Independent versus Autonomous Adult Learning in Mathematics?

Sylvia Johnson and Susan Elliott
Sheffield Hallam University

Abstract

Information and communications technology is being promoted in the UK as a mechanism by which adults may become more independent learners (and by which an expansion of higher education can be achieved within a static budget). An associated development is the increased use of diagnostic packages in mathematics at entry level to higher education. A new orthodoxy is emerging in which a diagnostic tool tells learners what they can and can't do and points them to one of the several packages to learn those bits of mathematics they could not do on diagnosis. This process can be completed with no tutor intervention (although maybe with tutor monitoring) and is being labeled as "students engaging in independent learning". This interpretation of 'independent learning' concerns us as educators within the HE environment. We examine the meaning of independent learning within a mathematical context and its current relationship with ICT.

Independent Learning and Information Technology

The term 'independent learning' is a buzz phrase of the nineties in Higher Education. Staff are exhorted to promote it, workshops are delivered on it and its value is hailed. Within the literature and discussing the term with colleagues in our own and other HE Institutions, a variety of interpretations of the phrase can be identified. These are currently almost all linked to the increasing availability of advanced technologies. It is also clear that the popularity of independent learning and the use of IT or ICT is closely tied up with the need for increasing efficiency in the FE and HE sectors in the UK. This appears to be particularly the case in mathematics.

Independent Learning equals self-study?

The notion of independent learning can be traced back to the 1980s. Indeed in 1988, the Department for Education and Science proposed the use of self-study through IT as a means of combatting teacher shortages;

> 'When students learn with the aid of a well designed supported self-study scheme, the teacher's skills as a tutor and classroom organiser are likely to be more important than a thorough knowledge of the subject which is covered step by step in the material.'

Five years later the Royal Society, on its report on the future of Higher Education suggested;

> 'An even greater impact on the whole education field will come from CD-ROM technology... The interactive nature of the environment makes it ideal for self -study packages. ...In future the use of these techniques offer the prospect of savings over time and more effective use of teaching staff...'

Both these views identify a different role for teachers, but both portray an image of the student as an *isolated* learner, learning through a technological package. In fact the second example suggests that the potential for interaction with *the package* is what makes it ideal. Of course interaction with current technology can imply interaction with

other people, though we would suggest that this was not what was implied in the Royal Society Report. In fact the report goes on to say:

> 'High technology can make a contribution. So can liberal use of techniques that go beyond the transmission and partial reception of lectures, and which can contribute to a more 'active learning' mode. Self study, group work, discussion classes, project work, interactive teaching techniques and other resource-based learning can all contribute.'

Here, the notion of 'active learning' is given positive value, with self-study forming but a part of what might contribute to such a learning mode. Is 'active learning' then synonymous with 'independent learning'?

Much of the pressure for independent learning can be traced to the expansion of Higher Education and the consequent dilemmas faced by staff. Mathematics staff encountered first year students with diverse mathematical backgrounds and overall a lower academic base in mathematics. The expansion spawned the TLTP projects that aimed to provide computer based learning materials across a range of academic subjects. One of the explicit goals of this project was to provide increased efficiency in 'delivery'. In mathematics this led to a range of computer based learning material and the extensive use of diagnostic tests. As Greenhow reports (1996), these have enabled staff to deal with the diversity of both experience and attainment and to target resource where it was felt to be most needed.

> 'The reaction to teaching and assessment via CALM was generally favourable, and it integrated well into a traditional lecture-based course by providing revision/backup, practice sessions, and for some topics by replacing lectures altogether...
>
> ...Computers provide the only sensible means of devising personalised study schemes for large classes.'

Here again, the notion of *self study* through the use of technology is advocated. The particular model emphasising the 'personalised' nature of the scheme is effectively an individualised scheme of work. This interpretation of independent learning as individualised, personalised study is one that finds favour with many mathematicians in their search to find pragmatic solutions to the problems they face.

Various paper based individualised learning schemes (SMILE, SMP 11-16, KMP, Ginn to name but a few) have been used particularly in Primary and Secondary Schools in the UK. Whilst these have been used for similar reasons - diversity of attainment and experience, need to acknowledge the differing rates at which individuals learn and so on, they have largely fallen into disrepute for two reasons. Firstly, despite an initial pleasure on the part of students at being able to work at their own pace and not have to 'listen to the teacher rambling on', motivation palls and the pace of learning drops. Secondly, whilst the learner is supposedly 'in control' of their own learning, there has been a realisation of the fact that in fact the material itself, the scheme, is in control,

both of the learner and the teacher, (Gray, 1991). A similar point was made by Brookfield (1986) in relation to adult learners;

> "Although the writers (of these books, magazines and programs) are not physically present to the learner, they nonetheless partly control his or her cognitive operations."

This dependency on schemes generally has minimised the creative input from the teacher, contributed to falling motivation and forced learners down a path in which they may be far from actively engaged, (Rudduck et al, 1996).

Diagnostic tests - a precursor to independent learning?

Within the mathematics community in the UK, the use of diagnostic assessment of students' skills and understanding in mathematics is becoming commonplace. The nature of the diagnostic tools and the purposes identified with their use are explored by Edwards (1996). One purpose identified by many Institutions is to target appropriate mathematics support;

> ' rather than change the emphasis of courses or diluting their syllabuses, many universities try to accommodate the changing background of students by identifying those who need extra help and, in particular areas, in which this help should be given.'
>
> 'However, I am convinced that diagnosis of freshers' weaknesses and needs is paramount...we do this using a bank of computer based tests. If a student fails any question an easier question is called up. If the student fails this the student is directed to a CALMAT unit...'

We see here a deficit model being adopted - one where what is to be learned and the approach to learning remains specified in advance, and in some cases unchanged, despite the failure of students to cope with the material. The diagnostic tool is used identify students who are deficient, or who need more help to acquire the prescribed knowledge in the prescribed way in a given amount of time.

Since tutor help is expensive, students and tutors are encouraged to adopt independent learning through supported packages, increasingly IT based, in order to make up for their deficiencies.

Whilst we acknowledge the need for incoming students to be reasonably fluent in a range of mathematical skills, and recognising the place of ICT based packages in helping students to sharpen such skills, we contend that this process has little to do with the development of independent learning skills.

The control over who must engage and the material with which they must engage lies firmly with the institution. Students, whilst apparently being given control, in reality are potentially disempowered. The emphasis remains on the need to acquire the specific mathematical knowledge and skills, rather than on the development of independent learning skills which might enable students to regain control of their own learning of mathematics - which for them has been and continues to pose difficulties.

Autonomy and control - essential ingredients of independent learning?

Two other phrases associated with independent learning which, semantically at least, focus attention on the individual are 'self-managed learning' and 'self directed learning'. However, these, together with the term 'autonomous learning', also convey a sense of the learner in control, the learner taking responsibility in the learning process.

The authors of a recent report, Investing in Knowledge: The Integration of Technology in European Education (Feb 97) suggest that ICT *must* be integrated in the new learning society because

> 'it opens up new ways of learning we are used to a rather passive way of learning. ICT has the ability to help the learner develop as a constructive creative, self-regulated, active and interactive learner, able to learn by him/herself...'

For this to be realised, learners' own conceptions of what it means to learn will need to encompass such a vision. We think the language of 'delivery', 'fill in the gaps', 'remedial', 'self study' ... which is prevalent in the literature and current discourse, is unhelpful here. It does not convey the notions of autonomous learners encapsulated above. On the contrary, it conveys a conception of learning through individualised study by passive, deficient, powerless adults who try to receive the handed on knowledge they are missing. The phrase 'independent learning' can be interpreted within either of these paradigms, but would appear to be too easily conceivable in the latter. If we wish to imply the former, it might be more useful to adopt 'autonomous learning' or 'self directed learning', both of which explicitly imply self-responsibility and self-control.

The technological power available today has the potential to facilitate the vision above and to prevent individual learning being over-prescribed. For example, conferencing makes use of peer support and discussion in ways that can empower. The use of CD-ROM materials (closed but typically interactive) can be contrasted with the use of the World Wide Web. The World Wide Web is an open environment. It is not interactive but demands analytical and critical examination because of the lack of recognised authority behind it. The current use of and search for computer based software packages does not harness today's technological power as effectively as it might. Ultimately, learners can only become autonomous if other mechanisms are used which enhance their capacity for independent learning - as opposed to self-study through even a loosely prescribed scheme. Chene (1983) suggests that autonomy is only possible when learners have an awareness of the process of learning, knowledge of norms and the ability to make critical judgments on the basis of that knowledge.

Independent learning in a trap – unmeshing it from ICT

The use of diagnostic tests as a device by tutors to tailor an appropriate learning diet for each student begs the question 'where is the locus of control?'.

It also detracts debate away from the central issues of the nature of adult learning of mathematics and the needs of adult learners. The 'problem' of adult learners' not being fluent or competent mathematically becomes the central issue. The students become the problem, not the teaching and learning approach.

Independent learning and ICT are becoming entwined in Higher Education institutions' attempts to solve problems of increased pressure to become more efficient. Alongside this pressure are pedagogical issues of encouraging students to take control of their own learning. Houston (1995) describes the changes made from a "traditional" lecture and tutorial method of delivery to one of "independent learning" with peer-tutor support on a "Mathematical Modelling" course at the University of Ulster. He declares that there were several reasons for making this change.

> There was the desire to respond to pressure to be "doing more with less" i.e. to try to remove the teacher from the classroom for at least some of the time. **More importantly** (our emphasis) there was the belief that students should be encouraged from an early age to take more responsibility for their own learning...

Although this particular project does not appear to make use of ICT it raises clearly and very honestly the dilemma faced by many lecturers. A similar project, which makes extensive use of ICT, has been undertaken at our own institution. A student on the course expresses cynicism about our motives for using MathWise as a vehicle for some of the course content. She says:

> I think it's a good idea and easy to follow, but is it a cop out to cut down on teaching time as we move faster into the 21st century?

This course, in common with the one at the University of Ulster, causes problems for some students. Houston (1995) concludes that for the University of Ulster students:

> Unless they are very self-disciplined and able to manage their time to good effect, many students put off doing their learning ...Some disliked the independence culture, first, because they were not used to it, and secondly, because they were unwilling to take so much responsibility for their own learning...Some felt (rightly) that they were in a competitive situation with their peers and so were reluctant to share their learning with them.

These conclusions point to the need for students to be adequately prepared for independent learning. This new learning process is neither necessarily easy nor simple to implement. Preparation, management and support for learning will remain high on the tutors' agendas. Neither ICT nor independent learning removes the need for these functions although they do change their nature. 'Since ICT environments are essentially unstructured, learners will need intensive help for knowledge management.' (Investing in Knowledge, 1997)

The incorporation of ICT into a course simply to replace an existing teaching method without a comprehensive review of the whole course begs the question of why ICT. It

also demands a reappraisal of the relationship between the activities of teaching and learning and the contexts in which they occur.

Conclusion

We suggest that the use of an ICT environment and the development of autonomous approaches to learning need to be considered as two separate issues. The way in which the ICT environment is employed and managed needs careful consideration. Also, the purpose and quality of the material used is of paramount importance.

The uses of teacher/tutor time in ways which actively support the development of autonomy are crucial if students are to develop appropriate learning skills for increasingly unstructured learning environments. Brookfield (1986) reminds us of the 'dangers of equating control over techniques of learning with autonomy.'

ICT is a learning environment not of itself an approach to learning.

References

Brookfield, A.D. (1986) Understanding and Facilitating Adult learning, Open University Press

Chene, A. (1983) 'The Concept of Autonomy in Adult Education: A philosophical Discussion.' Adult Education Quarterly, 34(1), 38-47.

DES & MSC, (1988), Action on Teacher Shortages - A Guide to the Role of the New Technologies and Other Approaches to Learning, DES, London.

Edwards,P. (1996), A Survey of Mathematics Diagnostic Testing on non-Specialist Mathematics Courses, The Open Learning Foundation

Houston, S K (1995), 'Attitudes of Students to Independent Learning', in Alvin White (Ed), Humanistic Mathematics Network, Journal #12. Harvey Mudd College, Claremont , California.

Gray, E. (1991) 'The Primary mathematics textbook: intermediary in the cycle of change', in Pimm, D. & Love, E. (Eds.) Teaching and Learning School Mathematics, Hodder and Stoughton

Greenhow, M. (1996), 'Computer-based diagnostic tests and assessment at Brunel University', Maths & Stats, Volume 7 No 3, CTI

Royal Society, (1993) Higher Education Futures

Rudduck, J., Chaplain, R. & Wallace, G. (1996) School Improvement: What can Pupils Tell Us? David Fulton Publishers

The European Round Table of Industrialists, (1997), Investing in Knowledge: The Integration of Technology in European Education, ERT, Brussels.

Software

MathWise, Centre for Computer Based Learning, University of Birmingham