Sharing and Reuse of Innovative Teaching Practices in Emerging Business Analytics Discipline

Olivera Marjanovic
The University of Sydney Business School
Sydney, Australia
o.marjanovic@sydney.edu.au

Abstract
This paper focuses on the educational research/knowledge management problem of sharing and reuse of teaching practices in an emerging business analytics discipline. Our research context is the Teradata University Network (TUN) community – the leading worldwide community of university and industry members in the field of business intelligence/business analytics. This research aims to investigate the following research question: “How to support and improve knowledge sharing and co-creation of innovative teaching practices in the TUN community?” The paper describes a three-level model of knowledge repository, consisting of (i) instructional resources, (ii) domain-specific learning designs, and (iii) instructional design patterns. In combination, these layers enable design, reuse and sharing of innovative teaching practices, as illustrated in the paper. In addition to making research contributions to educational research and research-led teaching in business analytics, this project also aims to contribute to teaching practice, by improving the current knowledge sharing and reuse of innovative practices.

1. Introduction

In recent years, the field of Business Analytics, also known as Business Intelligence (BI), has experienced an unprecedented growth across all industry sectors. From its diverse origins in data warehousing, simple reporting and codified intelligence, this emerging field has evolved well beyond technology. The latest thinking emphasizes human-intelligence i.e. human ability to interpret data and turn insights into value-adding actions.

While some practitioners and researchers alike use the term “business intelligence” for reporting or BI technology, and “business analytics” for more advanced applications, such as data mining and predictive analytics, in this paper we adopt a broader all-inclusive view of business intelligence. Thus, BI is an “umbrella term that is commonly used to describe the technologies, applications and processes for gathering, storing, accessing and analyzing data to help users to make better decisions” ([1], p. 14). Therefore, we will be using the terms business intelligence and business analytics interchangeably.

One of the important consequences of the emerging nature of this field, as well as its rapid expansion, is a world-wide shortage of BI professionals, as confirmed by very recent industry reports [2], as well as two academic surveys [3] and [4]. Also, “the biggest barrier to BI deployment continues to be a lack of user skills and knowledge of best practices” ([5], p. 2).

Fast changing content and even faster changing technology continue to create numerous teaching challenges related to design and delivery of BI-related subjects and programs. “Faculty members are challenged with staying abreast of business intelligence (BI) and teaching the topic in relevant ways” [6]. Compared to the more traditional disciplines, a typical action learning cycle of design, implementation, evaluation and ongoing improvement of BI teaching practices is becoming shorter and shorter. In spite of the recent developments, BI is still considered to be an emerging field. Teaching practices are still evolving around the core body of knowledge (i.e. fundamental concepts and frameworks), that is yet to be firmly established in the BI community [7].

Most importantly, regardless of the tools and pedagogical methods used, one of the key teaching challenges in this field is to go beyond currently available technology, in order to prepare students for yet-to-be-invented tools and business practices of tomorrow. In other words, today’s students will be working in the new information environments that could not be even imagined (in terms of their size, data types, technologies), let alone described to students. Therefore, it is important to design learning experiences to help students to make their learning
transferable to the future BI contexts, thus helping them to learn how to learn. Design of these learning activities require a solid grasp of educational theories and curriculum design methods [8], including for example reflective learning [9] and action learning. Some BI teachers may not be formally trained to use these methods and would benefit from re-using the activities designed by more experienced teachers.

The above-identified teaching challenges call for collaboration and more effective knowledge sharing among BI educators. Even more, our wider collaboration will ensure that this emerging teaching discipline continues to grow and improve, at a much faster rate than what would be achieved otherwise, through isolated “pockets” of good practices.

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

However, in very recent times, teaching communities are becoming aware of the importance of sharing and co-creation of teaching practices. In fact, this has been identified as one of the key challenges to innovative education today [10], [11] and [12].

This paper focuses on the research problem of sharing and reuse of teaching practices in the BI discipline, motivated by the teaching challenges described above. While the actual teaching practices consist of many different components, we focus on their most creative aspect – that is design of learning activities. Our research context is Teradata University Network (TUN) - the leading worldwide BI community of academic and industry partners [13].

Inspired by the real knowledge sharing needs experienced in this environment, as well as perceived opportunities for possible improvements, this research focuses on the following research question:

“How to support and improve knowledge sharing and co-creation of innovative teaching practices in the TUN community?”

The research project described in this paper uses a design (science) research method [14] to create a simple, domain-specific, high-level conceptual language for modeling of innovative teaching practices in the TUN environment. These practices are represented as a three-level model that combines educational resources, domain-specific (BI) learning designs, and instructional design patterns. From the educational research perspective, the proposed model further extends the emerging concept of learning designs, previously considered by [10], [12] and [15] in the field of eLearning. Compared to the current approaches to sharing of teaching practices in TUN, the proposed model enables learning activities to be decoupled from the learning resources, facilitating their better reuse. Most importantly, this model separates learning activities from the so-called instructional design patterns that are context-, activity- and resource-independent. As such, these high-level patterns could be reused in different activities and combined with different resources to create very innovative and interactive learning experiences, as illustrated in this paper.

2. Related work

Teaching practices combine to some degree, both explicit and experiential knowledge. While in more established disciplines, teaching methods (i.e. effective ways to teach a particular concept) are likely to be known and well tried and tested over many years (sometimes even centuries), in the emerging disciplines such as BI, these practices are predominantly experiential and still emerging.

The latest educational research calls for more effective and systematic ways of representing the teaching guidance and practices how to create innovative pedagogy, to enable their sharing and reuse [12]. “There is a substantial unmet demand for useable forms of guidance and a systematic representation of reusable ideas, rather than fixed, pre-packaged content-based solutions [15]. “There would be great value in programme of work to identify effective learning activity models and build standardized descriptions of the forms they take [16]. These models should be designed to inform rather than prescribe [17], as teaching practices are always situational.

Educational researchers often cite examples of domain-specific notational systems used in different disciplines (e.g. music, software engineering), to illustrate what could be achieved by a systematic representation of reusable ideas. Obviously, the essence of what constitutes a potentially reusable idea or a practice and, more importantly, to what extent it could be captured, will always be discipline-specific, and should be left to the experts with a substantial domain knowledge (both explicit and tacit).

Most importantly, there are already examples of educational research, confirming that the more appropriate guidance on effective pedagogy, given in the appropriate form, enable teachers to apply, adopt and, better reuse their practices [18]. This important evidence comes from the field of eLearning where, for almost a decade, researchers have been conducting interesting work on representational systems to capture
teaching practices and good ideas how to best use various ICT tools (e.g. forums) in eLearning and blended learning activities. For examples see previous research described in [10], [12] and [15].

Inspired by the above cited research, we also argue that, by analogy, the TUN environment is very likely to benefit from a more structured and systematic description of BI teaching practices, as well as a new method for describing these practices. These are the exact research challenges this project aims to investigate. Furthermore, given the previous knowledge management (KM) research that confirms that the success of knowledge repositories is closely related to the communities using them [19], TUN has a distinct advantage compared to the other web based educational repositories. TUN has already implemented a number of strategies to support a worldwide community of BI members, interested in, and already engaged in sharing of TUN resources and teaching practices, as described in the next section.

This research aims to improve the existing approaches and create new opportunities in this area. The following section offers a brief overview of TUN and sets the context for our practice-inspired educational research.

3. Context: Teradata University Network

The TUN community was initiated more than a decade ago and currently (in 2012) includes more than 2,000 academic members from over 1000 universities in 78 countries [13]. The community is supported by a free learning portal designed to support a worldwide community of academic users “to teach, learn about and connect with others in the fields of Business Intelligence, Data Warehousing, Data Management and Decision Support Systems [20]. This free resource repository provides an ever increasing number of valuable learning and teaching resources, including industry-based case studies, white papers, web casts and podcasts, learning activities, assignments and solutions, as well as commercial BI tools, training packages and large industrial-strength data sets. These up-to-date resources are provided by industry members as well as leading academics in the field. A very comprehensive overview of different types of TUN resources is provided by [21].

Furthermore, TUN provides much more than a repository of educational content. It enables all members from industry and academia to form synergistic relationships, where each side contributes to the shared value creation process, in its own way. For example, industry partners add value by providing up-to-date, industry-relevant resources. These resources are then used by the academic community to design learning activities for their students and, via TUN portal, share them with the other members of community. Even though the individual goals of university and industry members are very different, they are aligned and mutually supportive, creating a win-win-win situation for everyone. “Teradata and other industry partners are increasing brand awareness and thought leadership, students acquire up-to-date skills, employers receive better graduates and professors are more effective” [22].

4. Problem Definition

In order to evaluate and better understand the existing approaches to sharing of teaching practices within TUN community, a very comprehensive qualitative analysis was undertaken, focusing on:

- different types of TUN resources that contain teaching practices or experiential knowledge expressed in some form
- the current approaches to describing these activities e.g. text-based, model-based etc.
- different ways these practices are evaluated (formally or informally) and if some information of the outcomes is provided,
- the current level of decupling of teaching practices from the resources used by these practices,
- identification of the alternative teaching practices designed to use the same teaching resources,
- the level and quality of knowledge representation within each practice in terms of learning objectives, the assumed or intended level of knowledge (e.g. fundamental concepts, applied, experiential knowledge and creativity) and
- the current level of instructional design represented by each teaching practice.

Our analysis has identified a number of limitations and opportunities for possible improvement. First of all, teaching (learning) activities are not described in a systematic or consistent way. Their description often does not include very important teaching-related information, such as the intended learning objectives or the intended knowledge level for a particular activity (e.g. the level of awareness versus applied knowledge). Learning activities and/or resources are simply described as suitable for postgraduate and/or undergraduate (i.e. graduate/junior) students, obviously with very useful questions/activities and answers/solutions, but without more descriptive instructional guidance. The main emphasis is still on the resources, rather than teaching practices. In other words, content is structured around TUN resources more than teaching/learning activities. Most importantly, learning activities (how to teach) are...
tightly coupled with the supporting learning resources. It is not very easy to see how the same resource could be reused in very different ways to achieve a completely different set of learning outcomes. Just using the provided search tool to look for the specific TUN resource is not sufficient.

Based on the above findings, we argue that the currently used knowledge sharing methods in TUN, as well as the artifacts being shared, could be taken even further, in order to enable better and easier reuse of the existing resources and well as to enable creation of new resources and generation of new ideas, as attempted by this research.

5. Research method

The research project described in this paper follows the principles of Design Research (DR) method (also known as Design Science research). DR is an applied research method that relies upon the application of rigorous methods in the construction and evaluation of the design artifact, aiming to contribute both to the theory and practice. [14]. More precisely, this research method aims to make a contribution to the existing body of knowledge, both in terms of the foundation concepts (including new theories, frameworks, instruments, models and methods) and methodologies (including data analysis techniques, formalisms, measures and validation criteria).

When used in the information systems (IS) or IT fields, DR research method tends to be focused on the construction and evaluation of technology artifacts, designed to solve practical problems. However, “it should be stressed that the outcome of DR is not only systems” [23]. In addition to the IT and IS fields, principles of DR have been used in other disciplines such as education and management with the research outcomes (or research artifacts), being new models, new organizational practices, even new organizational forms. In fact, March and Smith [23] identify four possible design outputs (artifacts): constructs, models, methods and instantiations.

According to Hevner [14], design process is a sequence of expert activities (depicted by Figure 1) that produce an innovative product (i.e. research artifact). The proposed sequence aims to inform and guide, rather than prescribe. After all, design of such an artifact is highly creative endeavor and could be described as art more than science. Therefore, it cannot be reduced to a set of steps that, when followed, would result in the new design artifact.

Also, as depicted by Figure 1, even this highly creative process needs to be informed by the existing knowledge base that provides the theoretical concepts that could be used to guide design thinking and problem analysis.

As described by the previous sections of this paper, this research project was inspired by the need to solve a context-specific, knowledge management research problem, while improving the current practices of knowledge sharing in TUN. Therefore, the TUN environment constitutes the “Environment” component of our DR method.

The main design artifacts include a conceptual model language (notation) for modeling of teaching practices, design principles and guidelines for modeling of these practices as well as a growing collection of the actual models of teaching practices that have been designed so far. The subsequent sections of this paper describe these artifacts.

6. Foundation theories (Knowledge Base)

The Knowledge Base (Figure 1) for this DR project came from two fields: knowledge management and education. While the relevant knowledge management concepts, such as explicit and tacit knowledge, were described earlier in the paper, this section briefly describes the emerging theory of learning designs that has been increasingly used to address the problem of sharing of learning activities. It has recently emerged as a response to the “content-driven” pedagogy that, although widely used by various online educational platforms, is still quite limited. As Koper and Olivier [24] pointed out, this popular pedagogy is based on the following set of quite limited principles: “Learning is the process of consumption of content… In order to learn, a user needs to go through a sequence of learning objects… Teaching is the art of: (1) selecting and offering content in a sequenced, structured way and (2) tracking the learner’s progress through the content module and assessing the acquired knowledge” ([24], p. 97).

In reality, teaching/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 teaching practice (learning activity) 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 [12].

To make it easier for practitioners to understand LDs, Koper and Olivier [24] use a metaphor of a theatrical play. Thus, the model of a play is a script that can be shared, in order to be “instantiated” (staged) many different times by different actors, in different environments and, for different audiences. Obviously, the script needs to be written in a systematic way, using a notational system that is widely understood to facilitate knowledge transfer. Also it has to be generic enough to enable its sharing and reuse. The actual performance (an instance of the process) is always unique and highly contextual. A play consists of one or more act(s) and each act is implemented by one or more concurrent roles, playing different parts and using various resources. The acts in a play can follow a sequence or a more complex structure that includes concurrent acts or even more complex patterns.

Even though the concept of 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 learning objectives.

In spite of the growing number of projects, emerging over the last decade, the research related to LD, their representation and use, is “still considered to be in the emergence stage. …Consequently, there is no consensus over definitions and what really constitutes a LD” [12]. The reported projects typically distinguish between “Learning Designs” (upper cases), to refer to the process of designing learning activities, and “learning designs” (lower cases), to describe the outcomes of the design process such as documented representations that could be shared. This project predominantly focuses on the models of teaching practices i.e. conceptual models of “learning designs” (here denoted LD) in the TUN environment.

A very comprehensive literature review confirms that LDs are currently documented in many different ways, are used for many different purposes and, are modeled at very different levels of granularity. A good overview of the major six learning design representations is given in [12].

It is also important to clarify that in some (but not all) cases, commonly used lesson plans, may be also considered as examples of LDs, depending on their structure, instructional details, granularity, notation but most importantly, their intended use (e.g. to guide an individual teacher’s practice in a particular class, or to be used for knowledge sharing and reuse by others). Note that LDs are typically represented at the higher level of abstraction than the lesson plans, and written to promote knowledge sharing and reuse in a future unknown context, by the other educators, who understand the notation as well as the meaning of the content being represented, to be able to reuse it.

The theoretical grounding for our work comes from the learning design theory by Koper and Olivier [24]. Our proposed model is an extension of the emerging concept of learning designs, previously considered by [10], [12] and [15] in the field of eLearning. We propose to extend the learning design layer with two more layers to capture learning resources and instructional designs, as described next.

### 7. Conceptual modeling of BI teaching practices (DR research artifact)

As previously described, TUN environment is a rich repository of learning resources of different types. In order to capture the essence of BI teaching practices in a systematic way, we propose to combine the resource repository with two more layers, and turn it into a knowledge repository of teaching practices. In essence, we propose a three-level model of TUN environment, conceptually shown by Figure 2.

| Layer 3: Instructional designs | ID1, ID2, ……IDn |
| Layer 2: Learning designs | LD1, LD2, ……, LDn |
| Layer 1: Learning resources | R1, R2, ……, Rn |

**Figure 2: A three-level model of repository**

A teaching practice spans across all three levels, combining (i) one or more educational resources from Layer 1 (“what to use?”), (ii) a learning design from Layer 2 (“what to do?”) and (iii) one or more instructional design pattern from Layer 3 (“how to do it?”) For example, Figure 2 shows a teaching practice combining Learning resource R2, Learning design LD2 and Instructional design ID1. Many different combinations are possible, giving the educators, using/designing a particular teaching practice flexibility to match their learning objectives and educational context. Thus, the same learning resource could be used by more than one teaching practice and
the same learning design could be implemented by more than one instructional design. The layers are further explained as follows:

**Layer 1: Learning resources** – this is a set of one or more resources recommended for a teaching practice being described. In this context we are using TUN resources, however, any other educational resources are also suitable.

**Layer 2: Each LD is captured by the following components:**
- **Knowledge Level:** This component is used to express the intended knowledge level for the given learning activity, ranging from the factual knowledge to creativity, as depicted by Figure 3. This particular taxonomy is an extension of the well-known Bloom’s taxonomy with the creativity level.

![Figure 3. Different levels of knowledge](image)

These levels are briefly explained as follows:

- **i)** The *factual knowledge* level includes fundamental concepts, such as terms, definitions and basic relationships between concepts. The activities at this level require students to recognize, name, classify and/or define the key concepts and terms, in a given context. Examples of these activities include various questions & answers designed to test factual knowledge and descriptive case studies.
- **ii)** The *applied knowledge* level requires students to apply the fundamentals in a particular context, to be able solve the given problem and/or reason about the proposed solution. Typical learning activities used to test this level of knowledge are various analytical case studies.
- **iii)** The *experiential knowledge* level requires students to apply their experience to observe, recognize and analyse the elements of open-ended problems and then proceed to find and evaluate the alternative solutions. Obviously to be able to do it, they need to acquire the applied knowledge first, and then start to “internalise” the “patterns” of the applied knowledge, into their own new experiences. This will enable them to reuse this experience in order to recognize similar problems in the future.
- **iv)** The *creativity* level requires students to recognize previously unidentified problems as well as invent new opportunities in their own environment, drawing upon their previous experience acquired in related and unrelated areas. Concepts such as lateral thinking, reflective practice and design thinking are highly appropriate thinking patterns for this level.

Continuing with LDs, the remaining elements include:
- **Learning Objectives:** The second component of a LD describes the intended learning outcomes for the given activity that need to be used to guide students experience and evaluate their learning.
- **Prerequisite Learning Design:** This component could be used to combine learning activities into more complex structures.
- **Additional learning resources:** This could involve additional activity sheets for students or any other learning resources they need to complete the given tasks.
- **Specific Instructions:** This component includes any other teaching tips or instructions that are LD-specific and therefore, not captured by the instructional design sequence (that is always generic).

**Layer 3: Instructional Design pattern:** This layer is used to describe different coordination and collaboration patterns of teachers and students in the chosen learning activity. In essence, this layer describes “Who needs to do what” in order to complete the activity, as specified by the corresponding LD. These high-level patterns are independent from any teaching context, learning resources or learning activities and, therefore, could 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, as illustrated in the following sections of this paper.

### 8. Illustrative Examples

The following scenarios offer a small sample of BI teaching practices, created, implemented and evaluated by the author and her students. The set is simple enough for practitioners to understand, even if they are not currently using any of the TUN resources, while for the current users, it is indicative enough of different types of LDs. Due to the limited space available, they are meant to illustrate the modeling concepts, rather than offer comprehensive models.

To illustrate the concept of decoupling between resources and activities we use a single TUN resource and proceed to describe different BI teaching practices using it. All chosen LDs focus on the so-called multi-dimensional (MD) modeling, but at different levels of knowledge and with different learning objectives.
In this paper we start from a well-known example of multi-dimensional (MD) modeling called “FitWorld Gym” by Jukic [25], currently available on TUN.

Figure 4 depicts a simple learning that focuses on the fundamental concepts. Thus, in this LD students are required to compare and contrast the given Entity Relationship (ER) and MD models. In order to do it, they need to identify the basic components of each model and, for example, reason about the nature of their relationship. The recommended instructional design patterns include two options. Students can work individually, or if their teacher wants to make their learning experience even more interactive, s/he may decide to use the suggested “peer review”, so students swap their solutions and evaluate each other’s work.

Figure 5 further illustrates decoupling of the learning resources from the LDs that use them. The same TUN resource “FitWorld Gym” from LD1 is now used to create a more complex learning design LD2, aiming at the applied level of knowledge and using a more complex instructional design pattern.

Recall that the applied knowledge level requires students to solve a well-defined problem, given by their teacher. Most importantly, this teacher knows that, in order to acquire this level of (applied) knowledge, students need to be exposed to as many alternative solutions as possible, in order to observe and learn from alternative designs. This is why s/he decides to use the instructional design pattern called the “White board gallery”.

Therefore, upon completing their models, students are required to post their solutions (A4 paper or a transparency) on a white board (or even classroom walls) and then walk around and analyze different solutions posted by their fellow students. They could vote for the best solution or even give an anonymous mark to each. They could be given an assessment/marking guide to do it (this is easier) or work out what is relevant and discuss their own marking criteria (a much harder way to assess).

Although they could also use the “peer review” instructional design pattern, this teacher knows that the white board gallery is a more effective way to teach at the applied level, because students are exposed to more possible alternatives than in the “peer review”, where they get to see only one more solution.
But at the same time, s/he may decide to proceed with the “peer review” simply because of the size of her class.

While experiencing the same classroom constraints as the previous teacher, another teacher may get an idea to use wikis to implement the electronic version of the white board gallery, asking her students to complete and post their evaluation online, before the next class. This could be easily implemented, as collaborative tools required to support this activity are already available. Alternatively, two teachers from different universities may decide to collaborate and reuse the same LD, but give their respective students a much more complex MD modeling problem. Those two teachers may then decide to implement a cross-institutional version of the electronic whiteboard gallery using a wiki-like solution.

9. Design and sharing of teaching practices

Suppose now that teacher C wants to take LD2 (depicted by Figure 5) a step further, as shown by Figure 6. She designs LD3 that uses a different learning resource (e.g., Harrah’s case study available on TUN [13]). She also wants to help her students to acquire the experiential knowledge. Again, students are required to design a MD for a given organization. However, compared to the level of applied knowledge, where students needed to solve the given problem, previously defined by their teacher, at the experiential level, students face a different learning challenge. They need to analyze a particular context (e.g., case organization) and use their previous experience to identify (and justify) a problem themselves (within the given parameters) and then work on a solution.
Our example now goes back to teacher A. Having observed all previous LD1-3, she decides to tackle a new learning challenge and design LD4 to help students attending her advanced BI class (e.g. at the postgraduate level) to further improve their lateral thinking skills. These skills are considered to be very important, as they stimulate creativity through observation of similar high-level patterns in quite unrelated areas. Therefore after completing LD 1-3, in LD4 students are asked to analyze their MD models (created in LD2 and LD3) and then observe common dimensions (features), even though these models were designed in different business domains. Students are then asked to find another existing TUN resource where the same dimensions would apply or even find a new example in the business press.

Therefore, rather using a prescribed TUN resource for LD4, students are required to identify and “bring in” their own resources (depicted as “?” in Figure 6). These resources could be shared in class where students could give short presentation or engage in a much more complex pattern, such as for example “learning circles”.

It is quite obvious that even with a very small set of LDs (four) it is possible to create many different activities to teach multidimensional modeling at very different levels of complexity. This is a significant improvement compared to the content currently available on TUN. In fact, the multi-level models of LDs enable us to redesign TUN as a multi-level knowledge repository (as depicted by Figure 6). Given the fact that the number of available TUN resources is constantly growing, our opportunities to create, reuse, recombine new learning activities (LDs), instructional design patterns and even design cross-university activities are only limited by our creativity and organizational constraints.

10. Evaluation

The adopted model of DR by Hevner [14] suggests that the design artifacts could be evaluated in different ways including: case studies, experiments, field study and simulation, taking into account the identified needs that had lead to the development of the artifact in the first instance. In the context of our research that focuses on the problem of sharing of teaching practices, there are several important aspects that need to be evaluated. Having in mind that the research artifact is a modeling language, the first step is to evaluate its expressiveness i.e. whether it could be used to model the existing BI-specific teaching practices in a more systematic way.

In order to complete this type of evaluation, the author used a sample of very diverse examples of teaching practices, currently available on TUN. Based on modeling performed, is possible to confirm that the proposed modeling language was much more expressive in terms of the learning objectives, instructional design and the levels of knowledge aimed at, than what is currently the case. Furthermore, decoupling the resources and instructional designs from the learning designs enabled us not only to express the fact that different TUN resources could be used in different ways to achieve different learning objectives but also to create new ideas about possible use of the other resources.

However, this type of evaluation (expressiveness of the modeling language) could be only considered as a starting point. We readily acknowledge it as the main limitation of this research at this point of time.

Even though this work was conducted in a specific teaching domain (business intelligence/business analytics), the proposed model of learning design is by no means domain specific. As such, it should be
applicable to a wider educational practice. However, further research is necessary to confirm this statement. Finally, it is also important to point out, that the above-described models are not meant to be a complete representation of the explicit knowledge and teaching practices we use. As Malhotra [19] and Davenport [26] correctly pointed out, tacit knowledge cannot be ever captured in its entirety. These models could take our existing knowledge sharing practices to the next level, and even create more opportunities for collaborative research and teaching. Our research aims to set the foundations and invite the researchers interested to test, evaluate, improve and co-design new practices.

11. Conclusions and future work

The main objective of this research was to investigate the problem of sharing and reuse of teaching practices in the TUN community. The paper describes a design research project, inspired by the perceived needs for more effective and systematic ways of sharing and reuse of our in experiential knowledge, related to innovative ways of using the existing TUN resources. The main research contribution is the proposed modeling language used to express innovative learning designs. Further research includes design of a more comprehensive set of TUN learning designs, further refinement of the proposed language and design of new methods for evaluation of their knowledge sharing and reuse potential in a wider educational context.

12. References