The TOOMOL project: supporting a personalised and conversational approach to learning

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Abstract

Toolkit for the Management of Learning (TOOMOL) project is a JISC Technologies Applications Programme funded project, developing tools to help teachers and students to manage learning resources, negotiate learning programmes and develop learning profiles. The system can be used in both local and distance learning contexts, and is designed to be able to support those engaged in life-long learning programmes. Two key theories underpin TOOMOL: conversation theory and organisational cybernetics. The former is concerned with the interactions that take place between participants in the learning and teaching process; and the latter with the organisational constraints under which learning and teaching takes place. TOOMOL has been designed to embrace a constructivist approach to learning, specifically making the management of learning conversations its primary aim. From this viewpoint, learning resources (including online materials), activities and assignments can be seen as amplifying and enriching conversational acts. Using the tool, teachers and learners can build and then access a history of their learning conversations, allowing this to inform their continuing interactions. This paper describes the theoretical framework that guided the design of the software and briefly illustrates its application. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: Computer-mediated communication; Co-operative/collaborative learning; Distributed learning environments; Interactive learning environments; Pedagogical issues

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PII: S0360-1315(99)00055-X
1. Introduction

All software systems embody a model of the problem area they aim to support. For Learning Management Systems, or Virtual Learning Environments (VLEs), this is learning and teaching. Many such systems do not make their model of the processes involved in learning and teaching explicit, and need to be deconstructed to establish their model, which unsurprisingly often reflects traditional modes of course delivery. We set out to make our constructivist model explicit, as a basis for building a system that reflected such constructivist principles (von Glasersfeld, 1995).

A key problem facing education is to manage complexity. Despite the exploding growth in knowledge, higher education also faces a growing student body. However, it is not the number of students that is the problem, but the increased variety of student backgrounds, aptitudes, interests, learning needs and so on. This makes the traditional approach, of providing essentially the same information and learning support for all students on a course, difficult to sustain without having an increased dropout or failure rate. It is our view that well-designed information technology systems can help managing complexity, by providing tools to support more individualisation and better communications.

From this perspective, a key issue for the design of VLEs is how to help teachers with the management of groups of learners. If VLEs are to be successful in enhancing educational quality by supporting a constructivist model of learning, they need to provide improved techniques for dealing with the complexity inherent in formal education. We propose that Beer’s Viable System Model (Beer, 1979, 1981, 1986) can be applied to education to generalise and explain these issues, and thus inform the design of VLEs. Our presuppositions are summarised below:

- Universities (and other educational establishments) produce learning, not courses or lectures.
- It is students that create their own learning. It is fashionable to think of students as ‘customers’, but a better metaphor is that they are ‘workers’.
- Learning happens through conversations. It is through engagement in the discourse of their chosen subject that learners acquire the distinctions and models that make them recognisably members of that subject’s community of practitioners. The term ‘conversation’ is used here to mean both synchronous and asynchronous, spoken and written interactions (Laurillard, 1993).
- Teachers enable and support learning. Rather than simply ‘transmitting’ knowledge, they create the context where learners engage in learning conversations.
- Teachers manage the complexity of conversational actions. Most courses involve many more students than teachers, and so teachers need to use techniques and methods to manage the potentially overwhelming complexity of conversational possibilities.
- Institutions exist to manage complexity. The organisational structure of institutions permits some conversations, and prohibits others, thereby reducing complexity.

2. A cybernetic perspective

According to the Viable Systems Model, the key problem for any organisation in
maintaining its viability is how to manage complexity. How it does this determines the type of organisation it is (see Fig. 1). In this figure, ‘V’ stands for variety, the measure of complexity. In formal terms, it is the variety of the environment that is much larger than the variety of the organisation. Hence, the organisation must amplify its variety or attenuate the environment’s.

A common method for variety management in organisations is to try to constrain the potential complexity by limiting the legitimate actions of the workforce through strict job definition and demarcation — the Taylorist model. The problem with this is that organisational flexibility is lost. Another method is to look for ways in which operations can become self-managing while remaining within the overall guidance of management. This requires a number of communication channels between management and operations for specific tasks. These include: resource negotiation, co-ordination and monitoring.

There is also need for communication channels that permit self-organisation, allowing
operational elements to interact with each other without involving management. Self-organisation allows the operational elements to soak up much of their own complexity. (Fig. 2).

How these channels are constructed, determines organisational flexibility and effectiveness. The aspects of the VSM described above have strong implications for the management of complexity in education and VLE design.

3. The VSM and education

Education, or at least formal education, depends on organisational systems, e.g.: institutions, courses, examinations, etc. We have argued elsewhere that educational systems are susceptible to interpretation using the VSM (Liber, 1998). It is necessary to understand VLEs in organisational terms to properly appreciate the types of impact they can have. We suggest that VLEs can be examined at two levels of recursion: the course level and the institutional level. In our view, the learning process is facilitated, resourced, co-ordinated and monitored by teachers, but is undertaken by learners (see Fig. 3).

How an organisation operates and adapts to programmes of study needs to be considered:

- **Resource negotiation:** How do learners negotiate their learning ‘contracts’ with their teacher? Is this one an off or a continuous process? What are their mutual rights and responsibilities? What is the currency of this negotiation?
- **Co-ordination:** Can learners collaborate in creating their learning? How? What provision is there that can prevent exploitation?
- **Monitoring:** How does a teacher monitor whether learning is happening so that, if necessary, remedial action can be taken?
- **Autonomous Learning:** How can each student find their own resources and advance their

![Fig. 3. The VSM applied to a course.](image)
own learning independently of others? Can they contribute their discoveries to the group?

- **Self-organisation**: What space or tools are available to let the learners organise themselves as a group, outside the teacher’s purview?
- **Adaptation**: Is it possible for the teacher to adapt to the course and its resources in light of experiences gained during its operations?

An interpretation of these focal questions is shown in Table 1. These questions are equally valid for the organisation of formal teaching and for virtual learning: it is the answers that are different. All these issues can be affected by the use of technology. How they are affected depends on the facilities and flexibility particular systems offer. We believe that, in addition to the conversational criteria outlined earlier, these organisational criteria are crucial when designing VLEs.

### 3.1. Learning landscapes

The Toolkit for the Management of Learning (TOOMOL) project is a JISC Technologies Applications Programme funded project, developing tools to help teachers and students to manage learning resources, negotiate learning programmes and develop learning profiles. The system can be used in both local and distance learning contexts, and is designed to be able to support those engaged in life-long learning programmes. The software developed by the TOOMOL project (known as Learning Landscapes) was designed following analysis of these organisational issues and with a strong adherence to constructivist principles. Fig. 4 summarises the object design of the system, illustrating how conversations are root objects within the system and how learning activities are composite objects that comprise people, resources and assignments. Learning activities are easily created and adapted within the system (see Fig. 4).

Table 2 below describes how Learning Landscapes was designed to improve on some of the variety management techniques within formal education.

### 4. Conclusion

The Learning Landscapes VLE is an attempt to provide a system that puts conversation at the heart of the learning process, supported and amplified by learning resources, and always

![Component objects of learning Landscapes illustrating the centrality of conversations to the system.](image)
Table 1
Variety management in formal education

<table>
<thead>
<tr>
<th>VSM activity</th>
<th>Level of support</th>
<th>Variety management strategy</th>
<th>Problems/benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource negotiation</td>
<td>Low–no individual resource negotiation. Some individual attention in small groups</td>
<td>All students get the same resources</td>
<td>Problem: Lack of flexibility and individualisation. Benefit: Efficient for teacher’s time management</td>
</tr>
<tr>
<td>Co-ordination</td>
<td>Low–Medium. Group working amongst students is not typically catered for outside special time-tabled sessions</td>
<td>Timetabling</td>
<td>Problem: Lack of variety in different students activities, so all get the same ‘diet’. Benefit: Efficient for institutional time management</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Low–Medium. Large class sizes prevent the previously high level of individual monitoring available through tutorial system</td>
<td>Teachers amplify monitoring capability using postgraduates as group-tutors/demonstrators.</td>
<td>Problem: Teacher can lose track of some students progress. Benefit: Large classes are feasible, if less than satisfactory</td>
</tr>
<tr>
<td>Autonomous learning</td>
<td>Medium–High. Plenty of opportunity for autonomous learning in universities, although guidance can be lacking</td>
<td>Libraries provide access to resources. Diverse student population gives diverse interest sub-groups outside formal learning.</td>
<td>Finding like-minded students with similar interests on fine grained subject areas is not always easy, especially for post-graduates.</td>
</tr>
<tr>
<td>Self-organisation</td>
<td>Low. Little evidence of formal structures helping students to organise themselves into work or study groups</td>
<td>Making it easy for students to self-organise themselves is a vastly under-utilised strategy in formal teaching for attenuation</td>
<td>The key benefit of self-organisation is to alleviate time pressure on the teacher by saving time on information transmission, thus allowing more time to spent on monitoring</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Low–Medium. Adaptation of lectures and supporting resources from year to year</td>
<td>Coarse-grained variety management at the level of group not individual</td>
<td>Individual needs are not catered for. Adaptation is slow and time consuming</td>
</tr>
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</table>
within the context of a specific learning activity. We have tried to develop a system that is efficient to use while permitting a high degree of individualisation. We offer this tool as a contribution to the ongoing conversation about the role of learning technology, and in this paper we have tried to make our design principles and educational philosophy explicit. How well Learning Landscapes realises our vision remains to be seen, but we hope this is only one of the many systems that will enrich and promote conversational learning within a coherent educational framework.

References


<table>
<thead>
<tr>
<th>VSM activity</th>
<th>Level of support due to design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource negotiation</td>
<td>Medium–High. Activities can be set up with just one student and their individual resources</td>
</tr>
<tr>
<td>Co-ordination</td>
<td>High. All students allocated to an activity can freely engage group working at any time</td>
</tr>
<tr>
<td>Monitoring</td>
<td>High. Monitoring is made easy and time-efficient using the VLE as the teacher can quickly scan</td>
</tr>
<tr>
<td>Autonomo learning</td>
<td>individual and group conversational histories. Students assignment submissions are also recorded</td>
</tr>
<tr>
<td>Self-organisation</td>
<td>High. Students can set up their own activities and groups thus providing a mechanism for self-</td>
</tr>
<tr>
<td>Adaptation</td>
<td>High. Most importantly Learning Landscapes activities are extremely easy to set up and adapt</td>
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<td></td>
<td>at any point within a course</td>
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Table 2
Variety management in the Learning Landscapes VLE