Hallelujah! Using Topical Examples to Illustrate Ethical and Business Issues for Engineers

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Abstract - **Technically-oriented undergraduate students are often reluctant to engage with "Legal, Social, Ethical and Professional Issues". In particular many learners appear to have an increasingly cavalier attitude to intellectual property in digital media. Meanwhile local employers complain of graduates' "unworldliness".**
This case study describes the creation of a reusable learning object that uses topicality to make these issues seem more relevant to first year undergraduates in a School of Computing. Based on first delivery we identify principles for the design and maintenance of topical RLOs. One unexpected issue is how quickly topicality wanes and we identify that learners themselves are the best placed to identify future topical examples.

Index Terms – Topicality, Reusable Learning Objects, Ethics, Professional Issues

INTRODUCTION

Technically-oriented undergraduate students are often reluctant to engage with, what the British Computer Society refer to as, "Legal, Social, Ethical and Professional Issues" (LSEPI). In particular, after a decade of widespread and illegal downloading of music, video and software, many of our learners appear to have an increasingly cavalier attitude to intellectual property in digital media. This lack of professionalism threatens the perceived quality (and employability) of our graduates and also risks the loss of professional body accreditation, which impacts both on graduates' career prospects and the ability of a university to recruit.

A secondary challenge is that modularization has resulted in a lack of "deep learning" – learners do enough to pass the assessments and demonstrate the learning outcomes for a module – which they seem to forget gradually over the following years of their course. We believe that delivering *topical* learning material will result in more meaningful learning experiences, and that this would motivate learners to engage more closely with the material and result in deeper learning.

Increasing financial pressures on universities mean a reduction in the amount of resource available to prepare for each hour of class contact, and an increase in the reliance on Reusable Learning Objects (RLOs) as resources to be used in class contact to compensate. While using someone else's RLO avoids reinventing the wheel, there is a risk that material goes out of date after a while. If we rely on topicality to motivate deep learning, then how often does the RLO need to be rejuvenated to keep its relevance?

For more than a decade, as educators we have intuitively sought to find relevant and topical examples both to illustrate our teaching but also to form the basis of deeper learning. We have, for example, taken artifacts from recent industrial practice, annotated them and used them as a basis for classroom activity and as model answers for assessments. It is in the nature of our institution that all our teaching materials are stored, on delivery, in a repository for immediate student access on specific modules, and for colleagues to access as needed. We have done this in a way consistent with RLO philosophies within the functional constraints of our Virtual Learning Environment (VLE). Our materials are used by colleagues at partner institutions both in our home country and in partnerships such as described in earlier work [1].

This paper explores how to address these interlocking and complex issues within a justifiable business case. We report on a relatively informal study of first year undergraduates' response to current, recent and legacy materials. This is combined with practice-based reflections on the challenges of helping contemporary learners to motivate themselves and an analysis of the expectations of professional engineering bodies from degree courses. Our general philosophy is rooted in learner-centeredness and our general experience is that students have much to contribute to the design of their own learning situations, and that we can use research approaches in our classrooms to help with this design process.

ADDRESSING LEGAL, SOCIAL, ETHICAL AND PROFESSIONAL ISSUES

I. Student Attitudes Towards LSEPI

In the UK, our professional bodies (and our graduates' employers) make detailed demands of our graduates to conform to legislation, to behave in an ethical and professional way at all times and, at the very least, to avoid creating negative social connotations of their work. Yet our experience of those leaving UK high schools is that they have fairly naïve views of the nature of employment and the need for professionalism. Society increasingly appears to require universities to prepare learners in LSEPI. However, this is much more complicated and subtle than it may appear, partly as an unintended consequence of attempts to

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simplify intellectual property (IP) rights through, for example, Open Source approaches.

While the challenges of campus MP3 file-sharing are familiar and longstanding, much more nuanced IP issues emerge. It's become commonplace, in our experience, for students to misinterpret Open Source and Creative Commons licenses. While "fair use" provisions may apply to academic work (in some jurisdictions), the learning outcomes (and the assessments) require students to behave as they would in a professional situation, and to use third party content accordingly. Plainly the potential cost to a future employer or client of accidental abuse of the above licenses could be substantial.

For example, we find that students often crop, tint or resize third party images that they use in websites for assessment. They believe that a Creative Commons license indicates an unrestricted right to use these freely. On closer inspection these images often have the Creative Commons "No Derivatives" condition, which precludes cropping etc.. Table 1 records the total number of images available under Creative Commons licenses on a popular image sharing site [2]. Although the majority of images are free for adaptation, the most popular category forbids the user to "alter, transform, or build upon this work".

TABLE 1
CREATIVE COMMONS LICENSE TOTALS ON FLICKR.COM

Attribution License	18,250,042
Attribution-NoDerivs License	**6,298,676**
Attribution-NonCommercial-NoDerivs License	**42,066,903**
Attribution-NonCommercial License	18,978,928
Attribution-NonCommercial-ShareAlike License	40,033,552
Attribution-ShareAlike License	11,966,753

This admittedly subtle issue of copyright infringement is only one of a number of areas which lead to local employers' complaints about graduates' "unworldliness" when it comes to business situations and ethics. Other examples include the well known (and oft-addressed) "soft skills" such as time management, project management, communication skills and so on. Additional issues include the capacity to make the business case for investment in a given activity (which in turn requires the knowledge of IP rights, contracts and true costs of ownership).

II. LSEPI in Computing Courses

As the body of knowledge (BOK) of computing continues to grow, the technical areas of the timetable are increasingly crowded, and leaders of purely technical modules can be reluctant to include non-technical content, such as LSEPI, in their classes, and certainly in their specified learning outcomes and resulting assessments.

A dedicated module to cover LSEPI can be tokenistic. Too early in a course, it runs the risk of the content being forgotten; if added into the latter stages of a course, it can seem like an irrelevant hurdle. When LSEPI are embedded within a module, it's quite common for student feedback to complain about this module being the "the least interesting, the least useful, and the most trivial" [3]

Similarly, attempts to "outsource" LSEPI – for example a module on, say, Law, Marketing or Communications, delivered by colleagues from other departments, results, at best in learning that is soon forgotten – superficial learning.

TOPICALITY AND MOTIVATION

We identify motivation as a key factor in achieving deeper learning, and that emotional engagement is a key factor in motivation of learners. Topicality can help with emotional engagement. Yet, notwithstanding the review below, we found surprisingly little in the literature to sustain this chain of reasoning – perhaps it's seen as common sense, to value a good and relevant example in teaching.

Topicality is a useful way to bring theory alive for learners, for example topicality can be used to attract learners and lead them to more pedagogic content [4]; "topicality can help motivate students" [5]. Academics in the field of statistics, for example, are urged personally to build the competency to "link statistics and real-world situations" when teaching those from other disciplines [6]. To summarize, topicality can support learning topics that the learner might otherwise deem peripheral.

Moving beyond immediate classroom situations, topicality can be seen, in the context of formal learning, as supporting informal learning [7]. This is useful to us – we can present this as a rationale to more technically-focused colleagues for including topical examples that both illustrate technical issues while at the same time encapsulate LSEPI. We all agree that learners need to study more outside the classroom, and much of this learning social and informal by definition [8].

There is a clear case for topical content in learning situations and resources. In many sub-fields of Computing the rate of change of domain knowledge quickly renders teaching materials out of date. Our experience, over the last ten years, as funding per student has failed to keep pace with inflation, is that the topicality that used to result from the annual rewriting of teaching materials, can no longer be guaranteed. In some institutions the use of temporary staff to teach and generate resources, which are then delivered by a new member of staff or via a VLE, means that these materials are infrequently refreshed. In our case staff allowances for preparation allows a small amount of updating, while fuller refreshment is scheduled by justifying resources every 3-5 years. This does not seem uncommon at other institutions. In this sense science and technology subjects are falling into the practices more common in the arts and humanities.

We are challenged to make learning situations more motivating and relevant, resulting in deeper learning. To achieve deep learning, learners need to understand the acquired information by relating it to previous knowledge and experience [9]. Topical material, by definition, should allow learners to relate what they study to their own experiences – if the material is genuinely topical to them. We want to use topicality to achieve motivation, and now we need to justify where resources will add value in this respect.

By definition, if not refreshed, teaching materials grow less topical with time – but at what point does this begin to impact motivation?

Thus we seek to embed LSEPI in our teaching in a way that does not seem tokenistic or irrelevant and which motivates our students towards deeper learning. Our approach was to define a small (2-3 hours of learning experience) topical RLO on LSEPI, specifically copyright issues of works of music when used in digital media applications (for example, for entertainment, information or for learning), which is deployed into an existing module. We chose IP issues related to popular music, partly due to personal expertise and teaching opportunity, partly because music copyright is a relatively clear-cut and much publicized aspect of IP in contemporary life, and partly because we thought the students would find it more interesting.

This paper describes the process of constructing the initial version of the RLO, reviews the issues arising from first delivery, evaluates the first mainstream deployment and identifies a set of principles for the design of topical learning objects, incorporating mechanisms to refresh the topicality.

METHODOLOGY

We followed our standard approach for RLOs [10] which has grown from the "star lifecycle" [11], i.e. evaluation at every stage. We start with a qualitative approach and in the longer term change to more quantitative mechanisms, not least in order to address financial constraints. In this case we identified the need to evaluate the following:

- The trial deployment of the LSEPI RLO in an optional class
- The first full use of the LSEPI RLO in the classroom as part of the assessed curriculum
- Understanding whether the materials and structure meet the needs of the learners
- Assessing the efficiency of module in terms of student numbers, resources
- Judging its effectiveness in the short term, in terms of the learners' performance in assessment
- Judging effectiveness in the long term – whether the learning outcomes were retained

For the study reported here, we took an exploratory approach to the first four points, leaving the last two for subsequent work. This exercise also contributes in the longer term to more detailed classroom studies. At this stage we seek insights into the rate of change in our students in their perceptions of LSEPI, for example do different levels of awareness of LSEPI result in different perceptions of the value of our supposedly topical examples? Do they relate these issues to their personal behavior, for example in how they choose to spend their income? We are also interested in the tipping point between topicality and datedness – and are there a number of intermediate points? We also want to identify how to maintain topicality at minimal resource cost.

We prepared the RLO and delivered it as part of an option class in a general teaching module. We then revised it for delivery the following year to a more specialist class, adding additional topical material, and preparing the students for a mandatory assessment in the area. We also reviewed other RLOs within the module, to establish the extent of out-of-date material, which might reduce learner interest.

We designed a simple anonymous questionnaire and administered it to all students attending the class in the week after the second delivery of the RLO. It was entirely optional whether students completed it. The following statement was included as formatted (prepared with the guidance of our Ethics Advisor):

*"This **anonymous** survey is to gather background data for a paper about digital media students' awareness of intellectual property rights and the effectiveness of teaching in this area. The survey is distributed for completion in class time but **no student is required to complete it and it does not form part of any assessment**. If you do complete it, you are giving your informed consent to the use of this data as part of a research study."*

This illustrates two challenges in studying our learners. Not only do we need to ensure that their grades do not in any way depend on participation in our studies, we also need to convince them that this is the case.

We decided to control our sample by first capturing their age group (under 20, 20-25 and over 25 years of age, at the time of the study. These ages also relate to different eras in the wide availability of digitized music.

Secondly we assessed how important musical products were to the students personally, and whether this had changed in recent years, by inviting them to rank in order their expenditure on at least 3 of 8 possible digital media products or services, and to do so for both the years 2009 and 2004. We hypothesized that "digital natives" (those who were born after 1990 and thus became music consumers after MP3 downloading and online purchasing became a mainstream activity) might have a different profile from older learners who, as teenagers, had bought music in record stores. We also hypothesized that those with less interest in music would find topical examples from music less interesting.

Finally we asked students (see Table 2) if the examples provided in their recent classes were familiar to them, and also asked their familiarity with a more recent example, which might be thought of as this year's version of last year's topical example.

I. Initial Delivery (April 2009)

In the trial delivery, we had to help first year engineering undergraduates achieve the following learning outcome:

- "Explain the contribution of the web to society and assess its legal and social implications".

We studied similar RLOs, and then chose our topical issue. At the time a highly-popular UK music talent show (The X Factor) had led to several recordings of a Leonard Cohen song, Hallelujah, competing to be the Christmas #1 hit record. Much press speculation centered on who gained financially from this, since the various intellectual property

rights (IPR) had been repeatedly traded, a topical basis to discuss information provenance and IPR issues. Teaching had centered on the rights of IP owners to sell or license those rights to others in return for money. The parallels between music IPR and the rights of an engineer, with a patent, registered design or copyright software, were self-evident.

At the time of constructing the RLO, national campaigns (via social computing tools such as Facebook) emerged between those in favor of, and opposed to, "manufactured" popular music and "engineered" artistic success. New UK records were set for online sales of music in the frenzy. Thus we could explore the shift from physical to digital markets, and discuss the application of engineering ideas to business. We also included analysis of the press coverage to encourage the learners to learn how to question the providence of information.

It was all the more topical as the songwriter himself had recently resumed touring, at the age of 73, and press coverage focused on the belief (based on press interviews) that Cohen "needed to tour" because of the loss of many millions of dollars after poor business relationships, mismanagement and/or bad business decisions. Ultimately there were several concurrent, and major, national news stories, and our students were as caught up in these as anyone else. They saw no reason to doubt dubious media assertions as to who would earn what money from the resulting sales.

We realized that the topical situation could be exploited, both to make the subject matter interesting and to provide specific practical examples of theoretical points. However four months had elapsed before initial delivery of the learning object, to a relatively small cohort, and over a year before it would be incorporated in mainstream provision.

For the first delivery (April 2009), we chose an optional web module taken by a large number of mainly first year engineers – from electrical, to built environment, mechanical and software/digital media. The class in question was an optional one, lasting two hours, and, since it coincided with an assessment submission date, attendance was disappointingly low – 9 of a possible 150.

Despite this, the trial delivery went very well. The class enjoyed the experience and participated fully. The topicality of the example was self-evident and the students communicated back their understanding of the nuances of copyright ownership and the rights of the creator/owner to sell or license these.

II. Second Delivery (January 2010)

For the first full delivery the RLO had to contribute to addressing the following learning outcome:

- Demonstrate knowledge and practical understanding of contracts, copyright and other intellectual property

We identified that the RLO need minimal updating to address this, but for topicality the previous year's example could be updated to include the most recent X Factor Christmas #1 race. We sought out information about the intellectual property owners and that year's web and press campaign. In this case the 2009 social media campaign was to "stop the winner of X Factor getting to number 1", with proponents echoing some of the previous year's sentiments about "engineered success". The IPR issues were less clear-cut though it was an effective example of the use of the web in the furtherance of social and business objectives, and we combined the new material with the previous year's. All told, however, the atmosphere in the classroom was a little disappointing. While the cohort of students seemed comparable in their range of dedication to their studies, the illustration of press clippings from 15 months earlier did not seem particularly to inspire them. In that sense the topicality of our RLO had waned far faster than expected.

It was a major effort to prepare the original RLO; analysis of our timesheets revealed the following:

- 6 hours of observations and analysis several months before, including contacts with UK Performing Rights Society and other external professionals
- 3 hours preparing a set of slides, including some further analysis
- 1 hour producing and distributing paper and electronic resources, and seeding discussions in the VLE
- 1 hour evaluating and updating with new topical material

This is disproportionate within the workload constraint of one hour's preparation time for each hour of class. Even the more generous allowances for periodic refreshment of content allow for only half of the actual time spent creating the RLO. The business case for the RLO is that we can amortize the preparation time with repeated delivery, but it would need to be delivered in multiple contexts to achieve this.

III. Contrast With Other Once-Topical Material

As mentioned above, we had also decided to triangulate the delivery of the RLO with an older example that had once been topical. This emerged serendipitously, and illustrates how topical material finds its way into our teaching (and can stay there regardless of ongoing topicality).

In the early 1990s the song "I Will Always Love You" was a popular example used by educators to illustrate different aspects of IPR. As the theme song for a major movie, it had been one of the best selling records of the previous year, and it encapsulated many of the various copyright issues to be considered in multimedia productions (the author/composer's rights being different from the performer's, the song having been used in a movie, publishers' various global territories, etc). We were inspired to adapt and extend the same example for our teaching materials. In reviewing the materials for this study, we discovered that our original example was still used in current lecture slides – despite new students not being born at the time of the movie or song! The lecture slides interestingly had migrated from masters-level teaching to earlier years in

the curriculum, eventually to turn up in a first year module on a completely different topic. This is a testament to the potential robustness of an RLO but also a risk that, in an era when academics have insufficient time to develop new material, topicality will wane.

SURVEYING THE STUDENTS

Out of a class of 45, 32 were in attendance and 17 attempted the questionnaire, 14 completing it (the other three only completed the first half, where their answers did not noticeably differ from the average. We elected to ignore these three), leaving n=14.

Since only one respondent was over 25, we divided the groups those aged under 20 (n=8) and those aged 20 or over (n=4) and those who chose not to declare their age (n=2). We asked them to rank at least three of the following expenditure items (1=highest, 8=lowest) in order of how much they thought they spent on each in the year 2009 and also in 2004.

- Recorded music
- Computer Games
- DVDs
- Cable/Broadband
- Mobile Phone (Cellphone)
- Ringtones
- Live shows
- Dance Clubs

TABLE 2
QUESTIONS RELATED TO TOPICAL EXAMPLES

A number of examples have been used in your classes. We'd like to know whether the people, the songs and the events were already familiar to you. Please indicate which of the following statements best reflects your views, based on your knowledge before these examples were used in class
1 I had never heard of
2 I was only vaguely aware of
3 I knew a bit about but was not interested in
4 I already had some interest in
5 I already had a strong personal interest in
(From 1994 Lecture Slides)
Song: I Will Always Love You
Artist: Whitney Houston
Movie: The Bodyguard
Artist: Dolly Parton
That Dolly Parton wrote the song I Will Always Love You
(From 2008 Example)
Song: Hallelujah
Movie: Shrek
TV Show: X-Factor
Artist: Alexandra Burke
Artist: Jeff Buckley
Artist: Rufus Wainwright
Artist: Leonard Cohen
That Leonard Cohen wrote the song Hallelujah
That Leonard Cohen restarted touring at age 73 apparently motivated by problems in business dealings in his copyrights
(from 2009 update)
Artist: Joe McElderry
Artist: Rage Against the Machine
That the Xmas 2009 #1 battle resulted in defeat for the X-factor winner due to a Facebook and Web campaign

Finally, we asked their familiarity with examples (Table 2) used in the previous week's classes. Since the survey was being completed in class time, and within 10-15 minutes, we chose to conflate two issues in a 5-point Likert scale – a pragmatic choice we now regret somewhat. The scale attempted to measure both *awareness* and *interest*. The two are obviously linked but are not the same – for example there was no obvious response for "very aware of but supremely disinterested in" or "vaguely aware of, but sounds interesting". But the students appeared to take a common sense approach in their responses.

We had also prepared our own expectations of what we thought each age group might respond to each question – so we could unpick our own assumptions and have them challenged by the actual student responses.

I. Student Responses

With such a small sample, we realized that statistical significance was unlikely, and we are more interested in understanding our students' interests, in order to design topicality. Overall our preconceptions of the relative expenditure in both eras were sustained but we were surprised by some of the rankings of the relative expenditure areas. For example, the majority of those aged under 20 excluded *recorded music* from their top three in 2009 expenditure - whereas all of the older group had included it. Conversely, both groups ranked it similarly in their 2004 expenditure.

Almost all students rated *computer games* ahead of *recorded music* both in 2004, which surprised us, and 2009, which did not. In particular 7 of the 8 aged under 20, rated it their highest expenditure item in 2009. We had expected high expenditure on attending *dance clubs* but it was surprisingly low (18 is the legal age for entry to clubs so this was not a factor).

Moving on to the familiarity with the three songs and their IP owners and exploitation, the ratings, particularly from the under 20s, surprised us. The familiarity with the music examples from 1993 was surprisingly high for the under 20s – although the movie and the songwriter detail scored lowly. On reflection, this might be due to the dated nature of the movie and that Dolly Parton is not particularly known amongst the younger age group as a songwriter, or indeed as a performer.

More perplexing was that our carefully fashioned topical example from 2008 scored surprisingly lowly with both groups, the opposite of the 2009 example which had currency amongst both groups. This surprised us in the case of the over 20s.

Familiarity of, or interest in, the movie, Shrek, was the strongest of all of the items, with the song, the performers and the writer being progressively less of interest, suggesting that the impact of a popular movie is greater and longer lasting than a popular song. Even the younger students were more familiar with the song from the movie than from the headline-grabbing story of just over a year earlier. Given

that they would have been aged 10-12, the target age for the movie, on its release in 2001, perhaps we should have expected this! Again this illustrates the perils for the lecturer in choosing topical examples for a teenage class – even successfully avoiding the risk of a patronizing or gauche choice, the lack of understanding of the nuances of the cultural context, means that the educator can take entirely the wrong impression.

The most recent TV example was the second highest-scoring, and served well as our topical example in teaching, but it seems clear that year-old news items and TV programs are quickly forgotten by both age groups. Conversely, the perceived topicality of our legacy and by now non-topical example did not seem to have waned as much as we had anticipated, and the aspect of our 2008 example that proved most of interest turned out to be a socially-situated coincidence from 2001.

In terms of assessment, we have no way of correlating the subject sample here and their subsequent pass rates. However the subsequent coursework assessment of the LSEPI learning outcome saw above average submission and pass rates and overall submissions demonstrated a better-than-expected understanding of IPR issues relating to digital media.

CONCLUSIONS

We were disappointed how quickly the topicality waned with subsequent delivery, although our survey of students provides us with an understanding of both the changing nature of what they spend their money on, and the rate at which familiarity and interest reduce, for different examples of topical media.

We are drawn to the conclusion that we are not the best people to decide what will be a topical example for our students. As reflective and student-centered practitioners, we should not be surprised by this. Our future deliveries will therefore turn the use of topical examples on their head. We know the generic points we are trying to make and we were able to recognize an up-to-date example, yet we were also unable to detect when an example was past its sell-by date. Meanwhile other examples maintain their relevance in ways that surprise us, until we realize that the power of popular movies far outweighs that of popular music, newspapers and, so far, social computing tools.

So for the next delivery we will invite the students to co-construct learning examples, based upon their collective abilities to recognize a topical example that matches a given abstraction of common situations. This will make better use of the preparation time for classes as we can take their example and identify the LSEPI associated with it in the next class, and know that it will seem relevant and topical.

We can recognize immediately, on our students' faces, the powerful impact that topical examples have in our classrooms. But our abilities to judge topicality will vary according to the context of our learners. By letting them judge that topicality, we also benefit by the increased emotional involvement that leads to deeper learning.

FUTURE WORK

The next stage will be to identify the best way to allow students to co-construct the topical examples. Thereafter we hope to track a cohort through to graduation to see if they retain an understanding of LSEPI in subsequent work, even when these issues are not directly assessed in subsequent modules.

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