Systems in particular.

Bloomberg as a key employability skill for accounting and finance students

Bloomberg LP is a financial information services company, founded in 1981 by Michael Bloomberg, later Mayor of New York from 2002 – 2013, and is headquartered in New York. The company's principal business line is the supply of its Bloomberg terminals, and the information to which they provide access. The terminals, with their distinctive keyboards, are connected to Bloomberg's global financial information system, and provide access to live prices for a vast range of financial assets, making a Bloomberg terminal a key, and indeed, ubiquitous, tool in the professional trading environment (Loomis, 2007).

Bloomberg terminals also find widespread application for the power of their company research functions. For each company, Bloomberg links their current and historical accounts, details of all their equity and debt securities, their options and derivatives, their competitors, and their news, directors and industry details, all from a single screen via an extensive system of menus. This makes Bloomberg a key tool for any organisation providing corporate finance service, brokerage, advisory or banking services, or for governmental bodies exercising supervisory functions. Bloomberg's repository of historic financial information, in many asset classes the only readily-available source of historic data, further makes it a key tool for researchers in academia and asset management. The ability to use Bloomberg to undertake financial research and solve problems is therefore regarded as a key employability skill by professionals (Bailey, Dennick-Ream, & Flanegin, 2014), and enables candidates to distinguish themselves in the application process.

Conceptualizing Bloomberg as an Accounting Information System

Bloomberg can be conceived of as a specialised form of Accounting Information System (AIS), defined by Hurt (2016) as 'a set of interrelated activities, documents, and technologies designed to collect data, process it, and report information to a diverse group of internal and external decision makers in organisations', since it links historical databases and live prices with a wide range of powerful analytics, and offers a very wide variety of specialised report output formats.

As such, the pedagogy of training in Bloomberg might be expected to be similar to the pedagogy of training in Excel, one of the principal software packages taught as part of an AIS curriculum to students (e.g. Tribunella & Tribunella, 2006; Brown & Pike, 2010; Convery &

Swaney, 2012; Braun, 2013). However, most case studies of teaching Excel use a classroom format in which each student has their own computer with Excel installed, and where the instructional material is delivered in a computer lab, using instruction documents and example Excel spreadsheets which are manipulated by the students (Alexander, 1996; Tribunella & Tribunella, 2006; Simkin, 2007; Hayes & Bee, 2008; Braun, 2013; Frownfelter-Lohrke, 2017), while some additionally use an assigned textbook (Brown & Pike, 2010).

However, there are some notable differences between Excel and Bloomberg, which force a different approach to teaching the latter than the more established ways of teaching the former. Firstly, the teaching of Bloomberg usually faces the operational constraint that there are many more students than Bloomberg terminals (Ottaviano, 2014; Sharma, 2015), whereas it is usual for each student to have their own computer, in computer laboratories where Excel is taught. Secondly, most university computers have Excel pre-installed, and students can be assumed to arrive with a distribution of familiarity with it. By contrast, for Bloomberg, virtually all students will arrive with no experience of it.

Thirdly, Bloomberg is a much less intuitive and user-friendly system; it lacks a menu-driven layout in the manner of Windows or iOS applications, and its initial learning curve is steep (Sharma, 2015). Competent use of Bloomberg involves a number of threshold concepts from finance, economics and quantitative methods (Sharma, 2015), and McCann and Russon (2019) report that their students made frequent requests for more resources. Finally, there are few extant written materials for the teaching of Bloomberg compared to more common IT packages: there are no Bloomberg textbooks aimed at university students such as exist for Excel or Word.

Conceptualizing Bloomberg as a programming language

The pedagogy of the Bloomberg financial data system could also be usefully compared with the pedagogy of software in computing courses, since much of it effectively functions as a high-level programming environment, controlled by keyboard-entered function commands. Like a programming language learnt for the first time, the student's initial impression is of a complex and demanding interface, which requires a great deal of initial learning in order to be able to achieve even basic functionality.

Conceptualized as a programming language, the student's learning of Bloomberg is a good demonstration of the Constructivist philosophy of teaching, in the sense that students bring their own toolkit of concepts and skills to learning the system, and must construct their own knowledge, individually and collectively, as they interact with the system.

One discussion of computer science pedagogy, in the collection edited by Fry et al (2008), stresses that the learning of programming is something which is 'best learnt over a long time and with a great deal of practice,' which does not fit well into a lecture-based delivery system, and which must be done with students being active participants rather than passive recipients (Fry et al., 2008, p. 285). The teaching of programming has historically been taught using a combination of independent study, and laboratory sessions in which students are supported to make independent progress without heavy supervision (Fry et al., 2008, p. 287). To this, the authors additionally suggest creating Virtual Learning Environments. Regarding assessment, group work is often employed in order to minimise marking burden, though this introduces the problem of how to penalise freeriding, and of how to assess individual contribution; the case studies presented suggest that groups should be made to keep log-books and minutes of meetings, and for group members to rank each other's' contributions as part of the final project submission. (Fry et al., 2008, p. 290).

Using Bloomberg in teaching and learning

Bloomberg terminals have found use in accounting and finance education as a company research resource, for elementary portfolio modelling and risk / return analysis (Lei & Li, 2013), and as a laboratory in which to practice econometrics using the Bloomberg's historic datasets (Sharma, 2015). Being an industry-standard system, it is also valued as a powerful tool for experiential learning (Croushore & Kazemi, 2019), and for facilitating the practical application of theory and boosting student attainment and satisfaction (McCann & Russon, 2019). Bloomberg's ability to present live prices is also valued by those teaching arbitrage and the reaction of financial markets to breaking news (Holowczak, 2005). It can therefore enhance the quality of the student experience by helping to drive engagement with the financial world, by assisting students in their research projects, and by helping them to feel that they are gaining a scarce and commercially valuable skill.

The most common approach to the teaching of Bloomberg is for instructors to teach small groups in a computer laboratory or ‘Trading Room’ equipped with terminals, often with the use of a written handout (Lei & Li, 2013; Ottaviano, 2014; McCann & Russon, 2019). This, of course, limits the class size to the number of Bloomberg terminals rented by the institution.

Bloomberg does produce its own training course, Bloomberg Market Concepts (BMC), formerly Bloomberg Essentials and Bloomberg Professional Services, available through the Bloomberg terminal, and which leads to a certificate of completion. This, however, has three principal drawbacks. Firstly, it is time-consuming to complete, now taking ten hours (Bloomberg, 2019), and for some, it will contain too much material, whereas others with more specific needs will not find what they need (Ottaviano, 2014). A survey of students by Payette and Libertella (2012) found that some students even had problems with getting started on the Bloomberg-provided training, with 26% responding that the biggest problem was getting started. Secondly, the training is only available through a Bloomberg terminal – while it is very helpful to practice on a terminal, it makes previewing and revision of the training outside of the classroom impossible. Thirdly, the issue arises as to how best to integrate the Bloomberg training with the intended learning outcomes of the module in which it is used, in order to ensure successful learning. As Holler (2009) notes, a training programme directed at the needs of professionals may not match the experience and needs of students; Holler (2009) addresses this by constructing a blended programme in which self-study of the Bloomberg-provided training is interspersed with weekly classroom lectures. However, even with this assistance, the programme was still not able to ensure that all students secured accreditation by the end of the course.

The use of simulations in accounting and finance

Albrecht (1995) notes that two of the most widely-used methods to achieve increased student interaction in learning are case studies (Stewart & Dougherty, 1993; Boyce, Williams, Kelly, & Yee, 2001; Healy & McCutcheon, 2010) and simulations, arguing that these latter motivate students to participate to a greater degree in educational activities than they would otherwise, enhance cognitive growth, promote the application of concepts, and also enhance affective learning, with greater personal and emotional involvement in the decision-making process.

Simulations also help students to make the connection between the material taught in the classroom and the 'real world'. Educational theorists since Dewey (1933) and Bruner (1966) have stressed the importance of the student's interaction with their learning environment, and as Marriott et al (2015) argue, simulation can be conceptualized in the Kolb (1984) framework of experiential learning, as facilitating a cycle in which students take a theory learned (the abstract conceptualization stage), apply it in a simulation (the active experimentation stage), make observations of the effects (the concrete experience stage) and draw conclusions from these (the reflective observation stage), before applying fresh insights in a new stage of active experimentation. There is evidence that this succeeds in practice in the teaching of accounting and finance : Cebula and Toma (2000) find that a portfolio management simulation both improves students' grades on final summative assessment, and also improves instructors' teaching scores.

Simulations in accounting and finance need not involve IT to be effective: Albrecht (1995) observes enhanced learning in an accounting simulation based on repeated rounds of games of Monopoly. However, technology was recognised early as a useful tool with which to facilitate simulations for students, for instance, Breen and Boyd (1976) describe a very early use of technology in teaching economics, constructing a very early computer model for students to use at a terminal, in learning about IS-LM economic models. Excel is also widely used as in computer laboratory settings as a platform for simulations, for instance, Coval et al (2007), who use it to teach economic principles in a Dynamic Markets course, and Morley (2016), who employs it in a portfolio management simulation conducted over two months, to perform analytics and portfolio construction. More recently, proprietary software has been used in specialised 'Trading Room' classrooms to conduct trading simulations (Ascioglu & Kugele, 2005; Marriott et al., 2015). Others have used proprietary extensions to Excel to teach Value at Risk through simulations (Hoyt, Powell, & Sommer, 2007). Helliard et al (2000) describe their commissioning and use of bespoke software to teach portfolio management by a bespoke computer game, taking share price information from Datastream and enabling students to construct and manage a portfolio throughout an academic year, and note that many concepts in Asset Management are difficult to demonstrate unless students have a portfolio of securities upon which to experiment.

The production of media for use in teaching

The process of producing media for use in teaching has its own, extensive literature. One of the most frequently-cited approaches is that of Bates and Poole (2003, p. 79), who propose a SECTIONS model for the production of media for use in teaching:

S: Students: what is known about the students, and the appropriateness of the technology for this particular group or range of students?

E: Ease of use and reliability: how easy is it for both teachers and students to use? How reliable and well-tested is the technology?

C: Costs: what is the cost structure of each technology? What is the unit cost per learner?

T: Teaching and Learning: what kinds of learning are needed? What instructional approaches will best meet these needs? What are the best technologies for supporting this teaching and learning?

I: Interactivity: what kind of interaction does this technology enable?

O: Organizational issues: What are the organizational requirements and the barriers to be removed before this technology can be used successfully? What changes in organization need to be made?

N: Novelty: how new is this technology?

S: Speed: How quickly can courses be mounted with this technology? How quickly can materials be changed?

The use of asynchronously-delivered video to teach Accounting Information Systems

There are few studies on the teaching of Accounting Information Systems which detail the creation of instructional videos as a teaching resource, possibly because this requires a substantial investment of time and effort, compared to delivery in person by a tutor in a computer lab. Convery and Swaney (2012) represent a notable exception, in that they do use video to teach Excel; they face the resource constraints imposed by a large student group, approximately 400 students in the Autumn term and 900 students in the Spring term, which would require a very large number of computer lab sessions were the teaching to be delivered in person. As a solution, they develop 10-minute instructional videos on Excel for students to view, which are hosted centrally and are delivered asynchronously. Students afterwards attempt assignments with the aid of a printed directory of Excel functions, and are offered additional one-to-one help from Teaching Assistants in a 'Help Room'. Stanley and Edwards

(2005) document the use of embedded video on a CD-ROM used to teach students about AIS case studies. The resource is, however, not compulsory, but the survey finds that those who use it find that the variety of material presented to be important in helping them gain a deeper understanding of the concepts.

Research methods

The process of 'action research'

The definition of 'action research' has been both diversified and refined through time, and it may be useful to locate the present methodology within the history of these definitions.

Cunningham (2008) distinguishes two schools of thought on action research, the first, which concerns social welfare and aims at social change (Bogdan & Biklen, 1997), and the British tradition (Carr & Kemmis, 1986). The more recent work by Kemmis et al (2013, pp. 14–16) identifies a three-way division of action research, into:

- '1. Technical action research guided by an interest in improving control over outcomes', characterised by the 'desire to control and improve the outcomes of her or his practice';
- '2. Practical action research guided by an interest in educating or enlightening practitioners so that they can act more wisely and prudently', characterised by, 'a symmetrical, reciprocal relationship between the practitioner and others involved in and affected by the practice.'
- '3. Critical action research guided by an interest in emancipating people from irrationality, unsustainability, and injustice', characterised by and exploration of, 'work and lives as socially constructed formations that may need to be transformed if their work and its consequences are irrational, unsustainable or unjust.'

Biggs and Tang (2011, p. 51) advocate a process of transformative reflection, in which teachers reflect on their current teaching, using a theory of teaching and learning, in order to create an improved teaching environment, in a reflect-plan-apply-evaluate cycle, similar to the 'plan-act-observe-rectify-replan' cycle in Kemmis et al (2013, p. 19). They quote from Kember and Kelly (1993), who define 'Action Research' as changing aspects of teaching systematically, using whatever evidence the teacher can obtain to suggest that the changes are

in the right direction. More formally, it involves obtaining evidence of progress, reflection on what has worked and not worked, introduction of correction at those points which appear not to be working, obtaining of evidence which monitors whether the changes are working, and using a ‘critical friend’ wherever possible (Biggs, 2011, pp. 284–285).

Seen from these perspectives, the current research started out as Type 1 in in the classification of Kemnis et al (2013), concerned with improving my own practice. This moved towards Type 2 as I saw the potential to communicate my experience to others in the institution and beyond, and the experience of learning from others, notably the in-house e-learning team. The project could be framed as representing two full cycles within the Kember and Kelly (1993) and Kemnis et al (2013, p. 19) approaches to action research.

The Teaching Setting

Introduction

From 2016 onwards, I have been module convenor and sole lecturer on a Master’s level Portfolio Management module. It is an optional course, taken in the first semester, and is open to three different Master’s courses, namely, the MSc Accounting, MSc Accounting and Finance, and the MSc Quantitative Finance courses. The module attracts between 150 – 160 students each year. The course is assessed by a Group Coursework Project (40%), and a two hour unseen examination (60%).

Module Intended Learning Objectives

For the academic year in which this paper is set, the module Intended Learning Objectives were listed as being that successful students should:

‘A1. Understand how to formulate the investment decision and select assets matching investment objectives, and appreciate the key foundations of portfolio diversification and risk-return optimization.

A2. Appreciate how factor models are used in portfolio selection and management, and how securities are selected based on intrinsic valuation, sector analysis, and market timing.

- A3. Be able to apply a broad knowledge of issues related to investing globally and in emerging markets, in particular, currency risk, country risk, and behavioural finance.
- A4. Appreciate the key attributes of an equity portfolio: Tracking Error, Passive Strategies, Active Investing, Active vs Passive Management.
- A5. Gain hands-on experience of portfolio risk analysis tools, and use them to create, manage and evaluate equity portfolios throughout the course.
- A6. Appreciate the ethical framework within which investment professionals must operate and the duty of care owed to their clients.’

The Group Coursework Project

The Group Coursework Project involves students engaging in a ‘fantasy fund manager’ exercise, in which they apply macroeconomic theory to make their own country forecasts for a set of ten European stock markets, and on that basis select a portfolio of stocks which represent the performance of whole countries. Groups then calculate and critically evaluate complex portfolio risk analyses, and critically evaluate the performance of their portfolio over a reporting period in the light of market trends and material macroeconomic events. Finally, they produce a Project Report, presenting their findings to professional standards, as if they were a professional fund management team reporting to investors.

The Group Coursework Project aims to fully deliver ILO A5, which describes the object of the Project. It also includes elements of A1, A3 and A4, in that students must act as fund managers themselves, making investment decisions on the basis of macroeconomic forecasts, and must apply the theory of portfolio management to measure the risk and performance statistics of their chosen portfolio.

Since the module only runs over a single semester, rather than a whole academic year, the project does not have time to use live prices; establishing and then liquidating a portfolio in real time over the course of a few weeks would not give rise to meaningful performance statistics. Instead, the simulation is performed with historic data, with students using news, research and economic statistics as at the February prior to the start of the academic year to make their portfolio choices. Portfolio performance and risk is then simulated as it would have been over the period from February to October, giving at least six months of historic performance which can be analysed. The use of historic data does not detract from the

Learning Objectives of the module, since the project does not call for the portfolio to be periodically rebalanced in the light of further news, and students are assessed on the quality of analysis and presentation, and not on the profit made over the performance period.

The first cycle of Action Research

The decision to use investment simulations as a teaching tool

The first action research cycle involved reflection on two issues before the start of the new term: firstly, a re-evaluation of the investment simulation project in the module I had inherited on moving to the institution, asking how the structure and aims of the project could be more closely aligned to the course learning objectives and promote deep learning. The second question sought to identify the best platform on which to operate such a revised investment simulation project.

Even though simulations have been widely used in the teaching of accountancy and finance due to their perceived usefulness in promoting deep learning, they are not necessarily a guarantee of deep learning, and need to be deliberately aligned with course learning objectives. One outcome of this review was therefore a resolution to create a more realistic portfolio management simulation, more closely aligned with the learning objective A4, by placing more emphasis on analysing portfolio return, and identifying material events and key factors which had influenced its performance.

The first action research cycle also identified Bloomberg as the platform on which to run the simulations, with three key advantages: firstly, as a system, it has a sophisticated portfolio analytics suite, which allows users to construct portfolios of their own, and to model their performance and risk over time with considerable sophistication. Using its vast database of historical financial data, Bloomberg permits ‘fantasy’ historical portfolios to be simulated at any point in the past, many years prior to the present time if necessary, and so permits the historical simulation that the project requires, being designed explicitly to allow industry professionals to do this. Secondly, Bloomberg is a key information source and analysis tool in many businesses, financial services organisations, research bodies and government units, being ubiquitous in the financial markets. Teaching accounting and finance students to become expert users of Bloomberg therefore gives them a key employability skill, with

obvious careers benefits. Thirdly, Bloomberg is free for students to use, that is, there is no additional cost to the University. This contrasts to other simulation platforms investigated at the time, which were only available on a pay-per-user basis.

Promoting deep learning

In order to better prompt students to achieve higher-order learning, the requirements of the coursework instruction document were changed. The object of the new Coursework Instruction Manual was to specify more closely the outputs required, while giving greater latitude to the students in deciding for themselves how to address them. I aimed to make some of the required elements address both lower- and higher-order learning within Bloom's (1956) taxonomy, as revised by Anderson and Krathwohl (2001; 2013). The key ingredients of the project report were staged so that each section of the report moved from lower- to higher-order learning activities. The coursework instructions started by targeting the Applying and Analyzing levels, for example, identifying the largest contributors to risk and the specific factors to which the group's portfolio is exposed, before moving on to instructions targeting the Evaluating level, such as discussing the results of their risk analysis, and whether their risk exposures fit with their investment views.

Additionally, I wanted to target the Creating level of learning, by asking students to add any information which they thought might make the Project Report more informative, using any other Bloomberg portfolio analysis or performance attribution functions which they thought might be helpful to illustrate the risk and exposures of their fund.

The initial, classroom-based approach to teaching Bloomberg

In the first year of using Bloomberg for the investment simulations, my initial approach to teaching utilised three methods. Firstly, a simple document illustrating its operation with use of screenshots was made available. Secondly, three weeks of classroom demonstration were organised, in which my Graduate Teaching Assistant or the author demonstrated the use of Bloomberg to small groups, using a staff Bloomberg laptop connected to a projector. Though these took place in University computer laboratories, the room was not equipped with Bloomberg terminals, and students were entirely passive during the demonstrations, having no opportunity to experiment for themselves in the session. Finally, the Graduate Teaching Assistant also provided one-to-one assistance in Office Hours.

Constrained resource

In this first cycle of action research, the institution had a total of nine Bloomberg terminals available for student use. These were situated in three different locations with highly limited seating.

End of year review

Feedback through classroom dialogue with students that year revealed that they had been dissatisfied with these means of delivery, since students were entirely passive, and were unable to interact with the system for themselves during the class.

The second cycle of Action Research

Corrections adopted at the start of the second cycle of Action Research

The next year therefore began with a resolution to find a more interactive means of teaching Bloomberg, in which students could learn while sitting at and interacting with a Bloomberg terminal, rather than being mere passive observers of a demonstration.

Given that resource constraints prohibited the personal demonstration of Bloomberg in a setting in which each student had access to a Bloomberg terminal, I decided to create a series of online videos, to teach students how to use Bloomberg to accomplish the tasks in the Group Coursework Project. The objective was that an online resource would enable a large number of students to use a small number of Bloomberg terminals, through asynchronous, online delivery of what would otherwise have been delivered in a classroom setting. This situation is therefore similar to that faced by Convery and Swaney (2012), where the large number of students compared to the available computing facilities drove the production of a video resource which could be accessed independently and asynchronously. One-on-one assistance delivered by a Teaching Assistant was also provided through the term, a solution also adopted by Convery and Swaney (2012).

Development of the video resources

I therefore created a set of 19 narrated video tutorials: the first half of each was a brief presentation, presenting the Learning Objectives of that video, and explaining in bullet point

form the key steps to be shown in the second half. The second half of each tutorial consisted of a demonstration of some aspect of Bloomberg functionality, recorded on a staff Bloomberg laptop using screen capture software and a microphone, edited with video editing software, and overlaid with an additional voice narration track where necessary. Screen capture was performed using TechSmith Relay, an application supported by the University, and which it was possible to install onto the University-managed Bloomberg laptop. Video editing and narration was performed using TechSmith Camtasia on my own computer.

The series of 19 Bloomberg tutorials began with a basic introduction to the system, and introduced its core functionality, keyboard and menus. Later tutorials demonstrated the construction of a portfolio in Bloomberg, and moved on to risk and performance analysis functions, so that the full set of procedures necessary to execute the Coursework project was demonstrated in a set of progressive tutorials.

Once created, I uploaded the full set of tutorials to the module's podcast section of the institution's video podcast website, so that students could then view them in the same location as the standard lecture podcasts and watch them in their own time while working at a Bloomberg terminal. The university has far fewer Bloomberg terminals than the module had Coursework Groups, so an on-demand delivery which permitted staggered use of Bloomberg terminals by groups was essential.

The use of video editing software enabled the on-demand videos to deliver a richer experience than a simple presentation in a lecture setting: the video editing software enables the production to zoom in to and out of on a particularly important dialogue box or a key menu during the demonstration, so that it is clear which of many options on a screen need to be selected; this is one example of the Spannaus (2012, p. 5) argument above, that video has the potential to show detail of procedures which would be difficult to illustrate otherwise. Additionally, an on-demand video can be paused, and replayed while students follow the steps on a terminal, whereas a live presentation is delivered at a pace controlled by the teacher, not by the student, in a way that would be much more difficult in a live lecture; this is one aspect of the Bates and Poole (2003) principle above, that video technology should be valued for the functionalities that it offers over and over older technologies and processes.

Delivery of the video resources

Regarding delivery of the resources, I employed the suggestion in Fry et al (2008, p. 287) and used a Virtual Learning Environment to deliver Bloomberg tuition. The university's video podcast portal, ordinarily used for lecture capture, also allows teachers to upload their own videos to the module portal, and to control which students are able to access them. The system is free to use, is highly reliable, and is accessible both on- and off-campus.

The physical setup I assumed that students would adopt, was to be seated at a Bloomberg terminal in the University, and from there to view the on-demand Bloomberg tutorial, stopping and starting it as they practiced the steps and methods depicted in the tutorial at their own pace on the terminal.

Supplementation with one-to-one assistance

To supplement the online learning, three weeks of drop-in surgeries were included into the timetable: each student was allocated to a nominal workshop group of around 20 students. Each workshop group was then allotted one hour in each of those three weeks, during which they could work through any outstanding Bloomberg issues with a Graduate Teaching Assistant on a staff Bloomberg laptop. These troubleshooting sessions were strictly optional, and students were not required to book in advance. The allocation of students to a nominal workshop group meant that each student had a guaranteed hour in each of those weeks, when they would have no other timetable commitments, and would be free to attend.

Application of the Bates and Poole (2003) framework

The present project could be analysed in Bates and Poole (2003) framework as follows:

S: Students: In this case, the assumption could be safely made that the Master's level students should be able to access and use an online video resource.

E: Ease of use and reliability: The assumption was that the videos could be deployed through the institution's podcast platform, which already podcasts lecture capture recordings for most university courses. This platform additionally allows lecturers to upload their own

videos to the video podcast area for their course. This is a reliable and intuitive platform to use, and is already used to deliver thousands of lecture podcasts to students at the institution.

C: Costs: There was an upfront cost to the department to purchase the TechSmith Camtasia video editing software and a high quality microphone on my behalf. The screen capture software used on the Bloomberg machine, TechSmith Relay, was installed by the author from the University software service, for which the University already holds a site license; there was therefore no extra cost to install this. The cost of hosting and delivering the videos through the video portal is borne by the University, and is offered by IT Services as a free resource to end users. There was therefore no cost to the School for using extra storage space, though there may have been some costs borne by the IT Services.

T: Teaching and Learning: Two sorts of training is necessary, namely, teaching about the principles of the Bloomberg system, and the skill of how to use it efficiently and effectively in the construction and analysis of portfolios in order to accomplish the course work project. Spannaus (2012, p. 5) identifies how instructional videos can be very efficient means of demonstrating a procedure, in that a video can reveal detail for viewers which would not otherwise be easily visible. The zooming functionality of the Camtasia video editing software was frequently used in this project to zoom in on important dialogue boxes, menus and options in Bloomberg screens, in a manner which would have been impossible in a live demonstration presented straight to projector.

I: Interactivity: An online video, delivered asynchronously, allows the user to control it, being able to pause, rewind or advance, as they may require. Bates and Poole (2003) argue that when comparing different media, we must ask not how one could be a replacement for another, but rather, what a new technology may enable that an older technology does not. In contrasting a lecture delivered in person with a lecture which is recorded and then made available for asynchronous online delivery, they point out that students have been found to rate on-demand resources which they could control more highly than those over which they had no control.

Spannaus (2012, p. 47) discuss whether it is better for the presenter's face to appear, on the basis that Mayer's Personalization Principle will enhance learning by associating a person with the instruction, or whether Mayer's Coherence Principle and Sweller's cognitive load

theory point to minimizing extraneous content. He suggests a compromise, where the presenter appears in the first video in a series, but not in subsequent videos. In the videos as initially produced, I do not personally appear in any of the videos.

O: Organizational issues: No organizational changes needed to be made in this case, since I was module convenor.

There are, however, be drawbacks to ‘going it alone’: Bates and Poole (2003, p. 141) advise a collegial development approach, in which a whole department works collaboratively to develop video resources, but do identify the most common model of course development as being a ‘Lone Ranger’ model, in which teachers work on their own or with the help of a small grant from their university. While they are essential for ‘getting innovation started’ and demonstrating the potential of technology, they point out that they face problems of workload and quality. In the present project, the creation of the Bloomberg videos involved significantly more work than anticipated, and so this warning rings true.

N: Novelty: The technology of making video podcasts is now well-established; however, to the best of my knowledge, there are no other university resources which demonstrate the use of Bloomberg by showing clips taken from Bloomberg using screen capture software.

S: Speed: My initial assumption was that the Bloomberg videos could be produced quickly, but I soon found that the process took much longer than anticipated. Spannaus (2012, p. 8) identifies that teachers’ audiences will tend to expect higher production values from online clips than from amateur YouTube clips, and that they will tend to discount the credibility of video which looks as if it was made in haste. I encountered this issue in my own creation of the Bloomberg videos, finding that I judged my own recordings as if they ought to be slick instruction clips rather than amateur footage, and that it took much longer than I had anticipated to create quality. Spannaus (2012, p. 54) notes that first-time video makers tend to be over-optimistic when estimating the time that a project will take to complete, and suggests a formula for estimating completion time which aims to remove this optimism bias. Notably, it sometimes took several takes to get the script and procedures exactly correct, and to eliminate non-words from my narration, whereas I would be less concerned with using non-words in a lecture, and am in practice content for non-words to remain in my lecture podcasts. Implicitly, I was treating my Bloomberg videos as being held to higher production

standards than my lecture podcasts by its intended audience, and was investing much more time in production and editing on that basis.

Were I repeating the process, I would first write a script at the outset, as Spannaus (2012, p. 18) recommends, before then using it to narrate the videos; in the feedback, some students have requested the scripts of the videos, in order to be able to take notes more effectively. This would have made the planning phase slower, but would have resulted in fewer bad takes in the production phase.

Analysing the alignment of the online videos with the intended learning outcomes of the module

The alignment of the online Bloomberg videos to the module's intended learning outcomes can be analysed at two levels. Superficially, they contribute principally to ILO A5, in that they assist in delivering learning on the use of the Bloomberg platform, to create, manage and evaluate equity portfolios, and to analyse their risk and return.

A more profound analysis is to ask some of the questions posed by Phil Race in O'Hagan et al (1995). Though the book dates from the early years of the internet and is set in the context of video presented in mass learning rather than asynchronously-delivered video, some of the questions that it raises concerning the use of video in learning are equally applicable to video-on-demand delivered across the internet in teaching. Among the 20 questions on the usage of video, Race asks some which are highly relevant to this section:

‘1. How do we get learners to adopt an ‘active viewing’ mode when watching videos, rather than the ‘normal’ somewhat passive mode they are accustomed to adopt when watching television? Does it help to explain what the intended learning outcomes are, associated with each video we use?’

To address this, each video had two sections, the first outlining the objects of the demonstration and showing how it linked to achieving the Group Project aims. It is pleasing to note from the feedback below that many students took notes while watching the videos, indicating an active style of viewing. This could be improved for the future by explicitly encouraging students to take notes.

‘6. How will the learning outcomes to be achieved from the video be demonstrated?’

In this case, the learning outcomes are demonstrated by successful completion of each part of the Group Project report.

‘7. When will learners be expected to demonstrate their learning outcomes? (e.g. after what time interval?)’

In this case, students watched the videos and completed the Group Project Coursework either at the same time in tandem. The feedback below shows that some students watched the videos all at once before commencing the practical work, while others watched them in batches, using them to complete one section of the coursework before moving on to the next section, while yet others watched them all at once before starting, and again, as needed, while carrying out the practical work. In any case, the time interval was relatively short.

‘8. Do learners know in advance what they will be expected to do? Should they? Do we intend that a particular video make an impact in its own way?’

In this case, the aims and steps of the Coursework were demonstrated in lectures and also clearly spelled out in the Coursework Instruction Manual, and no videos were intended to surprise students.

Initial usage survey and first round revisions

My initial impressions were that uptake of the online Bloomberg tutorials was good, and that students were using them as I had anticipated, by following the steps demonstrated in the videos for themselves, before constructing their own portfolios. One of the earliest indications of this came in some of the early student queries: groups had apparently constructed for themselves the example portfolios that I had used in the videos, and had found that the total value of the portfolio at the end of the performance period differed by a very small amount to the values that they could see in later videos; they had evidently used earlier videos in the series to re-construct my example portfolios, and had used later videos in the series to conduct analyses on those same portfolios, and had gained slightly different answers to those they could see on-screen in the videos.

On checking, I found that I had omitted to select one configuration option on one of the takes in one of the later videos, so that the answer displayed on the screen was slightly inaccurate. I addressed this in the short term by notifying all the students, and will re-record that section of the video for future use.

The drawbacks of the resource

One drawback of asynchronous teaching provision is that immediate help is not available where students have queries. I tried to ameliorate this by timetabling three weeks of drop-in Bloomberg clinics, but found in practice that students needed answers to their Bloomberg questions more quickly, in order to be able to progress with their projects. A workaround that I ended up making was to take a staff Bloomberg laptop with me to the lectures, and to offer informal Bloomberg clinic sessions at the end of the lecture, where brief technical queries could be dealt with on the spot.

One weakness of this ad-hoc approach is that queries from one group which receive an answer are not then copied to all other groups. In some cases, the queries related to a specific group's unusual issue, but in others, queries clearly were of more general application.

One potential solution to this would be to expand the Virtual Learning Environment to include a repository of answers to questions, perhaps by posting queries and solutions to a discussion board or wiki on Blackboard. In order to check that a group with a query had properly understood the reply, one approach would be to ask groups to write down their Bloomberg question and the solution they had found, before they left the after-lecture session, and then post this to the discussion board.

Assessing the effectiveness of the videos as a teaching resource

In order to obtain more concrete evidence of progress, as part of the 'Action Research' loop, I conducted my own survey in the final lecture of the term. I received a total of 68 responses out of a class of 147 students, a response rate of 46%; the survey questions and summaries of responses are detailed below. The full set of responses are available on request.

Summary of survey responses to the survey, and the resulting changes to practice

1. **Usage:** Did you use the online Bloomberg Tutorials yourself? If so, how often did you use them?

Table 1. Usage

Did you use the online Bloomberg Tutorials yourself? If so, how often did you use them?	Once per month	1	1.5%
	Twice per month	1	1.5%
	Every week	12	17.6%
	Twice per week	11	16.2%
	More frequently than twice per week	2	2.9%
	Yes - unspecified	38	55.9%
	Not at all	3	4.4%
	Total responses	68	100.0%

On this first question, my prior assumption was that students would tactically divide tasks within project groups so that only one or two team members would need to operate Bloomberg, with the others making macroeconomic forecasts, doing literature and news searches and writing the document. In the event, I was pleasantly surprised to find that 96% of respondents had viewed the tutorials and had used them to teach themselves how to use the Bloomberg system. It was very good to see that students saw the resource as an opportunity to learn, and took the opportunity to engage with the learning. Even though students were not individually tested on their knowledge of Bloomberg, the vast majority of the respondents chose to add to their learning in this way.

I had no prior expectations of how often students would use the Bloomberg videos, so it was surprising to see such a wide divergence in how often students accessed them during the module. Two students reported usage more frequently than twice per week, 12 students (18% of respondents) viewed the videos once per week, and 11 students (16% of respondents) viewed them twice a week.

Changes to practise from the Usage question

Knowing that so many students viewed the Bloomberg videos was a great motivator to improve them for following year: students are evidently using them to advance their own skills base, and from this point of view, I can make the assumption that a majority of students will engage with the resource.

Some students accessed the Bloomberg videos early on in the course, before starting analytical work on the Group Project. For following year, I therefore made the videos available from the start of term, so that students were able to train themselves early if they wished.

2. Modality: How did you use the Bloomberg tutorials? Did you watch them all at once, or in stages? Did you watch them while sitting at a Bloomberg, or at other times?

Table 2. Modality

How did you use the Bloomberg tutorials? Did you watch them all at once, or in stages?	In stages	38	55.9%
	All at once initially, and then reviewing individually	6	8.8%
	First watch them all, and then in stages.	3	4.4%
	All at once	4	5.9%
	Not stated	14	20.6%
	No response	3	4.4%
	Total responses	68	100.0%
Responses mentioning activities performed while accessing the tutorials:	Took notes	4	5.9%
	Just listening	2	2.9%
Did you watch them while sitting at a Bloomberg, or at other times?	Once sitting at a Bloomberg terminal	25	36.8%
	Just at home / other times	8	11.8%
	At home, and then again with a Bloomberg terminal	21	30.9%
	Other	11	16.2%
	No response	3	4.4%
	Total responses	68	100.0%

Students watched the videos in a variety of ways. Three students (4% of respondents) watched the entire series all at once, before then rewatching them in stages, while six students (9% of respondents) watched them all at once before rewatching them individually. However, the majority (56% of respondents) watched them in the way that I had anticipated, working in stages through the series.

I encountered some surprising responses here. Firstly, four students (6%) took notes, while another two (3%) listened to the podcasts rather than watching them. I had expected all students to only view the videos while physically in front of a Bloomberg terminal, but eight students (12% of respondents) replied that they only ever viewed the Bloomberg videos at home, while 21 students (31% of respondents) replied that they first viewed the videos at home before then re-watching them while working on a Bloomberg machine. The note-taking activity and the two-phase viewing activity suggested that students were moving from lower-order to higher-order learning as they constructed their knowledge, forming a cognitive foundation before adding to it by interacting with a Bloomberg terminal.

Changes to practise from the Modality question

During the term, I had paid close attention to the viewing statistics provided on the institution's podcast website, and had assumed that the number of views by date for each video was a good measure of student uptake. However, some students may view the same video multiple times, in different phases of learning, so that a high number of views does not necessarily indicate wide uptake. By far the best way to measure uptake is to conduct a survey, and to ensure that the response rate is as high as possible.

I also had not anticipated that many students would use multiple phases of learning, apparently, one phase at home to create an overview of Bloomberg, and a second phase, to add detail and practice specific skills and mastery of specific functionality within the whole. I also had not anticipated that students would include written note-taking when watching a Bloomberg video.

From the theoretical point of view, the progress of students from lower-order to higher-order learning in Bloom's (1956) taxonomy, revised by Anderson and Krathwohl (Wilson, 2016) is obvious, commencing with Remembering and Understanding during the first phase of

viewing at home, and moving on to Applying, Analysing and eventually, Creating, when the review the videos while working on a Bloomberg terminal.

3. Positives: What did you find most useful or most helpful about the Bloomberg Tutorials?

Table 3. Positives

What did you find most useful or most helpful about the Bloomberg Tutorials?	Building portfolios	3	4.4%
	The step by step approach	5	7.4%
	Being able to complete the coursework	7	10.3%
	Ability to review videos	2	2.9%
	Having clear topics for each tutorial	4	5.9%
	Learning how to use the Bloomberg system	16	23.5%
	Having detailed instructions	10	14.7%
	No response	7	10.3%
	Other category	14	20.6%
	Total responses	68	100.0%

On this section, I had no prior expectations as to what students would most find beneficial. The most common elements that students found helpful were learning how to use the Bloomberg system (16 students, 24%), which unprompted, students mentioned separately from the more prosaic ability to complete the coursework (7 students, 10%); this suggests that many students valued the exercise for the skills they gained, and not just for the instrumental benefits of passing the course. Other common themes that students found helpful were the detailed instructions (10 students, 15%), and the step-by-step nature of the videos (5 students, 7% of respondents).

Changes to practise from the Positives question

This section seems to emphasise the importance of having one video to illustrate one task, so that students can master one step in the manipulation of Bloomberg before moving on to another step which then builds upon it. Shorter videos covering one the skill or task would seem to be better than a longer video covering multiple steps in one.

4. **Negatives:** Did you find anything difficult to use or unclear?

Table 4. Negatives

Did you find anything difficult to use or unclear?	No	47	69.1%
	Improve sound quality	2	2.9%
	No response	7	10.3%
	Other comments	12	17.6%
	Total responses	68	100.0%

In the early weeks after release of the Bloomberg videos, I conducted an informal survey in class to see whether there were any initial issues which needed to be resolved. One issue which was quickly mentioned was that the sound was too quiet. I therefore had to re-render all videos, making the sound much louder, and re-upload them to the video podcast site, and then notified the students that the issue should have been resolved. Feedback indicated in this section seems to indicate that this action resolved the problem.

In this way, the action research reflect-plan-apply-evaluate cycle of Kember and Kelly (1993) was in practice more rapid than I had thought that it would be; I had originally envisioned collecting survey data at the end of the course to evaluate its effectiveness, but ended up dynamically altering the resource during the term in response to short-term user feedback.

I had no other expectations for responses in this section. Reassuringly, 47 students (69% of respondents) replied that they did not find anything difficult to use or unclear.

Informal classroom feedback indicated that the theory of some of the advanced analytics was taught too late in the term to prepare them properly to use the Bloomberg analytics which apply those theories. In the survey, one student complained that the system itself is difficult and involved to use, and another, that the theory presented in the course needed to be more explicitly linked to its application inside Bloomberg.

Changes to practise from the Negatives question:

For the next year, I re-recorded much of the audio with better quality sound, to ensure a clear, bright, even tone throughout. I also re-ordered the material in the lecture notes presented so

that the theory used by the Bloomberg analytics was presented as early as possible in the course. Further, I made a more explicit link in lectures between the portfolio analytics in Bloomberg and the theory presented in class, so that students knew at the start of the Group Coursework Project exactly what analytics were available inside Bloomberg, and the sections of the lectures which related to them.

5. Improvements: What would you like to see in future versions of the Bloomberg tutorials?

Table 5. Improvements

What would you like to see in future versions of the Bloomberg tutorials?	Include a script	3	4.4%
	Nothing to add / is already perfect	8	11.8%
	Include more empirical skills / more details	4	5.9%
	More Bloomberg functionality / other useful functions	13	19.1%
	No response	12	17.6%
	Other comments	28	41.2%
	Total responses	68	100.0%

On the Improvement section, I had no expectations of what students might recommend here. One frequent request was that the Bloomberg tutorials should go beyond the requirements of the Group Coursework Project, and include much more Bloomberg functionality not required for the Project completion (13 students, 16% of respondents), or include more empirical skills (4 students, 6%). These are a good suggestions, because they indicates that students desire to learn more about the Bloomberg system than is necessary or required for completion of the course, and instead, see it as a valuable skill which they can take with them into their future employment.

Biggs and Tang (2011, p. 191) pessimistically write that, ‘[w]hat and how students learn depends to a major extent on how they think they will be assessed.’ This struck me immediately as being out of line with my own experience: one of the aims of a teacher with a passion for their subject will be to inspire students to learn far more than they need to in order to pass the examination, and to move beyond an instrumental motivation for taking their module. The student feedback here seems to act as a partial disproof of the Biggs and Tang position, in that many students were explicitly seeking to learn more than they needed to know to pass the examination or the Coursework Project.

Three students (4%) requested a script for each Bloomberg tutorial, showing that some students still prefer to work from a written document, rather than audio-visual media.

Changes to practice from the Improvements section

The request for additional Bloomberg tutorials to go beyond the scope of the Group Coursework project ties into another discussion I had been having separately, as to whether the Bloomberg tutorials ought to be released more widely, as a resource for the whole of the business school, or as an open learning resource publicly. The first section of the Bloomberg tutorials, introducing the system and the basic functionality, are germane to all the institution's business school, whereas the second section of the Bloomberg tutorials illustrate specific steps needed to accomplish the Group Project Coursework, but would be of less interest to wider users more generally.

The eventual solution, in coordination with the business school's public affairs unit, was to create an Open Learning Resource consisting of the first ten videos, which were general and related to the usage of Bloomberg more generally, rather than to the module. This was then posted on the business school's YouTube channel, to be available for the general public, as well as business school users. However, I have not yet made additional videos on extra functionality of Bloomberg, as making a video represents a very sizeable time investment, so executing a series of additional videos would only be worth it if there was likely to be realistic widespread take up, and if it could be promoted by the School as a whole.

If I were executing the project again, I would write a script for each section before recording, and then make the transcript available separately. It may be worth using some of my departmental budget in the future to obtain transcripts for the existing videos.

I did not appear personally in the initial videos. Following the advice of Spannaus (2012, p. 47) on promoting engagement by including a brief introduction of the presenter at the start of a series, I included an introductory clip of myself when a selection of the videos were made into an open learning resource and made available on YouTube

Evidence of higher-order learning Coursework Reports

Did the video tutorials help students to achieve higher-order learning? One approach to answering this question is to test for creativity in the Coursework reports before and afterwards. In the year of the first cycle of action learning, I added scope for a Creating level in Bloom's (1956) taxonomy, in which students were free to apply their understanding of the Bloomberg system, of Risk Analysis and Macroeconomics to add any information which they thought might make the Project Report more informative. The additional requirements of the coursework instruction document were,

‘Additional analysis: Use any other features of Bloomberg Portfolio Analysis which you think might be helpful to illustrate the risk and exposures of your Country Fund. Further analysis: Present and interpret any other features of the Bloomberg performance attribution functions which you think might help to explain the performance of your portfolio. Interpret these with respect to the investment decisions you have made.’

In the first action research cycle, few groups added additional analysis, but, following the introduction of the Bloomberg videos in the second action research cycle, many more group engaged in creative analysis of their own, despite the requirements of the coursework instruction document remaining largely unchanged in the second cycle. While it is difficult to prove a direct link between the introduction of Bloomberg videos and students exploring Bloomberg functions independently for themselves, they hopefully contributed to increased innovation in this area.

Table 6: Proportion of group reports evidencing specific further analysis techniques

	First cycle of action research	Second cycle of action research
Simple Value at Risk analysis on whole portfolio	7.4%	8.3%
Sophisticated Value at Risk analysis: Monte Carlo and Historical Simulation on whole portfolio	0.0%	58.3%
Value at Risk Analysis on portfolio constituents	0.0%	4.2%
Scenario analysis stress tests on portfolio	0.0%	37.5%
Up / down day profitability analysis	0.0%	8.3%

Closing the loop for Action Research

The survey and analysis process closes a larger reflect-plan-apply-evaluate cycle in the Kember and Kelly (1993) Action Research, and was used in adapting the videos for the next year.

As outlined above, an early problem with the volume level of recordings was detected because I conducted an informal survey in the first weeks of the operation of the Bloomberg Videos, and this enables an early problem to be successfully resolved.

Conclusion

This paper records a process of action research, to improve investment simulation as part of an investment management course attended by accounting and finance Master's students. The simulation was more closely aligned with the course learning objectives, Bloomberg was chosen as a simulation platform, and initially, Bloomberg was taught in a classroom without interactivity. Feedback showed this to be ineffective, so I produced a series of 19 Bloomberg video tutorials, delivered asynchronously via the university's podcast service.

Production of the videos was much more time-consuming than originally anticipated, with high production values taking much time and effort.

Despite the very sizeable time investment and difficulty of making the Bloomberg videos in the first place, the overall experience seems to have been well-received by students, securing wide and deep takeup by them. Students appreciated gaining employability skills, many students used the resources frequently, and students asked for even more teaching on Bloomberg functions, beyond the scope of the Group Coursework Project.

Data from a usage survey showed that many students watched the videos first at home, often making notes, before then re-watching the videos as they worked through them on Bloomberg terminals. This provided evidence that students were progressing up Bloom's (1956) taxonomy, as revised by Andersen and Krathwol (2016), moving from lower- to higher-order learning activities. Unexpectedly, many students took notes while watching the videos at home, before then re-watching them as they worked through the tutorials on a Bloomberg terminal, constructing their own knowledge as they first watched at home before then adding to it by interacting with the system itself.

Coursework projects evidenced much a greater degree of higher-order learning following the introduction of the Bloomberg videos: many more groups engaged in additional creative analysis, exploring the Bloomberg system for themselves, and discovering extra functions which they used to illustrate the risk and return of their portfolios.

Teaching Bloomberg in this way involves elements from both the pedagogies of teaching accounting information systems, and of teaching programming languages. On the first, using Bloomberg as a platform for an investment simulation can help to secure active learning and engagement with the financial world, and survey feedback provides evidence for this. On the second, programming is a skill which must be learnt by bringing their own toolkit of concepts and skills, and requiring each student to construct their own knowledge in interaction with a system, and survey evidence shows students moving through this process.

Bloomberg can be used as a powerful platform for investment simulations in the teaching of accounting and finance, and online videos, complemented with one-to-one clinics, can help to overcome the resource constraints which educators face in having many times more students than Bloomberg terminals. Instructional videos can be highly costly in time to produce for

'lone rangers' who produce them on their own, which may be one reason for their comparative rarity on accounting and finance courses.

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