Pedagogical Views of a Virtual Educational System

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Abstract: As virtual educational systems are developed there is a basic question about how they are associated with the various available pedogogical systems. The solution for some authors is to move to a new pedagogy for the new world of virtual learning (Popov, 2001). The solution reported here, associated with the development of a platform independent virtual learning environment, was to make the environment pedagogically agnostic in the sense that the system was not dependent upon any particular pedagogy, but supported any pedagogy a teacher might wish to use. The paper outlines the process that has been implemented in order to achieve this and has defined the process as taking *pedagogical views* of the educational objects in question.

Keywords: pedagogies, platform independent, virtual learning environment

Introduction

Virtual educational systems are a part of the thinking about how the educational world will develop. In this context, it is imperative to recognise that the structure of e-learning is not simply about learning through an electronic medium, but that it provides an opportunity for greater ramifications in the form of developing new forms of pedagogical thinking. McClintock (1992) has been the intellectual father in this area in that he developed, over 10 years ago, a position that pointed to the electronically supported learning world being one where conventional models would be replaced by models that moved away from replication of the classroom into a new pedagogical structure. The virtual classroom is not the central concept in McClintock's position, rather it is the development of resources, both electronic and human, that are accessed in an open and non-sequential way. A key to understanding this thinking is to move away from learning being carried out in a timetable semester system where material is presented in a sequential way. Learning tasks are defined and learning resources are provided. Thus, it is implicit that a virtual educational environment is a structure-free information system where minimal constraints are placed on the way educational objects shall be stored.

However, current virtual learning management systems (LMS) tend to adhere to specific and pre-defined structures for delivery of learning materials and therefore impose a pedagogical style on the users/teachers that use these systems. This paper proposes the concept of a virtual educational system that is pedagogically independent. We term this model *Platform Independent Agent-based Virtual Educational Environment (PIAVEE*) (Krishnaswami et al 2004) In PIAVEE, we have developed an interface and data base structure that allows the teacher to develop a *pedagogical view* whereby the teacher

imposes his/her own structure on the teaching/learning materials. That is, the teacher has total control over the way he/she wishes to have the teaching materials stored and presented, rather than the structure being driven by pre-existing ordering that is pre-wired into the LMS's repository. This enables the development and delivery of courseware within this virtual educational environment to be driven by various pedagogical models, ranging from *radical constructivism* to an *instructivist* pedogogy.

The underlying philosophy of the PIAVEE model is that the same learning material or courseware can be presented over a range of pedagogical thinking. Structures can be tailored to suit both teacher and learner preferences and that this would enhance the personalisation of the learning process. The PIAVEE model of pedagogical agnosticism aims to cater for, and to facilitate, user-centred development and delivery of learning materials.

In addition to the pedagogical independence for both the teacher and the learner, PIAVEE focuses on technological innovation. There has been an increasing focus on the development of virtual learning environments (Winn, 2002; Jancki & Steinberg, 2000; McFadzean, 2001; Taylor, 2001). In addition to the imposition of a pedagogical model that underpins the environment on the teacher, these environments have been largely limited to being large, static stores of materials. The uptake and usage of these environments remain hindered by the need for the developer of courseware having to provide the meta-data or descriptors. This imposes additional workload for the courseware developers and can also be constrained by inflexible descriptor templates of the repository. We believe that the flexibility of the underlying technological support infrastructure is the key to enabling the pedagogical independence. Thus, PIAVEE aims to provide an environment that transcends mere storage of educational material into a model that uses a user-defined curriculum structure to provide a framework for the intelligent information retrieval. PIAVEE operates in the world of distributed information systems while, at the same time, taking that idea into a new level in education. The development of PIAVEE is driven by the following functional requirements:

- Alleviate the need for manual entry meta-data/content description by curriculum/courseware developers by incorporating automated and sophisticated strategies for indexing courseware at both low-level features (e.g. keywords) and higher-level educational constructs (e.g. lecture notes, reading material, references and WWW links).
- Provide independence to the teacher from considerations such as the format of the material to be inserted into the repository by incorporating mechanisms that can deal with a variety of physical formats and operate on conceptual notions rather than on fundamental notions such as document format notions and platforms of operation.
- Facilitate support for learning, particularly in a self-managed context, by collating course materials in a personalised, cohesive and holistic manner by using sophisticated automated retrieval techniques that leverage the underlying index structures.
- Enable increased degrees of reuse of materials held within the environment in the context of curriculum development activities based on the semantic aspects of the indexing strategy.
- Facilitate a dynamic support environment for both learning and curriculum development.
- Avoid the traditional pitfalls of maintenance challenges of exponentially growing data content within such repositories by having a *virtual* repository underpinning PIAVEE. Thus, rather than physically co-locating course material, the central management component of PIAVEE should enable collation of relevant material in a dynamic manner based on user needs. This in turn reduces the management and maintenance onus of PIAVEE and fosters an autonomic self-managing educational environment.

A detailed description of the software architecture that underpins PIAVEE is available (Krishnaswami et al 2004). In this paper, we focus on how we develop the pedagogical independence in PIAVEE.

The PIAVEE model of pedagogical independence through the concept of *views* is a key to enabling and addressing several core issues in virtual educational environments:

- Virtual and distributed learning systems relate to an evolving structure of educational thinking that takes an interest in new delivery systems that transcend traditional models of learning and traditional pedagogies (Gehne, Jesshope & Zhang, 2001; Krishnaswamy et al 2004).
- Life-long learning (Ballou, Bowers, Boyatzis, & Kolb, 1999). has been seen as an integral part of the view of the world of work where jobs and careers are likely to change a number of times over a person's life. The use of the virtual learning environment may facilitate cost-effective delivery (Evans & Fan, 2002).
- The internationalisation learning is another area where the overlap between various evolving areas of electronic

and virtual education is becoming more complex. The recent views on the structure of distance education (eg. Taylor, 2001) are rapidly becoming outdated though the joint effects of agent technologies, broadband delivery and virtual management information. There is a movement from the virtual representation of the classroom into the virtual learning environment; a movement that indicates a shift in pedagogical development (O'Donoghue, Singh & Dorward, 2001).

Pedagogical Views rather than Pedagogies

The idea that the virtual educational system could the pedagogically independent is perhaps surprising but, for example, the work published on the TILE program (Gehne, Jesshope & Zhang, 2001) has included minimal educational theory. The point at issue here is whether such a system is dependent upon a pedagogical position or whether it is about a broader question of how educational systems are structured. What we would argue is that the system we will present here (PIAVEE) is about the structuring of delivery processes rather than being about a particular pedagogy. It is the task of the teacher to define the pedagogical processes to be used by the learner and that PIAVEE is simply a flexible platform through which teachers and learners can interact.

When we talk about pedagogical views we are talking about ways in which the virtual database can be structured by an individual teacher to provide the curriculum based format for his/her teaching materials. This means that the teacher has total control over the way he/she wishes to have the teaching materials stored rather than the structure being driven by pre-existing meta systems pre-wired into the database.

Defining pedagogical views

Figure 1 presents an example of a set educational objects associated with a hypothetical unit on introductory statistics. There is no inherent order in the way they have been entered. What can be done within PIAVEE is to structure this set of objects in a way that fits your pedagogical position. It can be seen that there could almost infinite flexibility between quite structured object presentation and unstructured presentations of the objects.

The median
The mean
Measuring central tendency
Analysis of mean application
Measurement types
Calculating the median
Analysis of median application
The standard deviation Doc
Unit objectives
Analysis of sd application
Calculating the mean
Measurement and research
Parametric/nonparametric
Calculating the sd
Measuring dispersion
Unit outcomes

Figure 1: An hypothetical set of educational objects

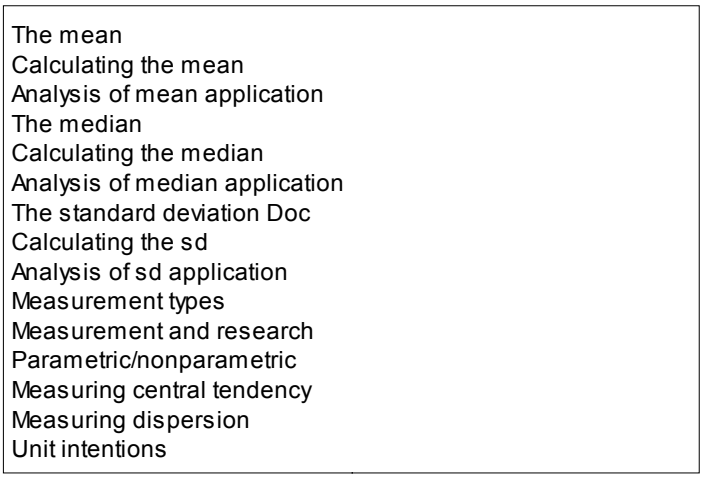
An example is given in figure 3 of how the process might be applied to a workshop on introductory data analysis methods. It can be seen that the base level being defined here might be called an atomic level of definition. This is where the educational materials have no external structure; where the structure is dependent upon the actual content of the educational material itself. The second level of definition provides minimal structure to the educational materials. They have simply been grouped together in a conceptual way that would make probably for a more economical description of a topic. This process continues until all of educational materials are grouped into structures and into presentation sequences.

It should be noted that the atomic level there is no necessary ordering in the way materials have been presented. That is, materials by entered into to data-base in any arbitrary fashion. Structuring is a function takes place at the pleasure of the educationist.

Views for action

View 1 – the critical theorist

As we have seen from Figure 1, the teacher is able to enter the set of educational materials into the data base in whatever form he/she thinks fit. This could be the format for the critical theorist or even the radical constructivist. But a simple reordering is possible to give some structure to the material.
The learner will simply access these materials and complete the unit at his/her leisure.



View 2 – the instructivist

The instructivist teacher would, most likely, presents the educational objects in an ordered way but, as has been pointed out above, this is not necessary. Once the data has been entered he/she would then go through the process of structuring the objects in order to place them in groups and in a defined sequence as shown in Figure 3.
When the learner accesses the materials, access would be controlled by the grouping and ordering defined by the teacher.

View 3 – the general constructivist

The constructivist teacher would organise the objects in the system in a form that he/she believes will scaffold the information to benefit student learning. The view given in Figure 4 has the objects grouped in terms of broad areas as the functional scaffolding. The order is a part of that structure although it has not been ordered by a discrete time-frame as was the case for View 2.
The access for the student would show the groupings of the objects.

Summary – Views to flexibility

It can be seen that PIVAEE allows for the same set of objects to be organised into any number of views and that these views will represent the way in which the educator wishes learners to access that information. The actual structure of the interface allows the educator to create multiple views of the same set of objects. This allows the learner to adopt a view which fits his/her view of the personally most appropriate way of approaching this set of objects.

Developments and Conclusions

PIAVEE will have a structure that allows the student to extract learning materials in the way(s) the teacher has established with the pedagogical views defined for the data base. Some staff may wish to adopt a completely self-managed learning

model in their course delivery and effectively allow any possible combination of materials. This raises questions about how students might cope (O'Donoghue, Singh & Dorward, 2001) as well as questions about the reality of self-managed learning systems.

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Measuring central tendency	3
The mean Calculating the mean Analysis of mean application	4
Parametric/nonparametric	5
The median Calculating the median Analysis of median application	6
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The standard deviation Doc Calculating the sd Analysis of sd application	8
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Unit objectives
Unit expected outcomes

Measurement types
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The standard deviation Doc
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