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New design approaches to repurposing open educational resources for collaborative learning using mediating artefacts

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In spite of high expectations and the support given by prestigious funding and educational institutions, Open Educational Resources (OER) have not been adopted widely by teachers and learners in practice. From a cultural historical activity theory perspective, we argue that Mediating Artefacts (MA) such as OER learning design visual representations and rich narrative pedagogical patterns may enable a more effective OER cycle of creation, design, use and evaluation. More specifically, two main arguments are analysed in this paper: first, that making the inherent design of OER more explicit will make them more understandable and hence reusable; second, that offering a small set of simple patterns will encourage new ways to interpret OER and inspire re-purposing in new challenging contexts. A series of successful workshops was carried out and qualitative data gathered which provide initial evidence that a set of CSCL pedagogical patterns were found very suitable in order to repurpose resources intended for individual use and adjust the focus to make them suit new collaborative learning contexts. Interpretation of the data will form the basis for further workshops that aim to extend the idea of using targeted mediating artefacts to guide the design and repurposing of OER.

Keywords: Learning design, pedagogical patterns, collaborative learning, open educational resources, mediating artefacts

Open educational resources: Opportunities and challenges

Open Educational Resources (OER) are considered to be important assets, since they may provide high-quality resources with a Common Creative Licence or equivalent to all interested learners, teachers or organizations on a global scale (D'Antoni, 2008). The open character of the resources and the eventual high impact to global well-being has motivated a significant support by Unesco and many participating countries, or funding organizations such as the Hewlett foundation. Such a high expectation for OER is also due to:

- the success of the open software movement and hence the perceived perception that something similar might be possible in terms of reuse of educational resources,
- the high investment in ICT in education and hence the notion that repurposing of existing resources is a means of lower costs,
- the impact and perceived success of key OER initiatives by prestigious institutions, such as OpenCourseWare by MIT at United States (<http://ocw.mit.edu>) and OpenLearn by the Open University in Europe (<http://openlearn.open.ac.uk>).

However, in spite of the abundance of OER and the high number of visitors to OER repositories, some recurring problems impede their wide adoption by learners and teachers and therefore influence daily practice. Besides obstacles in terms of culture, internationalization or business models (McAndrew and De Santos, 2008), we highlight two aspects that specifically relate to the design and repurposing of the open resources.

Firstly, it can be argued that teachers do not fully understand the resources and therefore they cannot effectively reuse them, or equivalently learners do not have the skill to select appropriate resources for

their own context. A considerable body of research in the Learning Design field (See for example Lockyer et al., 2008 and Beetham and Sharpe, 2007 for recent edited collections) suggests that making the design of resources explicit is of potential value to both teachers and learners, and that it can serve to capture the essence of the design and communicate the learning objectives, activities and outcomes associated with the resource more clearly. We believe that if the design of OER is made clearer to teachers and learners this is likely to ultimately make resources more reusable. Secondly, the influence of context and the flexibility through open use implies that the OER can be interpreted and used in many different ways. Indeed this is one of the key arguments put forward in terms of the benefits of OER.

One specific example of repurposing concerns resources that were designed initially for individual use that may be employed in a collaborative learning context, so that learners can benefit through social interactions in small groups or even at a classroom, or community level. Such a repurposing of the original resource for a challenging new pedagogical approach may require concrete support based on existing knowledge and validated by accumulated experience in this field. We argue in this paper that using collaborative pedagogical patterns as mediating artefacts is one way of achieving this repurposing from individual to collaborative use. Pedagogical patterns are in a sense structured case studies of good practice; which capture such an experience and provide a set of solutions associated with recurring problems, together with the underlying forces, examples and visual representations that help a better understanding for their use in a new context.

In this work we are bringing together our previous work in the areas of learning design and pedagogical patterns and using this combined approach as a means of providing an innovative new design approach to the repurposing of OER. Our focus of study is the Mediating Artefacts used in the design process. Conole (Conole, 2008) gives an account of our definition of MA, the different types and the ways in which they can be used in learning design. This term emphasises the role that different forms of representation of learning activities play in terms of how they are used to mediate subsequent design activities. Each representation foregrounds different aspects of the learning activity and provide a means of illustrating the inherent design. The work we report on here focuses on two MAs in particular which we used in the workshops. The first is a 'Task swim line' visual learning design representation, the second a set of narrative-based collaborative pedagogical patterns. Both the visually represented learning designs and formal narrative pedagogical patterns can be considered as Mediating Artefacts, due to their mediating role in terms of how they are used to mediate subsequent design and repurposing activities. These MAs build on the principles of a cultural historical activity theory perspective (see Cole and Engeström, 1993; Daniels, Wetsch and Cole, 2007) and aim to help users to make informed decisions and choices. A key notion of such a theory is the mediation by artefacts (Kuutti, 1991), which are broadly defined 'to include instruments, signs, language, and machines' (Nardi, 1995). In our context mediating artefacts are derived through a process of abstraction of learning activities, and may include models, patterns, case studies, vocabularies or iconic representations (Conole, 2008). We are interested in researching how specific design MAs might increase the effectiveness of the OER cycle. We also want to get a better understanding of the OER design process in order to offer paths for repurposing them in new significant contexts. In particular in this work we want to explore if OER designed for individual use can be repurposed for use in a collaborative context.

We report on on-going research work in which new evidence is being collected mainly through a process of intensive workshops with a mix of practitioners and experts in educational technology, as a step prior to a more extensive analysis of case studies with practitioners and learners. This research work is framed within the Open Learning Network (Olnet, <http://olnet.org>) initiative which aims to better articulate the design and evaluation of OER and to facilitate a greater degree of transfer of good practice.

In this paper, we put more emphasis on analysing the role of a small set of pedagogical patterns that form part of a pattern language for Computer Supported Collaborative Learning (CSCL) (Hernández et al., 2009). The use of these MAs has been shown to be very effective in the design of new learning activities or scripts that can be interpreted by IMS-LD compatible virtual environments, since they provide representations that are well understood by practitioners. Thus, we aim to understand the potential of the process shown in Figure 1 in the case of repurposing existing OER for CSCL through the use of appropriate Mediating Artefacts. Our view is that an OER has both the content/structure of the resource *and* an inherent design. Our hypothesis is that making that design more explicit will facilitate repurposing of the OER. In addition, both in the creation and repurposing of an OER there is a set of mediating artefacts that can be used. In the figure the mediating artefacts listed are the ones we used during the workshop.

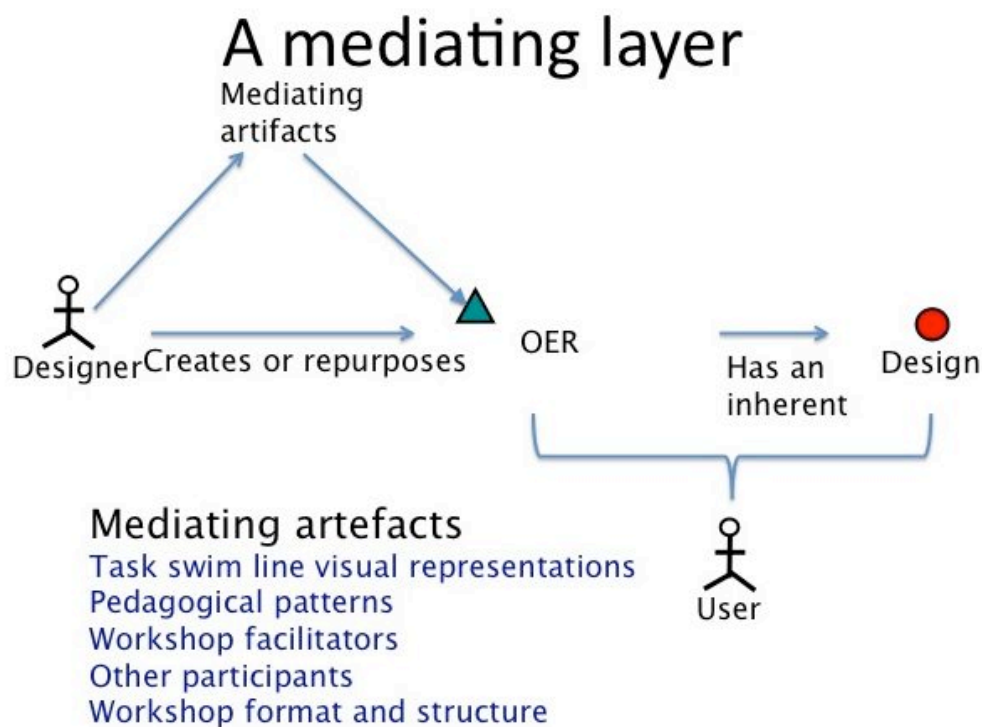


Figure 1: The process of repurposing OER through learning design and pedagogical patterns mediating artefacts

Figure 2 shows our vision for how articulation of these mediating artefacts can be used to guide design and repurposing. It shows in the centre the active process of design, i.e. OER creation or repurposing; the main artefact corresponds to a design map, as e.g. a *task swim line visual representation* produced through the CompendiumLD (<http://compendiumld.open.ac.uk>) software. According to this specific type of visual representation students and teachers employ one swim line in order to perform the teaching, learning or support activities (Conole, et al, 2008). As the designers work through the process they can draw on existing OER from repositories such as OpenLearn to get ideas and inspiration. On the other hand designers can build on a range of explicit designs, which could include visual learning design representations as well as *pedagogical patterns*. The combination of this content and design guides the process, the end product being a newly produced or repurposed OER *and* its design, which can both then be deposited back into appropriate repositories.

In the following section we present and discuss the data obtained in the current research work, while the last section points out to the main conclusions and further steps.

Evidence from the workshop

As mentioned above, a series of events were carried out in order to analyse the role that specialised Learning Design (LD) and Pedagogical Patterns (PP) mediating artefacts might play in increasing the effectiveness of use of OER in new pedagogical contexts, such as CSCL. These events evolved from an initial workshop at the Eden 2009 conference to a more focused workshop with experts in educational technology at the Open University, which showed that the workshop format was successful and could serve as a basis for a systematic data collection and analysis.

Prior to these events, an earlier workshop at the CSCL 2009 conference (<http://www.isls.org/CSCL2009/Pre-Conference7.htm>) showed that the use of the jigsaw pedagogical pattern motivated a successful redesign of an existing OER. The jigsaw strategy, introduced by Aronson & Thibodeau (1992), is related to a situation where several small groups of students ('jigsaw' groups) try

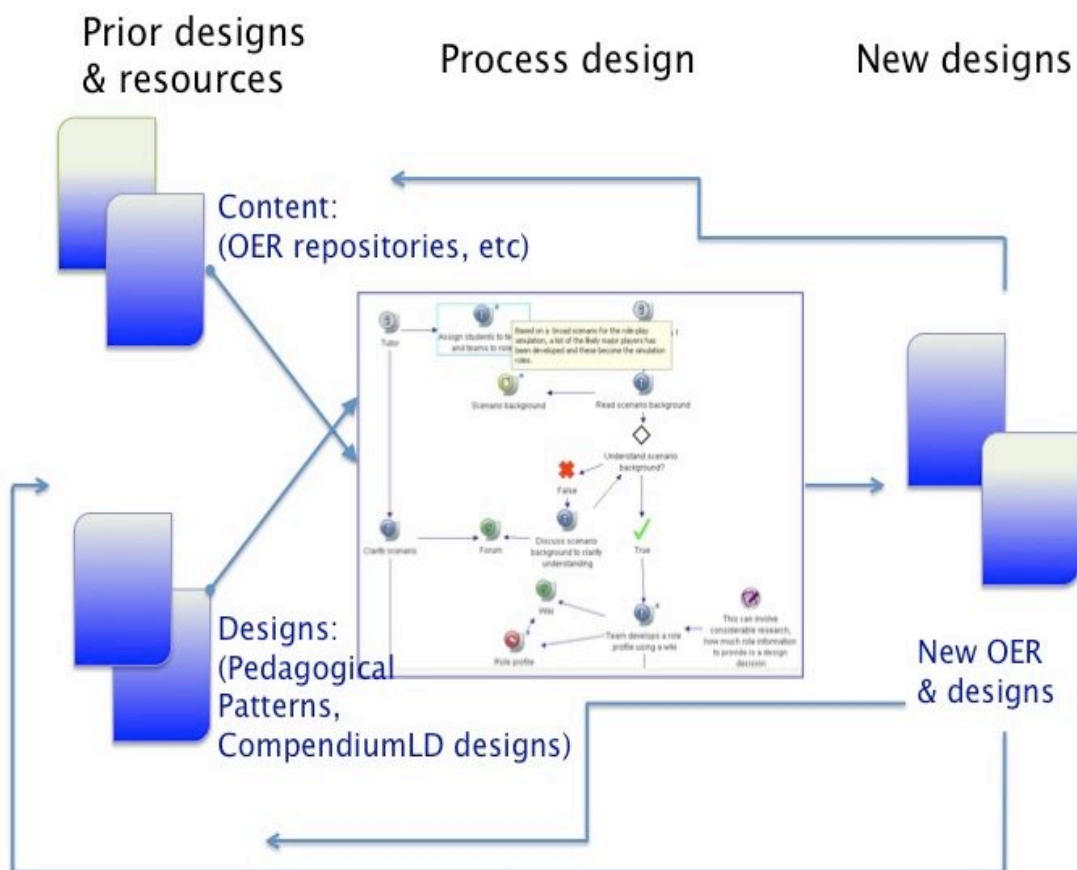


Figure 2: The OER design and repurposing cycle

to solve a complex problem that can be divided into independent sub-problems. A more practitioner-focused workshop was also held with course teams at the Business School of Open University within the OULDI (<http://ouldi.open.ac.uk>) learning design initiative. This last workshop demonstrated application of these concepts in an authentic environment.

In this paper we focus on the workshop that was held out with fifteen ET experts by the end of June 2009 and present some initial findings drawn from a qualitative analysis process using mainly video and audio transcriptions, besides the surveys and post-its, as well as some artefacts produced by the participants.

The workshop was used as an instrument to capture, extract and evaluate useful information concerning the effectiveness of the design patterns for the repurposing of OER. The experts were given a selection of OER and the basic types of design patterns (see Figure 3 regarding the basic set of Collaborative Learning Flow Patterns) for the design of collaborative use and activities.

The analysis of the workshop findings is presented in this section (text in italics corresponds to quotes by the participants and facilitators).

Workshop data analysis

The workshop consisted of the following components:

1. An activity based on the ‘Think-Pair-Share’ pedagogical pattern in which participants were asked to “Think of an existing resource or activity that you have created and write down a short representation of its design”, Pair with your neighbour and present your resource and design”, pair and discuss with their neighbour followed by a whole group discussion.
2. An exercise involving a “Task swim line” visual learning design representation, where participants analysed an existed OER in this representation.
3. The third activity involved them using a set of collaborative pedagogical patterns and the visual learning design representation to act as mediating artefacts in the repurposing of an OER from the OpenLearn repository on social work.

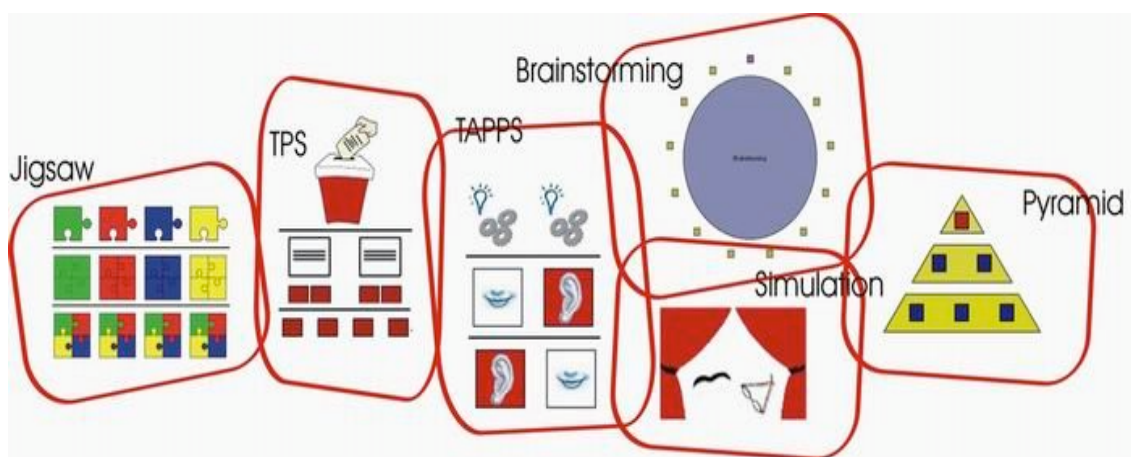


Figure 3: Visual representations of a set of pedagogical patterns used in the workshop

It should be noted that there were no specific instructions on the nature of resource or activity that was going to be described in the initial activity; we deliberately wanted to get their starting position in terms of understanding about the concepts of design and OER. Several interesting points emerged from this task. Firstly, the resources practitioners described, on the whole, were not actually open resources or OER; and secondly, there was certain confusion over the definition of “open in a broad sense or the OER sense” and the nature of the OER which “is freely available but it is not an educational resource”. It should be noted that participants didn’t think of an “open” resource in an OER-related workshop, although OER were presented in the introductory section of the workshop and some of the participants had prior knowledge of OER.

The type of representation chosen to describe the design of the resource by the participants varied a lot. Six participants primarily described it visually as a “kind of map, kind of diagram”, while seven of them described their design in a purely textual format. It was evident from the workshop that most participants had a poor understanding of how to represent their own design. There were also issues of different personal preferences for how to represent things, i.e. textual vs. visual; sequential vs. metaphorical, depending on level of skills or competences, reinforcing the argument which supports the use of different types of mediating artefacts. This task proved to be extremely useful because it allowed participants to see the value of different representations and to understand that each representation highlights some aspects of the design and not others. Additionally, some people prefer a certain type of representation because they “tend to think textual” and “because I am used to doing bullet points”.

Ownership issues around the resources and the different roles of the creators or consumers of the resource i.e. the creator of the original resource, the creator of the OER from the original resource, the user of the OER were emphasised. Participants found it quite easy to discuss their own learning design during the first part of the workshop, however, they found it increasingly hard to make designs from resources they didn’t create because “having another person’s framework creates limitations” and “our representation is biased because we have seen this structure so we are going to do the same thing”. One of the participants stressed authorship issues and the possibility of establishing an ‘anti-pattern to lack of using other author’s materials’.

The time required to undertake a complete analysis of the resource (and evaluation of how it might be used), along with an elaborate creation of the representation was stressed since “reading takes time, representing the visualisation takes time, and the issues of purpose and ownership of what you are doing is another very important point”. The importance of motivation was also stressed during the workshop. The complexity of the process and the value-added to the extra effort invested act as key determinants to the level of involvement or motivation expressed.

One important observation by the participants with respect to the pedagogical patterns that came out naturally after they had completed the first activity (Think-Pair-Share) was that they were concerned with what the factors determining effectiveness were, i.e. “the conditions of the effectiveness” and “what are these conditions or how can we improve these conditions so that these patterns become effective?” Such an issue is typically considered in the formulation of the underlying “forces” that may make a pattern effective or not. Another interesting suggestion related to the use of multiple layers of representation for a more effective use of the patterns with “several layers when you look at this and it could also help you to create a more effective design about how well you look at the patterns”.

Having completed the third activity using the set of collaborative pedagogical patterns participants indicated that they found these useful and that the patterns helped guide their design processes: “the pack with all the different learning patterns made the difference” and that “the patterns gave us scaffolding”. They stressed that “patterns empower a broad restructure” and that “this is actually more interesting, there are different levels, there are activity levels, level at the beginning, collaborative learning, learning level, learning activity.” Our hypothesis before the workshop was that patterns do indeed provide an interesting and powerful way of creating alternative, rich and new structures and this appears to be backed up from the comments made by the participants. Experts at the workshop also found the patterns helpful and observed that the process enabled them to think about the kind of patterns and combination of patterns that would enrich the content. Patterns enabled them to create very powerful structures and different factors motivated and affected each group and their selection of pattern combinations and pattern design schemas.

The table (Table 1) below articulates the eight different mediating artefacts we used during the workshop. We have included not only the design and patterns artefacts but also the structure and format of the workshop, and the facilitators plus participants.

Table 1: Types of mediating artefacts employed at workshop

| |
|--|
| 1. Think-pair-share activity as an activity |
| 2. Think-pair-share visual representation of the pedagogical pattern |
| 3. Task swim line representation – both electronic and paper-based |
| 4. The CompendiumLD environment |
| 5. Workshop format overall |
| 6. Workshop facilitators |
| 7. Other participants |
| 8. Participants own representations |

In the third activity, one of the groups selected the patterns, “Enriching the learning process” and “Jigsaw”, as they felt these two patterns as compatible and complementary to each other. Overall analysis of the data has lead us to conclude that the main factor that motivated the selection of the patterns was that “groups are not homogeneous, so people work at different speeds with different levels of understanding and the patterns we looked for were the ones that enabled sharing the tasks and we chose two that seemed to be appropriate and compatible because we had limited amounts of time and wanted to have compatibility, so one was Jigsaw and the other, Enriching the learning process”.

An “amalgam” of patterns was used by another group, probably inspired by the introductory presentation on patterns; including the “Brainstorming”, “Pyramid” and “Jigsaw” patterns. “The main pattern is the triangle one (i.e. the “Pyramid” pattern) and so that gives different levels, so then we go to Brainstorming with this particular type of family with a child who needs particular care and so we talk through and identify the issues as a group, then they would break-out and we thought we would use the Jigsaw pattern breaking them into couples or groups of three and research these issues they had identified”. Similar processes were followed by the other groups.

Other groups devised highly complex pattern structures in order to deal with knowledge on social work (the OER they were repurposing was in the social work domain) in different contexts with the pattern schema spreading across time, decision levels and number of users. “In the brainstorming session people will come up with the concepts and in the later session we have an assessment, group self-assessment where we can actually discuss and then we select the methods and we try to set-up a role-playing game where we have a social work situation as an opening game”. It is extraordinary that such highly complex combinations and selections were devised after an analysis of only a small part of the resource and the associated activities.

Another group could not find an adequate pattern in order to express the main challenge of the activity because “it is not a problem solving activity it is a collaboration around people becoming more collective and more aware, so I wasn’t able to find anything that directly expressed that in here” although finally the reflection process allowed them to think of a new activity flow based on the “learning journal” artefact. The solution of extending the pattern language is intrinsic in any pattern-based approach and it clearly

points to the typical trade-off of having an “extended and more complete” set of patterns that at the same time may require a higher cognitive load for detecting, organising or navigating such a big set. Finally, most participants identified through the task that the patterns were “flexible but also complex” and that “the pattern has some pre-conditions and has also some inputs”, and thus they tried to use content that could be easily imported into other pattern types. However, due to lack of time during this task it is hard to say with any certainty how they really interrogated and used the patterns.

Discussion

Educational structures are becoming increasingly complex, multi-dimensional and non-linear, requiring experts but also novices to quickly gain different levels of understanding and skills. This paper argues that there is a specific added value for the use of design patterns by novices to acquire design skills and domain knowledge. Design patterns through their flexible yet complex structure act as building blocks, providing users with a better understanding, adapting resources to context, making information accessible in multiple schemas and providing interoperable elements enabling different interpretations and patterns to be applied. The workshop provided some very interesting findings that merit further research and investigation. We provide a brief discussion of these here.

In relation to the nature and openness of OER, there appears to be a lack of clarity about what openness means. In addition participants had different interpretations about the reason for the lack of update and reuse of OERs. These were two of the key findings from the workshop. In addition, the ownership and authorship of designs emerged as an important factor, i.e. if the OER is created by another author there seems to be a very long process of reading the resource, understanding it and then starting to see ways in which you can personalize it and represent it in your context. Most participants agreed that reading someone’s rich narrative, interpreting it and understanding it and making assumptions about it is hard; whereas if they have constructed the OER, it immediately has meaning.

Another important finding of the workshop was the challenge of socialising learning designs. We have identified four different layers of design difficulty:

1. Understanding the value of representing designs;
2. Using representations effectively in the design process;
3. Communicating designs with others; and
4. Interpreting other people’s representations.

The solution of extending the pattern language is intrinsic in any pattern-based approach and it clearly points to the typical trade-off of having an “*extended and more complete*” set of patterns that at the same time may require a higher cognitive load for detecting, organising or navigating such a big set.

In addition to the ‘task swim line’ design visual representation, each of the pedagogical patterns also included a visual representation. However in contrast to the swim line representation, which is essentially operational/process focussed, the pattern visualisation was more metaphorical in nature – encapsulating the essence of the pattern. We think that the nature of this visual representation included in the description of the patterns is very significant, as it provides a quick conceptual overview of the pattern. The impact of the visualisation was evident in some of the discussions, for example one participant substituted the formal pattern name (“Pyramid”) by the name of its visual representation (triangle).

Complex processes require decisions on which elements to support at each stage. In an attempt to enhance the collaborative and communicative potential of OER repurposing, the types of mediating artefacts varied between levels, reinforcing the argument of supporting different representations. It is extraordinary that such highly complex combinations and selections were devised after an analysis of only a small part of the resource, the associated activities and a small set of patterns. This also emphasised the opportunity of new views on how OER content can be used, increasing the potential for learning from the content without rewriting the core material.

Conclusions and further research work

This paper has shown how design presentations along with a small number of collaborative patterns can be used to guide rethinking of how an OER works and help repurpose the OER to incorporate more collaboration and adaptability. Subsequent work in three other workshops with experts and practitioners has shown that while determining the pattern of an OER by considering the end product is difficult, the adoption of these collaborative patterns is relatively simple and leads to new views on how OER content can be used. Typically this extends the likely effort of the user and increases the potential for learning

from the content without rewriting the core material. In the OLnet project we are researching the impact of design on the use and reuse of OER and plan to investigate the use of small numbers of patterns and designs to guide reuse extending the use of patterns from the collaborative case presented here to consider individual use and other contexts.

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