Sharing and Co-creation of Innovative Teaching Practices in Business Analytics – Insights from an Action Design Research Project

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Abstract

This paper focuses on a practice-inspired research challenge of sharing and co-creation of innovative teaching practices in Business Analytics (BA). As confirmed by three international surveys of educators, BA is a very challenging teaching discipline, due to rapidly changing technology, complex data-related challenges, and a disciplinary body of knowledge that is still emerging. However, one of the greatest challenges is a notable absence of well-established teaching practices. The paper describes an action design research project that includes the design and implementation of a wiki-based collaborative environment for sharing of innovative teaching practices as well as the design of a conceptual language that enables these practices to be expressed in a systematic, yet non-prescriptive way. Theoretical underpinning for this work came from the theory of learning designs, a well-known educational taxonomy (the so-called Revised Bloom's taxonomy), instructional design patterns and knowledge management. The paper also identifies some opportunities for further applied research enabled by this evolving knowledge-sharing environment.

Keywords

Business analytics, Innovative teaching practices, Action design research, Knowledge sharing

INTRODUCTION

In recent years the field of Business Analytics (BA) (also known as Business Intelligence and Analytics) has experienced an unprecedented growth across all industry sectors. So much so that BA now dominates business and technology priority lists worldwide, as illustrated by very recent industry reports as well as academic research, see for example (Gartner, 2013; Luftman, et al., 2013).

One of the important consequences of a rapid growth and expansion of this dynamic field, is a world-wide shortage of BA professionals, recently confirmed by prominent industry reports (LaValle et al., 2010; McKinsey, 2011), as well as by three international surveys of BA educators (Wixom, et al., 2010; Wixom and Ariyachandra, 2011; Wixom, et al., 2014). Due to many data-related challenges and opportunities, this trend is expected to continue. For example, McKinsely Global predicts an even greater shortage of BA professionals with USA alone facing a shortage of 140,000 to 190,000 professionals with deep analytical skills and 1.5 million managers capable of analysing big data and making data-driven decisions (Manyika, 2011).

In order to meet a growing industry demand, universities are also starting to increase the number and variety of BA courses, programs and degrees. For example, the latest international survey of university offerings, reported by Wixom et al. (2014), identified 131 full-time BA university degrees in 2012, compared to only 15 in the previous 2010 survey. Among new programs, 47 are being offered at the undergraduate level – a significant improvement compared to only 3 just two years earlier.

Furthermore, industry employers agree that the biggest problem with BA education appears to be students' lack of real-world experience with a strong recommendation being made to the universities to offer relevant and realistic experiences to students (Wixom et al., 2014). However, an even bigger challenge is created by an important requirement to prepare today's students to use yet-to-be-invented tools in future information environments and to lead the business practices of tomorrow. Students' ability to "learn-how-to-learn" is considered to be the most important skill for the unknown future (May, 2010).

Consequently, it is necessary to design learning activities founded in real-life practices, based on sound educational principles to help students to make their current learning transferable to future BA contexts. This is certainly a very challenging task for BA educators, as it requires a solid grasp of educational theories and curriculum design methods, combined with an up-to-date understanding of current industry practices.

These unique challenges of BA education create a pressing need for knowledge sharing among university educators, beyond departmental and university boundaries (Wixom, et al., 2010). In fact, the effective

knowledge sharing and co-creation of innovative teaching practices ("know-how") is crucial for the future development of educationally-sound and scientifically evaluated innovations that remain relevant for fast-changing industry demands. Even more, our wider collaboration will ensure that this emerging teaching discipline continues to grow at a much faster rate than that which can be achieved through our individual efforts.

Inspired by these challenges, our research focuses on knowledge sharing and co-creation among university educators, specifically those in the BA field. While one could argue that sharing and co-design of teaching practices is relevant for any dynamic teaching discipline, in the BA knowledge-sharing becomes a necessity rather than an additional but optional aspect of our professional teaching practice, due to the complexity and very dynamic nature of this field (Wixom, et al., 2010).

This paper describes outcomes of an action-design research project focused on sharing and co-creation of innovative learning and teaching activities in BA. Our specific focus was on teaching visual analytics (VA). Compared to the mainstream BA, visual analytics has only recently made its way into leading industry practices, creating a pressing need for educators to come up with new teaching activities very quickly, in order to open up new opportunities for students in this rapidly growing area of demand. The paper describes the main design artefacts of our project including: 1) a conceptual modelling language used to represent innovative learning and teaching activities (here termed learning designs); 2) an online collaborative environment for sharing and co-creation of these learning designs; and 3) an evolving collection of innovative teaching practices expressed in the proposed language and stored in the online repository. In addition to describing the main phases of our project, the paper also offers some ideas about future research, enabled by this evolving knowledge-sharing environment.

BACKGROUND AND MOTIVATION

Universities are knowledge intensive organisations engaged in a wide range of value-creating knowledge processes. Just like in any other complex organisation, knowledge sharing among practitioners is of fundamental importance for organisational learning, agility and innovations.

Knowledge sharing in teaching communities is not a new concept. There are numerous examples of general-purpose and discipline-specific educational web repositories. However, more often than not, these repositories remain content-, rather than practice-focused. In other words, they continue to focus on educational content and educational resources, rather than on effective methods for sharing of teachers' experiential knowledge related to their teaching practices, in particular teaching methods.

Sharing of teaching practices is very challenging because it combines, to some degree, both explicit and experiential knowledge. While in more established disciplines, teaching methods (i.e. effective approaches to teaching a particular concept) are likely to be known, tried and tested by many, over many years (sometimes even centuries), in the emerging disciplines such as BA these practices are yet to be established. As argued by Agostinho (2008), teachers need guidance in an effective form (i.e. beyond text-based description in scholarly publications and textbook) to enable them to create innovative pedagogy and share it across disciplinary boundaries.

Acknowledging the challenge of effective sharing of teaching practices, prior educational research confirms the need for more effective and systematic ways of representing the teaching guidance and practice in how to create innovative pedagogy, to enable their sharing and reuse (Agostinho, 2008). There is a growing demand for a systematic representation of reusable ideas related to innovative teaching practices (Oliver, 2007), in particular the effective learning activity models and standardised descriptions (Laurillard, 2002). These models should be designed to *inform* rather than *prescribe* teaching practices that are always situational (Goodyear, 2004).

In order to support this argument for the sharing of teaching practices and to illustrate what has been achieved by a systematic representations of reusable ideas, these educational researchers cite examples of the existing domain-specific notational systems, used for example in music and software engineering. However, they also argue that the challenge of finding out what it is exactly that constitutes a potentially reusable idea and, more importantly, to what extent it could be captured in a systematic way, will always be a domain-specific challenge and as such should be left to the experienced domain experts i.e. teaching practitioners who have the required tacit knowledge, acquired over many years of teaching practice.

Prior educational research also offers examples of representational systems used to capture innovative teaching practices, predominantly in eLearning (Koper and Tattersall, 2005; Caroll et al., 2002; Agostinho, 2008; Oliver, 2007). Examples include sharing ideas of how to best use various ICT tools in eLearning activities that led to development of new machine-readable languages, so that once expressed these constructs can be automated. More importantly, more than a decade of this research has confirmed that the more appropriate guidance on effective pedagogy, given in the appropriate form, enabled teachers to apply, adopt and better reuse their innovative practices (Littlejohn and Pegler, 2007).

While sharing and re-use of innovative teaching practices is relevant to any teaching discipline, our focus is on the emerging discipline of BA, in particular visual analytics. Previous educational research (Wixom, et al., 2010; Wixom, et al., 2014) confirmed specific BA-related teaching challenges such as complex technology, fast changing content, lack of resources (including good data sets) and still evolving teaching practices. Compared to more traditional and long-established business disciplines, such as accounting and finance, a typical design cycle for BA curriculum is becoming shorter and shorter, due to the very dynamic nature of this discipline. Yet, teaching practices (especially teaching know-how) are still evolving around a yet-to-be-established core body of knowledge (Watson, 2009). All these challenges have been recognised in all three international surveys of BA educators (Wixom, et al., 2014; Wixom and Ariyachandra, 2011; Wixom, et al., 2010). Consequently, there is a pressing need for sharing of innovative teaching practices that provides the main impetus for the project described in this paper. The following section introduces the main design challenge and the associated design requirements tackled by our action design project.

DESIGN CHALLENGE AND DESIGN REQUIREMENTS

This practice-based research project aims to address the following design challenge (also considered as the main action-design research questions):

How to support effective knowledge sharing and co-creation of innovative teaching practices among BA educators?

Inspired by the above-described research on sharing innovative teaching practices, as well as author's insights from many years of teaching BA and long-term involvement in a leading international community of BA educators (details omitted to preserve anonymity), we derived very specific design requirements as follows:

1. *Design of a simple conceptual language to enable educators to express different types of innovative teaching practices that are:*

- Founded in educational research
- Decoupled from educational content and resources to enable educators to express different ways of using the same content
- Modular i.e. enables re-use and re-composition of different elements

2. *Design of an open online collaborative environment for BA educators to enable them to:*

- Document and store their existing or new innovative teaching practices (beyond content), using the proposed conceptual language
- Share innovative practices with other educators and get their feedback
- Reuse innovative practices or their components, created by other educators
- Collaborate to create (co-create) new practices
- Build upon the existing practice, by extending individual components
- Innovate by re-combining components of one or more practice
- Provide feedback to others and continue to learn from each other.

RESEARCH METHOD

A combined Action Research (AR) and Design Research (DR) method was originally proposed by Cole et al. (2005) with the following objectives: (1) to use scientific methods to solve a set of practical problems experienced by the researcher/practitioner (2) to contribute to the existing body of knowledge by creating new research artefacts. According to Cole et al., this integrated approach is required to stress the relevance, problem solving and intervention to learning that are all values inherent to both AR and DR. The same core values are highly applicable to our project and closely match its aims and objectives, both in research and in practice.

In more recent times this combined method became known as *Action Design Research* (ADR). "The method conceptualizes the research process as containing the inseparable and inherently interwoven activities of building the IT artefact, intervening in the organization and evaluating it concurrently" (Sein, et al, 2011, p.1).

Figure 1 depicts our implementation of a combined ADR method. As shown, the concept of Design Research Circles by Hevner et al., (2004) was extended to include an AR phase "Reflection and Learning", as suggested by Cole et al. (2005). This phase could be also described as "reflection-in-action" (Schon, 1983).

The main research artefacts of our ADR project include:

1. a conceptual modelling language used to express teaching practices (named learning designs) in a systematic way to enable sharing and reuse (Design requirement 1)
2. on-line collaborative environment designed to support knowledge sharing and reuse of innovative teaching practices (Design requirement 2)
3. a collection of the actual teaching practices, expressed using the conceptual language (Design requirement 1) and stored in the online collaborative environment (Design Requirements 1 and 2)

It is important to note that design, implementation and evaluation of design artefacts were not separated, as is typically done in DR, as previously critiqued by Sein, et al. (2011). Instead they have been interwoven, thus, *shaping each other in use*, through the researcher/practitioner's reflection-in-action and reflection-on-action (Schon, 1983). By doing so, we confirm the previous observation by Sein et al. (2011) that the ADR research process contains the inseparable and inherently interwoven activities of building the artefact intervening in the real setting and evaluating it concurrently, over several research cycles. The subsequent sections of this paper describe the main phases of the combined action design research, as adopted in this project.

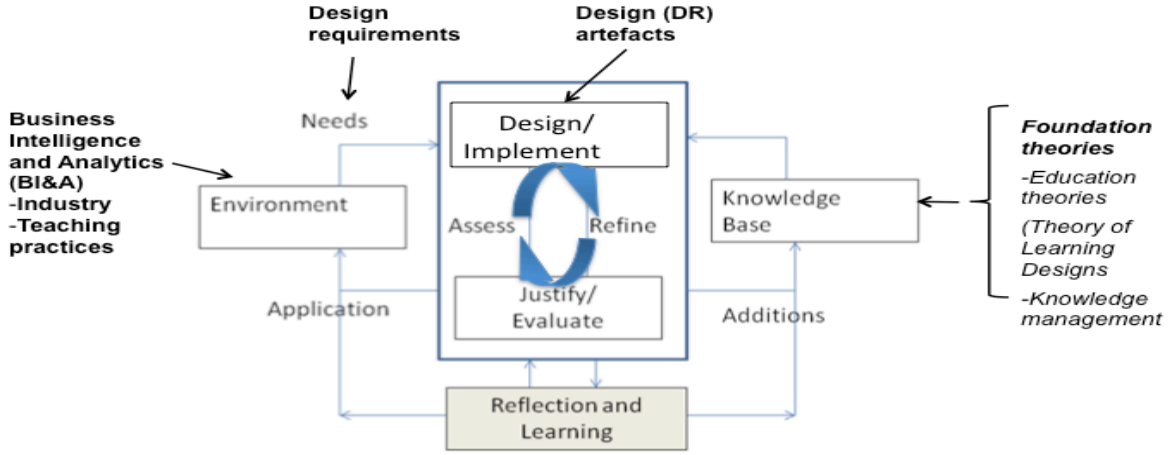

Figure 1: Our Action Design research method

FOUNDATION THEORIES (ADR KNOWLEDGE BASE)

Knowledge Management

In this project we adopt the human-centric rather than technology-centric view of knowledge sharing. We also distinguish between the explicit and tacit knowledge. *Explicit knowledge* can be easily written down or drawn and made explicit to people, who share the same context. *Tacit knowledge* includes things known by people but not possible to externalise. Examples include the know-how, understanding mental models and insights of an individual or discipline. Know-how often includes a vast store of knowledge that people don't even know they have. So, to become aware of this knowledge, they need a problem or an issue to draw it out. Know-how is difficult to communicate as it is always contextual and by nature incomplete. Only some aspects of it can be externalised and only to some extent is this commonly termed "experiential knowledge".

Teaching practices combine to some degree, explicit knowledge (e.g. resources) and ever-evolving experiential knowledge (teaching methods) as well as tacit knowledge, possible for individuals to tap-into, but not possible to externalise so it can be shared. Consequently, it is not our intention to capture teaching practices in their entirety. Therefore, systematic description does *not* imply systematic prescription. The main objectives are to inform the practitioners, encourage possible reuse and help generate new ideas. The same point was also made by Goodyear (2004) who argues that the appropriate teaching guidance needs to *inform* rather than prescribe. Numerous research studies from the Knowledge Management (KM) field confirm that any attempt to codify and "capture" what is in essence tacit knowledge is destined to fail (Malhotra, 2002). The KM research also confirms that in order to make sense of the externalised experiential knowledge stored in any form, it is necessary to share the context required to interpret the original experience. However, rather than trying to document all possible tips, insights and observations - a knowledge sharing method that has been proven not to work with tacit knowledge (Kwan and Balasubramanian, 2003), another option is to store some of this knowledge but also help bring people together so they can discuss/clarify the context, often via communities of practice (Davenport and Prusak, 1998). Therefore, we consider the task of building a community of practice around this online collaboration tool as an equally important challenge that is also currently in progress.

Theory of Learning Designs

This section describes the theory of *learning designs* that has been previously used to address the problem of sharing of learning activities. This theory has emerged as a response to the "content-driven" pedagogy that, although widely used by various online educational platforms, is quite limited as it reduces learning to consumption of content (Koper and Olivier, 2004).

In reality, teaching and learning processes are highly creative and could be guided by different pedagogical models. The main focus of the emerging theory of learning designs is sharing and reuse of these processes. Conceptually, a *learning design* (in this paper denoted as LD) represents and documents a high-level teaching practice using some notational form, so that it can serve as a description, model, or a template, that can be adapted or reused by a teacher to suit his/her context (Agostinho, 2008).

To make it easier for practitioners to understand LDs, Koper and Olivier (2004) use a metaphor of a theatrical play. A play consists of one or more act(s) and each act is implemented by one or more concurrent roles, playing different parts. The acts in a play can follow a sequence or a more complex structure including concurrent acts or even more complex coordination patterns. During each act, roles use various resources to achieve the intended objectives.

Hence, a LD corresponds to a theatrical script (i.e. a high level model of a play) that can be *shared*, in order to be "instantiated" (staged) many different times by different actors, in different environments and for different audiences. Consequently, each theatrical performance (of the same play) is always unique and highly contextual.

Compared to lesson plans, LDs are typically represented at a higher level of abstraction. They are written to promote knowledge sharing and reuse in a future *unknown context* by other educators, who understand the notation as well as the meaning of the content being represented to be able to reuse it. On the other hand, a lesson plan is written to provide detailed guidance to an educator in a very specific (known) context. Therefore, a lesson plan could be seen as a detailed instantiation of a script (i.e. LD) in a particular educational context that is typically written by an educator himself or herself for their own class and/or their teaching team.

Furthermore, to facilitate knowledge transfer, a script (LD) needs to be written in a systematic way, using a notational system that is widely understood. Also it has to be generic enough to enable its sharing and reuse. Even though the concept of a LD uses a "script", it is meant to be less prescriptive and more flexible than the actual "theatrical script". This will ensure that learning activities are truly flexible and driven by the teacher, rather than constrained by the script. In fact, teachers are the only ones who have the contextual knowledge and the ability to assess the progress of the chosen activity on the spot (in terms of student learning), and make a situational decision to fine tune it or change it all together, in order to achieve the intended learning objectives.

Our literature review confirms that LDs are currently documented in many different ways, are used for many different purposes, and, are modelled at very different levels of granularity. The field is still emerging and consequently, there is no consensus over definitions and the main components of a LD (Agostinho, 2008). A good overview of the six major learning design representations is given in (Agostinho, 2008).

DESIGN ARTIFACTS

Design Requirement 1: A Conceptual Model of Learning Designs

As shown by Table 1, a conceptual model of a LD consists of one or more loosely coupled (suggested) learning tasks. Educational grounding for LDs was found in the so-called Revised Bloom's taxonomy by Andersen et al. (2002). Thus, each task is aimed at specific level of knowledge and conceptual skills, suggested by the LD's designer on the basis of his/her experience of using this LD in their classroom.

It is also important to observe a clear separation among (i) educational resources ("*what to use*?"), (ii) learning tasks ("*what to do*?") and (iii) one or more instructional design pattern ("*how to do it?*"). Thus, the same learning resource can be used for more than one task or reused by different LDs. The instructional design patterns (IDP) describe different coordination and collaboration patterns of tasks and roles (teachers and students) in the chosen learning activity. In essence, this layer describes "Who needs to do what" in order to complete a particular task, as specified by the corresponding LD. These high-level patterns are *independent* from any teaching context, learning resources or learning activities and, therefore, can be reused to engage students in many different ways and increase class interactivity. By providing the alternative instructional design patterns to teachers, it is possible to create very different implementations of the given learning design, to suit different learning groups as well as different teaching styles. For example, collaborative work can be implemented as online discussion, in-class peer-review, in-class whiteboard gallery, learning circles etc. – all suitable for different purposes and all involving different coordinated tasks performed by the teacher and his/her students.

By providing different suggestions we aim to expand our collective repertoire of interactive classroom activities, but also to discover (through experience) those that could be more or less suitable for teaching some BA concepts. For example, based on the author's experience, peer-review or other instructional design patterns that expose a student to one or more alternative solutions, appear to be highly suitable for teaching the concepts and practice of multi-dimensional data modelling or other design tasks.

Design Requirement 2: Design of a Collaborative Environment

An open collaborative environment for sharing and co-design of innovative teaching practices, expressed as the above described learning designs, was implemented in 2013, using wikispaces (i.e. a wiki-based collaborative environment). The environment continues to be used to date. Figures 2 and 3 shows two screen shots from the actual environment (*http://oltproject.wikispaces.com/*). Taken *together*, they depict different *components* of learning design (LD13), created and stored in this environment and then made available to other educators to use.

Figure 2 illustrates some aspects of the collaborative environment. The LDs listed on the left show a list of currently available learning designs, with LD13 being selected and open (middle of the screen). Table of content (on the right) shows the main components of a LD.

As per our stated design requirement 2, this environment enables its users (educators) to design a new learning design (with the guidance provided, especially around educational taxonomy), store it and make it available to other educators to use, expand and provide feedback. They can also use the search function to look for other similar LDs, or their components including resources, they may like to adopt. Educators interested in, for example, scaffolding student learning through progressive LDs, across several weeks or a whole semester, may use the search option to look for LDs at a particular level of the revised Bloom's taxonomy. They can adopt the existing sequencing of LDs or design their own, suitable for their own context.

Alternatively, the users can look for a particular resource (e.g. a case study) and then explore all LDs using this resource in a variety of ways. The educators can focus only on the IDP component to get ideas about how to make their activities more interactive regardless of the context. With the guidance provided, they can explore possibilities to assemble different components from different LDs is a completely new way.

Figure 3, focuses on the first two tasks of LD13. In Task 1 students are given a complex business problem ("a problem of longer product delivery time to the company's top customers") and are expected to analyse possible root-causes, taking different perspectives (e.g. "sales and marketing", "production" etc.). This particular type of problem enables students to assume different disciplinary roles (e.g. marketing manager, production manager etc.) and work in multidisciplinary teams (as they would in a real-life environment). As shown, students are also given additional resources (including a case study) to help them gain a better understanding of the problem. Their collaboration will be guided by a particular IDP, chosen by their teacher as the most suitable for their context. For example, based on their class sizes, resources available and even seating arrangements in a particular classroom, the teacher may adopt *learning circles* (suitable for small classes), *small group discussion* (suitable for large classes) or the *whiteboard gallery* IDP suitable for environments where students can safely move around the room in order to observe and assess the work posted by different groups.

In Task 2 students are expected to collaborate in order to come up with a solution that needs to be demonstrated using a provided visual analytics tool (in this case Tableau). Because the actual tasks are decoupled from resources, including software, it is possible to implement the same set of tasks using different visualisation software that is available in other educational environments and contexts.

EVALUATION AND DISCUSSION

All design artefacts were created for, and implemented in our own teaching practice, through mini action learning circles, initially within the author's university and then subsequently across two universities (Sydney University and Deakin University). They are also in the process of being adopted by another business discipline (Co-operative Studies at Sydney University) which is interested in innovative teaching using visual analytics beyond the BA discipline, as originally intended.

As previously stated design, implementation and evaluation of design artefacts have been interwoven (Sein, et al. 2011), *shaping each other in use*, through the researcher/practitioner's reflection-in-action and reflection-on-action (Schon, 1983). The online environment continues to be used to support design and sharing of innovative teaching practices, recently with members of Teradata University Network (www.teradatauniversitynetwork.com) – the largest international community of BA educators. This is envisaged to increase our individual repertoire of teaching innovations and ideas.

Furthermore, Hevner (2004) suggests different forms of evaluation of design artifacts including: case studies, experiments, field study and simulation, taking into account the identified needs that had led to the development of the artifact in the first instance. The first type of evaluation used in our project was evaluation of the expressiveness of the proposed conceptual language. This was done in several phases. After designing the original conceptual model and a prototype of a collaborative environment, the author, who was also the main designer, used a sample of diverse examples of her existing teaching practices and represent them as LDs, using the conceptual language. The same task was then given to a research assistant (an experienced BA professional and the author's former student) who was asked to provide a BA-related (rather than educational) feedback. Insights obtained were used to fine-tune the conceptual modeling language as well as the wikispaces environment.

Table 1: A Conceptual Model of a Learning Design

LD Components	Explanation
Learning Design: LDxx	LD's Unique ID
School of Thought / Discipline	Suitable teaching discipline (e.g. Business Analytics, Knowledge Management
Suitability	Undergraduate or postgraduate course
Knowledge Level	Reference to Bloom's extended taxonomy by Anderson et.al., (2002) – commulative for all tasks
Learning Design Objective & Overview	The main learning objectives and overview of the whole LD
Required Resources	Learning and Teaching resources
Specific Instructions	Specific instructions are offered for each task
Task 1	Task id
Teacher's briefing	An introduction to each task designed to set the scene
Taxonomy Relationship	Mapping of the task to the specific level of knowledge and cognitive skills of the extended Bloom's taxonomy
Resources	Specific learning resources for each task
Instructional Design Patterns	Different ways how to go about teaching a specific task
IDP Pattern 1	A suggested instructional design pattern
IDP Pattern 2	The second alternative IDP etc.
IDP Pattern n	
Task Notes	Additional notes for Task 1
Task 2	…
Task n	…
Suggested Next LDs	A suggested learning progression and the most suitable subsequent LDs
Related LDs	Related activities that teach similar concepts or additional activities for the same level.
NOTES	Additional notes for the whole LD (e.g. an average duration)

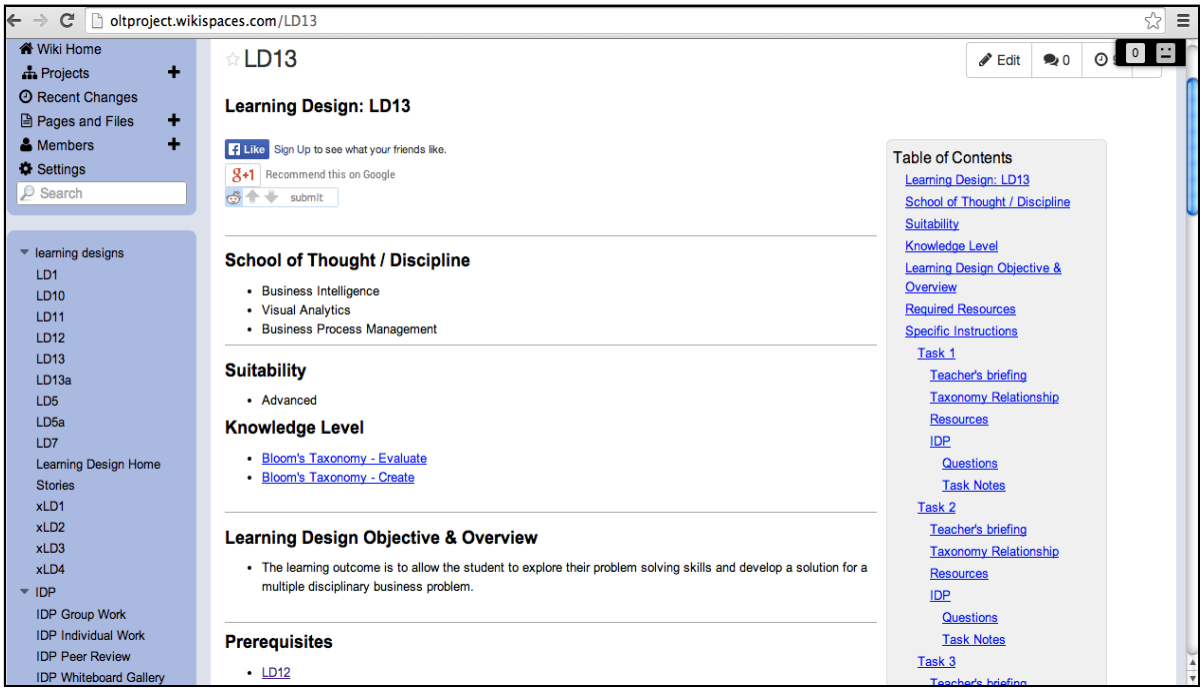

Figure 2: The wikispaces collaborative environment (shown with several components of LD13)

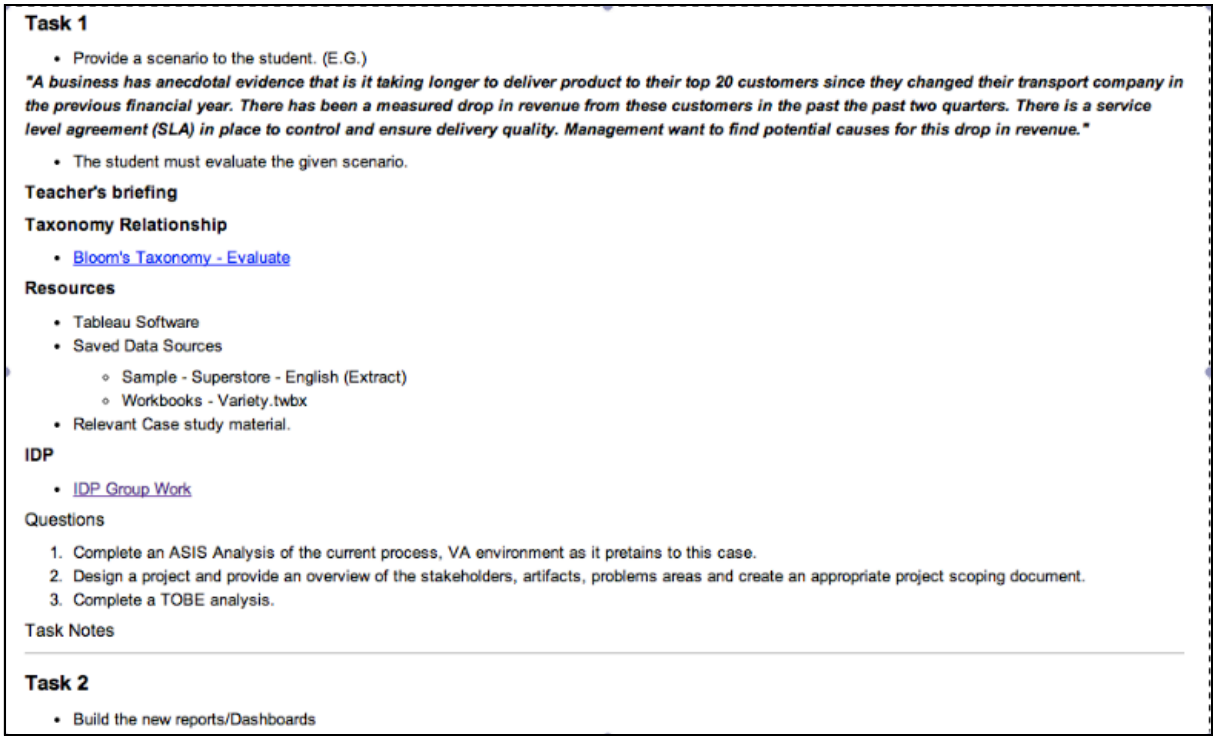

Figure 3: Task 1 of LD13 learning design

In the next step, the online environment, including the initial set of LDs were made available to a cross-institutional project team of BA educators, who were invited to provide feedback as well as document their own teaching practices without any consultation with the original designer. This has resulted in a new LD being designed to represent a visual analytics assignment in an introductory statistics unit (from Deakin University). While this type of cross-institutional evaluation continues with new LDs being designed and stored, the latest developments include educators from another business discipline (Co-operative Studies) interested in using visual analytics in their own units. This triggered the next phase of evaluation that is currently in progress. The main objective here is to test possible reusability of different elements of LDs in different disciplinary contexts, beyond BA. This is envisaged to further expand our repository of learning designs to include innovative teaching practices beyond BA, in order to facilitate possible cross-pollination of ideas across disciplines.

Although still limited, the above-described forms of evaluation offer very encouraging feedback on the sharing of innovative LDs. However, a possible adoption of this environment by a larger community of BA educators, or educators from other disciplines would enable a more comprehensive evaluation, needed to confirm that the online environment does support knowledge sharing, in particular the re-use and generation of new ideas.

REFLECTIONS, CONCLUSIONS AND FUTURE WORK

The main objective of this research was to investigate the design problem of sharing and reuse of professional practices among educators in the emerging and highly dynamic discipline of Business Analytics (BA). After more than a year of reflection-in-action and reflection-on-action, we have observed that the design of the proposed conceptual language and the design of a wiki-based collaborative environment have not been the main challenges of this applied project. Instead, the main challenge has been the actual design of realistic learning activities in BA aiming at the different knowledge and cognitive levels that could be then implemented in class, in different ways using different instructional designs. Our design artefacts enable systematic description of these practices, in a way that could facilitate easier knowledge transfer. Also the collaborative environment provides support for various operations that could make the reuse of these practices, or some of their components easier among people who are not sharing the same contexts. For example, one can learn how to use a sequence of LDs to scaffold students' learning or explore how other educators are using the same case study to achieve different learning outcomes, without knowing very much about the Revised Bloom's taxonomy (Anderson et al., 2002). So we see this environment as an exploratory, knowledge sharing and design support tool, rather than just a repository of static learning designs.

The three main design artefacts of this action design project (the conceptual language, online collaborative environment and a collection of learning designs) are envisaged to evolve even further, as our collective understanding of different ways of teaching BA improves over time through experience and knowledge sharing. In using this environment, we also observed new opportunities for research beyond education and BA. Possible research directions include research on knowledge sharing and co-creation, virtual communities, organisational learning in educational setting and community leadership.

Our further research includes design and evaluation of a more comprehensive set of learning designs as well as further refinement of the conceptual language, the collaborative environment and evaluation methods. We are also committed to building a wider community of business and other educators interested in sharing of innovative teaching practices related to business analytics/visual analytics and invite the readers to join us.

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