Evaluating The Le@rning Federation’s Online Curriculum Content: A Literacy Educator’s Perspective

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Abstract

This paper is chiefly concerned with reporting an ongoing evaluation of the use of learning objects provided online by The Le@rning Federation, on the basis of a sample of Australian and New Zealand schools. The paper is framed by considerations that arise from a literacy-education perspective, in particular the need to reshape and reconfigure literacy capabilities throughout the primary and secondary school years within the context of the growing distinctiveness of school subjects. These subjects, and the disciplines that underlie them, make particular demands on text management and production for the growing repertoires of modalities delivered by a range of a relatively new technologies. The significance of The Le@rning Federation's initiatives in delivering learning objects online in a variety of curriculum areas is discussed in this context. Summaries of survey and case study data are presented, which indicate the extent of support for the use of learning objects in relation to students’ engagement in learning and their learning outcomes. As well, results of a preliminary report of a field experiment are presented, showing the effects of the use of learning objects on aspects of students’ performance in mathematics.

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The curriculum setting

One of the significant benefits arising from the application of applied linguistics, sociology and anthropology to literacy education over the last 25 years has been a growing interest in the variety of literacy practices called upon as students move through their years of schooling. Lines of work exploring this issue have supplemented the ongoing interest, traditionally from psychologists, in the acquisition of script knowledge in the preschool and early school years. Compared to 25 years ago, classrooms look different now in many respects, most obviously in their gradual recruitment of a variety of new, digital technologies. Along with that have come significant changes in the ‘look’ of school textbooks and of the curricular materials with which students deal on a daily basis. This applies to the materials they are increasingly expected to produce as well as learn from and manage more generally, and the settings and tasks that constitute assessment of their learning. What all this means for educators interested in literacy is that a focus on basic skills and use of ‘generic’ materials, along with Peter-and-Jane content, to develop literacy skills, knowledge and dispositions in the early years of schooling has become well and truly obsolete by the time students reach the middle years of schooling.

On this matter, one of the enduring themes arising from the work of Nobel Prize winner James Heckman has been the rigorous study of how valued learning and dispositions are maintained in the periods following the gains made in those early years. On completion of his encyclopaedic summaries of the research literature on human skills formation and development (Heckman 2001), Heckman argued that original educational investments are dissipated if skills maintenance is not actively pursued, to the extent that the investment may yield close-to-zero returns for systems, societies, and individuals:

Complementarity (synergy) of investment reinforces self-productivity … early investments must be followed up by later investments to be effective (Heckman 2005, pp. 3–4).

Heckman’s work indicates the urgent need to maintain literacy and numeracy development in a variety of contexts including emerging fields of study that put new ideas and genres to work with new technologies in new learning settings.

Further, it is not always the case that conventional disciplinary knowledge and skills are simply being transmitted via new technologies and modalities; in many cases, the disciplines themselves are being reshaped by these factors. Because disciplines are living configurations of knowledge and practice, they are always in states of evolution, moving at a variety of rates, coupling and uncoupling with disciplinary neighbours, and re-aligning among themselves. This contingent and shifting nature of disciplines as organisational units of institutional and content domains is echoed by Viñao in the conclusions he draws from his study of various traditions that contribute to the professionalisation of teachers:
Academic disciplines are not abstract entities, nor do they possess universal or static essences. They are born and evolve, emerge and vanish, splinter off and join together, reject and absorb each other. They change in content and denomination. They are spaces of power, of contested power, spaces that cluster actors and interests, actions and strategies (Viñao 2001, p. 128).

A striking example is in the changes currently under way among scientific research activities grouped as ‘new life sciences’. These include biotechnology, bioinformatics, proteomics, genomics and bioethics. New ways of knowing are emerging from the research community: traditional subdisciplines of biology are undergoing integration via new molecular concepts and exploratory technologies, and these integrations are being applied to various real-world problems. The ensuing pressure on education systems is substantial, and may well end up being beyond conventional curriculum reform and professional development processes. Likewise the science-education literature – research, pedagogies, professional development, curriculum and policy – is lagging. Neuroscience, biochemistry, genetics, evolutionary biology, biotechnology, bioinformatics, proteomics, genomics, bioethics, cellular and molecular biology are all implicated in a rapid multidisciplinary evolution, and new connections are being made between these disciplines and mathematics, physics, chemistry and earth and space sciences.

For educators, an important point is this: in large part, new knowledge in areas such as the new life sciences can be produced, disseminated and effectively taught only via digital technologies; and as the knowledge in these research areas grows, much is known and represented in symbolic forms other than, or in conjunction with, language. So developing discipline-specific and technology-specific literacies becomes not only an intriguing research topic, but an ambitious system goal. It is in this context that I discuss the work of The Le@rning Federation’s development of learning objects.

The Le@rning Federation’s online program

The Le@rning Federation’s Learning Objects and Digital Repositories program, whatever else it is and however its initial consequences will be judged, is a substantial response to the context described above. Further, it has been given a timeframe that gives grounds for some optimism that the formations of changing communication technologies, and the kinds of knowledge and skills these technologies may afford, can be meaningfully recruited into digitally based activities in schools. As well, it provides a rich seed bed of research, so that these ‘wheels’ need not be re-invented in other places and times.

Briefly, the background is that, in 2001, the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) established The Le@rning Federation to produce online curriculum materials and make them available to education systems in the states and territories of Australia and New Zealand. The Le@rning Federation was charged with the following specific tasks:
1. Producing a repository of online materials in the following priority curriculum areas:
   • Innovation, enterprise and creativity (P–10)
   • Languages other than English (specifically Chinese, Japanese and Indonesian across all school year levels)
   • Literacy for students at risk of not achieving National Literacy Benchmarks (5–9)
   • Mathematics and numeracy (P–10)
   • Science (P–6 and 9–10)
   • Studies of Australia (P–10)

2. Developing online materials that:
   • represent cutting-edge best educational theory and practice
   • engage teachers and students in active learning and in creative and critical thinking

3. Supporting and reinforcing the increasing priority given to innovation, enterprise and knowledge by governments in Australia and New Zealand

4. Supporting teachers in developing enterprise education

5. Engaging students in innovative learning environments

6. Equipping students to live competently and proactively in an environment increasingly characterised by online communication, learning and work

7. Stimulating the growth of a marketplace for quality public and private online curriculum content.

The term ‘online curriculum content’, as it is used here, refers to interactive learning activities (which may include texts and/or graphic, audio or animated materials) that are linked to motivational and learning outcomes, and that also capitalise in innovative ways on the particular potential of information and communications technologies to enhance young people’s learning. In this project, the online curriculum content takes the form of learning objects. These learning objects are:

• one or more files or modules of learning material
• reusable in multiple settings and for multiple purposes
• potentially usable in classrooms as components of units of work accompanied by digital and non-digital materials
• accessible from digital repositories as referenced and located by metadata descriptors.

The evaluation process

In pilot interview, survey and case study observations, a strong prima facie case was established that the use of The Le@rning Federation’s online curriculum content:

• is, in general, supported enthusiastically by teachers, parent home-tutors and students
• motivates students to attend to and engage with tasks
• enhances students’ learning and interest in learning across a range of tasks.
The problems raised during the pilot study related to teachers needing time to ensure that their selection of learning objects, from an increasingly wide range, would be appropriate to their needs; and to technical difficulties that presented ongoing frustrations to teachers and increasingly complex and consequential challenges to systems.

As a result of the pilot study, some modifications were made to the survey and interview content for the main evaluation, and the range of schools to be visited was extended. To summarise the main findings of the surveys, interviews and case studies (see Freebody 2005, 2006):

- There is a strongly positive response to the use of the learning objects from teachers and students, for engagement in learning and also learning outcomes.
- These patterns apply across all teacher and student demographics.
- Multilevel models show considerable variation within and between learning objects, and some variance related to curriculum area.
- Major variations are evident in awareness and usage of learning objects within and across schools, and also in the extent to which learning objects are integrated into classroom work.
- There is some evidence that potentially new learning environments are being put to ‘old’ pedagogical work.

**Survey results**

Surveys were web-administered and voluntary. The distributional pattern of responses from each state, territory and New Zealand is shown in Figure 1.
The overall evaluations of the learning objects by the students are shown in Figure 2.

Students clearly distinguished between the variables under consideration. The top three items illustrated in Figure 2 are marginally on the positive side of the neutral midpoint on the rating scale. That is, students reported close-to-neutral views regarding the helpfulness of the learning objects in terms of ‘thinking about new ideas’ and, as a group, had no decisive views on the need for help from teachers or partners or peers. Students were more enthusiastic in their support for the learning objects as ‘easy to work through’ and ‘interesting and fun’ to complete. The interest, fun and ‘do-ability’ of the learning objects were strongly endorsed by this sample of students.

Features of learning objects that students nominated as helpful in their learning are summarised in Figure 3.
While all positive rankings are reliably above the neutral point, these students drew attention to the opportunity to work at their own pace in the completion of the learning object activity. This is an ongoing attribution to the learning objects that is compatible with results from the pilot study and from the case-study findings discussed below. All of the features, apart from the sound characteristics of the learning objects, are regarded as helpful; and, critically, students recognise the particular advantages of the use of learning objects compared to ordinary whole-class or small-group work in the classroom in regard to improvement, feedback, choice of pace, sequence and interactive content.

Teachers were asked for their perceptions of the motivational effects on students who used the learning objects. Their responses are summarised in Figure 4.
Figure 4: Teachers’ perceptions of the motivational outcomes of using the learning objects

All of the means presented in Figure 4 are substantially and statistically significantly above the neutral midpoint of 4. Differences between these means are not such that any highly differentiated response patterns to the various items are evident; that is, teachers strongly endorsed the helpfulness of the learning objects on all of the counts offered to them. This finding is compatible with the results of the pilot study and with the descriptions presented in the case studies below.

For purposes of ongoing development and to contribute to the growing field of research in this area, there is also interest in what particular aspects of learning the teachers believed the learning objects enhanced.

To that end a series of questions were asked about the value of the learning objects in general in helping students learn and use different kinds of knowledge. A summary of teachers’ ratings of these features is presented in Figure 5. Note that, on the vertical axis, the items used in the survey itself are shown in lower case; while the labels in upper case refer to the three factors revealed by factor analysis to be highly reliable underlying dimensions.
Again, the ratings are substantially above the neutral midpoint for all variables, and the differences in mean ratings are not remarkable. The three composite scores have very close mean values, indicating strong average endorsement of all forms of learning presented in the survey. Two points are worth noting in this regard:

- The items (shown in lower case on the vertical axis) were developed in the light of comments provided by teachers sampled in the pilot study and so reflected statements about the learning objects offered by those teachers.
- There was considerable variation of response, sufficient to warrant exploration of discernible patterns of response among the sample of teachers and further analysis of the relationships among these patterns and the particular settings in which these teachers worked and the particular learning objects to which they were referring.

To explore possible patterns or profiles of response among the teachers, a cluster analysis was conducted on the three composite variables indicated in Figure 5: a focus on factual content, a focus on conceptual understanding, and a focus on the transfer or application of knowledge. Cluster analysis groups respondents into ‘families’ whose overall response profiles are most alike, noting the diminishing returns of variance accounted for as the number of clusters increases. The outcome of the cluster analysis is presented in Figure 6.

Figure 5: Teachers’ perception of the learning outcomes of using the learning objects
In general, the four-cluster solution provided a good fit, accounting for about 66 per cent of the overall variance on the original three variables. It can be noted that two groups (Group 1 and Group 4), comprising 42 per cent and 13 per cent of the entire sample respectively, responded significantly higher (Group 1) or lower (Group 4) than the overall mean on all three composite measures. The other 45 per cent of the sample broke into two groups that showed clear differentiation on the three measures, one group (Group 3) indicating that they believed the learning objects were beneficial mostly on learning pertaining to factual content and the other (Group 2) emphasising the comparative benefits for the transfer and application of knowledge. Attitudes regarding benefits for conceptual understanding did not discriminate these ‘cross-over’ groups.

What this means is that teachers’ individual perceptions, differences of focus among the learning objects, or both, are the basis upon which almost half of this sample of teachers discriminate among the potential beneficial outcomes of the learning objects.

No associations were found between responses, cluster membership and the student or teacher demographics we assessed; differing degrees of like or dislike, and also nominations of key features, were distributed ‘randomly’ across the samples of teachers and students.

There were, however, strong statistical associations between students’ ratings of the learning objects and the curriculum areas in which the learning objects were located and the individual learning objects themselves, independently of their curriculum area designation. For instance, with respect to the students’ ratings, LOTE tended to rate lower than the other curriculum areas on overall approval, and literacy a little higher.
Case studies

Of the 17 schools visited in the case study component of the evaluation:

- eleven were urban, three were rural and three were remote
- seven were primary, seven were secondary, two were K–12 and one was K–8.

Distinctive features of some sites were:

- a high Indigenous population (five schools)
- classification as ‘special needs/at-risk’ (three schools)
- girls’ schools (two schools)
- a distance education centre (one site).

A general observation of the use of learning objects across the 17 schools revealed that:

- one school embedded use of the learning objects into general, conventional teaching practices
- five schools made substantial use of the learning objects but only on the part of a small proportion of the teaching staff
- in six schools some teachers used the learning objects from time to time
- five schools were only in the very earliest stages of awareness and implementation of the learning objects.

Some general issues that arose in the conduct of the case studies have been organised to supplement the main lines of results coming from the survey data with a greater level of practical detail and a sense of site-specific variation.

In the teachers’ observations of the ‘key features’ of the learning objects, there was a high level of consistency among teachers’ comments, as indicated in the following examples.

I love the way [the learning objects] engage kids and help them in the production of their work. They are so powerful in that regard. They are a great tool in our repertoire of engaging kids. … Students are working at their own pace and … being responsible for their own learning. We can use them across the board, and find them especially helpful with our integration students. (Teacher, primary school)

This comment draws attention to the notion that engagement, as an outcome of using the learning objects, brings with it two key corollaries: students’ being able to work at their own pace, and students taking responsibility for their learning. This teacher links students’ engagement in learning to superior cognitive and dispositional/attitudinal consequences. The breadth of applicability of the learning objects is also noted, as is the particular benefits accruing to students with special needs – indicating that the high levels of variation in the pool of available learning objects is regarded, in this case at least, as offering distinct benefits.
The potential role of the learning objects in offering a way through significant student differences in entry-level knowledge of a topic was noted by some teachers.

One of the major issues for the students I work with is finding the right starting point to enable them to learn effectively. In their normal classroom work the entry level can be just too high. Through using the objects I find that we can progress at a much faster rate through the syllabus and the sorts of content we want them to master. (Teacher, P–12 school)

Of note in this comment is the direct relationship of the learning objects to the syllabus being used in the classroom and the special benefit of the learning objects in permitting students to find the entry level that suits them individually, along with the consequent acceleration of their progress through syllabus materials. The learning objects are not typically developed to have a direct relationship with syllabus materials; indeed, their status as ‘stand-alone’ and totally portable learning materials militates against any intended tight fit with any particular syllabus or curriculum materials or with any particular pedagogical configuration. This makes the above comment about syllabus progression all the more forceful.

For many students it is clear that standard classroom practice presents difficulties. Whole-class activity provides distinctive opportunities for hearing, valuing and sharing ideas, but the single-line content and sequence, directed by and filtered through the teacher’s goals, assumes high levels of shared knowledge, attention and processing. The use of the learning objects was seen by many of the participating teachers as a way of offering other learning experiences to students for whom the standard classroom is either not an optimal setting for learning or not the only setting in which learning can occur. Teachers noted often the dramatic effects of learning object use for students who have experienced difficulties in standard classroom conditions. The following, contributed by the teacher working in a centre for students not attending conventional schooling, is an example:

The independence kids can achieve is phenomenal. Variety, motivation, flexibility, ease of use. The interactivity is very important ... They re-read – we do notice this – go back and recover. Being able to repeat is very important. It is an additional incentive, which otherwise would not be there and which our kids need, to get things right. (Teacher, at-risk centre)

This comment affords a particular insight into an often unremarked problem faced by many students in whole-class activity. A feature of whole-class activity and interaction is that the teacher takes a sample response from a student (or two or three students) to ‘stand for’ the state-of-knowledge-and-understanding of the group as a whole. The decision to move on to the next point in the work, made apparently on the basis of demonstrated students’ competence with the prerequisite knowledge and understanding, may in fact not be appropriate for a potentially significant proportion
of students in the room. This process is often referred to as ‘cohorting’ (see, for example, Edwards & Westgate 1994; Freebody 2003). In its simplest form, the teacher asks a question, a student gives a possible answer, the teacher confirms the acceptability of the answer and then moves on to a question that logically follows. The vast bulk of studies of classroom interaction in countries comparable to Australia confirms that ‘cohorting’ is a practice characterised by whole-class activity and interaction.

For students whose knowledge or understanding does not routinely allow participation in standard whole-class or even small-group activity, the cumulative effect of regular, long-term non-participation on their engagement and their accumulation of relevant knowledge can be devastating. As some of the students attending the at-risk centre that forms one of the case studies would fall into this category, the nomination of their engagement and willingness to revisit and repeat activities in the light of feedback is significant.

One long-term, dedicated, and effective user and advocate of the learning objects in classrooms encapsulated her understanding of the particular benefits offered by the learning objects in this way:

They encourage a high level of engagement from students because of their interactivity. The open-endedness of many of the objects stimulates further independent learning; and the screen and interface are generally very clear and accessible. (Teacher, primary school)

This combination of format, technology, learner engagement and disposition, and cognitive outcomes represents a succinct summary of the various positive perceptions of most of the case-study participants.

**New technologies for old pedagogies**

It is important to recall that The Le@rning Federation is not offering pedagogical advice or lists of recommendations to accompany any group of learning objects or any individual learning object. This is partly because of the wide variety of settings in which it is imagined the learning objects might be used and because settings may arise that cannot be predicted at this point in time. It is possible that settings may even evolve as use of products such as The Le@rning Federation’s learning objects becomes more prevalent. What is clear, however, is that some teachers and school personnel were incorporating learning objects into units of work or shorter-term activities in ways that did not seem to capitalise on the strengths that other colleagues were nominating as the special benefits learning objects can offer. In observations of a variety of pedagogical applications of the learning objects, one of the researchers comments:

Pedagogy is ‘influenced but not determined’ by learning object use … We saw the learning objects being used in ways ranging from the tightest lock-step process
imaginable to unsupported open choice … Some of the considerations that guided the thinking of some schools’ staff were that learning objects should be used for a particular educational purpose only, and not as a time-fillers (‘if they were openly accessible they might lose some of their appeal and interest’); [and that] only the teacher should be making judgments about their use to optimise learning. We saw cases where all accessible objects were made available for staff as part of the school’s digital resource library and were indexed and delivered in a structured, predetermined way. (David McRae, case notes)

Captured in the case-study notes is whether the learning objects are seen as ‘textbooks’ or ‘library books’. The point being made in the case note quoted above is not of itself a criticism of any particular event. If indeed The Le@rning Federation is agnostic on the matter of pedagogy, then it is not well placed to rule some uses of learning objects ‘out’ and others ‘in’.

But what is at issue is a matter that has consistently appeared in our main study and the pilot study: support for the learning objects is based on students being able to set their own pace, take responsibility for their own learning, make choices, enjoy flexibility, all of which highlight the contrast between what the learning objects offer and what is offered students in standard classroom settings. To put it bluntly, ‘bringing the learning objects to heel’, such that their use is made to fit with the imperatives and routines of the standard classroom setting, would seem to run counter to what students and teachers who participated in the main study and its pilot are consistently putting forward as their distinctive benefits, especially when offered to students who have not been well served by standard classroom provision.

The field study

A limited field experiment was undertaken as a ‘proof-of-concept’. Its two purposes were to observe the range of ways in which teachers were using learning objects in schools, with a view to documenting good practice; and to test for possible gains in students’ learning as a result of the use of learning objects. Mathematics at Years 5 and 7 were chosen as the targets, partly because of the availability of results in mathematics from national testing undertaken at those two levels. Participating in the study were 708 students from 41 classrooms in 21 schools in the Australian Capital Territory, New South Wales and Queensland, roughly distributed across four design groups: two year levels, each with two learning conditions – one group used learning objects while the other (‘Business-as-usual’) did not. Following a briefing of those teachers who would use the learning objects, teachers in all four design groups took six weeks to teach two topics: basic number operations (‘Number’) and introductory probability (‘Chance’), each of which formed part of Year 5 and 7 syllabuses. Pre-tests and post-tests were administered using assessment exercises taken from a bank of standardised items, normed for year level and related directly to Number and Chance.
Observers visited each school to observe lessons taken by those teachers who were using the learning objects. While field notes from the observations are currently being analysed and will be reported at a later date, observers reported that the Chance items were challenging to teachers and students generally, and were often avoided in ‘Business as usual’ conditions as they were regarded as complex and generally more difficult to teach than the Number topics.

I stress that findings reported here are of a preliminary nature, and a full report will be available on the The Le@rning Federation website to accompany the other two reports already there (Freebody 2005, 2006), from which much of the discussion above has been drawn.

First analyses of the test data indicate a statistically reliable advantage for the learning object group in learning outcomes relating to Chance at both year levels. There was also a difference that approached statistical significance on the Year 7 Number test. The Year 5 Number test showed no discernible advantage for the learning object group. The reliable advantage for classes using the learning objects was shown to apply relatively consistently across all sites. Figures 7 to 14 indicate the model estimate values for these effects.

**Figure 7: Year 7 Pre-test distribution of scores for Chance items**
Figure 8: Year 7 post-test distribution of scores for Chance items

Figure 9: Year 5 Pre-test distribution of scores for Chance items
Figure 10: Year 5 Post-test distribution of scores for Chance items

Figure 11: Year 7 Pre-test distribution of scores for Number items
Figure 12: Year 7 Post-test distribution of scores for Number items

Figure 13: Year 5 Pre-test distribution of scores for Number items
In all cases there were no treatment group differences on the pre-test measures. On Chance items, significant effects are established on the post-test for both year levels; on Number items, differences on the post-test for Year 7 approach statistical reliability, and there are no differences approaching reliability for Year 5 Number post-test scores.

**Conclusions**

On the basis of the findings of the main study, in combination with the pilot study, we can conclude that teachers’ and students’ views of the learning objects are generally positive, and that these participants have developed and presented views that discriminate among different features of the learning objects and their potentially distinctive benefits. There is also an initial indication that the learning objects can be shown to have a reliable effect on aspects of mathematics learning at Years 5 and 7.

What now needs to be documented, over a period of time that allows a reasonable establishment phase for the learning objects, is how those perceptions are acted out and the nature and extent of changed pedagogies and learning that result from, again reasonably established, use of the learning objects. To preserve and enhance the substantial investment in the development phases of the initiative demands planning for patient and rigorous research in the implementation phase. This will involve school systems and colleagues in schools accepting some responsibility for taking the investment to the next phase, especially in regard to producing high-quality teaching and learning environments. The research imperative is to support, expand and document the ‘best processes’ in close collaboration with school colleagues as the outcomes of using learning objects are outcomes of enhanced teaching and learning, not automatic outcomes of the intrinsic properties of the learning objects themselves.

The need to push forward with studies of implementation and outcomes is not only an inescapable conclusion from this study and the pilot study; it is also in line with the best advice from researchers and professional educators currently grappling with
questions of using ICTs for education. The next step seems to be to encourage and document the broadest possible range of good practices with learning objects while at the same time remaining aware of the retrograde uses to which any promising initiative can be put. This particular initiative is in a position to offer special answers to some of the thornier questions facing educators interested in ICTs (and perhaps more particularly the students of those who are not). To pursue those answers may mean first acknowledging the tensions attending the next step I have described and the high stakes of failure for communities, educational systems, schools, individual teachers and students.

What are now needed, more generally, are systematic programs of research and development that have the theoretical capacity to explore the digital bases of new disciplinary and interdisciplinary knowledge and their implications for futures-oriented learning and teaching in schools and in universities (see, for example, Freebody, Hedberg & Guo 2005). Debates about knowledge and the optimal mixtures of content and process – the ‘essentials’ – that syllabuses should contain have again become central in many Australian jurisdictions. It is important to recognise that students encounter and work with these essentials, however they may be defined, in material and technological settings of some sorts. Part of the justification of syllabus activities is that they have the potential to afford some simulation of real world practices in work, domestic and leisure places. Interfaces among disciplinary configurations, and their interactions with technological and modality changes become critical in the middle years of schooling and beyond. Building bridges for border crossings between the powerful disciplinary formations that structure the curriculum and the repertoire of skills, attitudes, understandings and dispositions that underpin real-world activity – the play of the epistemic and the pragmatic – becomes an important role in the next phase of research and development for projects such as The Le@rning Federation.
References


