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Beyond constructivism: Exploring future learning paradigms

Abstract

Educational practice is continually subjected to renewal, due to developments in information and communication technology (ICT), the commercialisation and globalisation of education, social changes and the pursuit of quality. Of these, the impact of ICT and the new knowledge economy are the most significant.

Changes in our educational practice lead, in turn, to changes in our approaches to teaching and learning. These changes also impact on our teaching and learning paradigms. Currently, as over the past few decades, we teach and learn in a constructivist learning paradigm.

This article discusses past and present paradigm shifts in education and then explores possible future learning paradigms in the light of the knowledge explosion in the knowledge era that we are currently entering.

1. The impact of ICT on education

The electronic information revolution currently experienced in the world can be compared to and reveals the same characteristics as the first information revolution started by Gutenberg's printing press. This means that, just as present-day society accepts the printing industry as given and printed materials form an integral part of our daily existence, electronic material will go the same way. Possibly in only a drastically shorter period than in the case of printed material.

It is furthermore important to acknowledge the increasing role and function of technology in the education environment. The rapid development of technology makes the concept of an electronic learning environment a reality, in which electronic education and Internet-based learning can play a major role.

Langlois (in Collis, 1999:374) makes the following statement: "New information technologies, and particularly the Internet, is dramatically transforming access to information, are changing the learning and research process, how we search, discover, teach and learn..."

As our educational practice changes, so our approaches to teaching and learning also change. These changes impact on our teaching and learning paradigms - our viewpoint and mindset about teaching and learning.

Currently, as over the past few decades, we teach and learn in a constructivist learning paradigm. Will we experience a change of paradigm in the near future? Will we adopt a new learning paradigm in the next decade or two?

These questions lead us to explore new learning paradigms. But before we continue with the exploration, let us first look back over past recent decades and review the paradigm shifts we have already experienced.

2. Paradigm shifts in education over recent decades

The paradigm shifts that we experienced in the 20th century are well known. Some of the prominent paradigm shifts that have taken place in education are discussed briefly.

- Reproductive learning vs productive learning

Learners' achievements were measured against their ability to reproduce subject content - in other words, how well they could memorise and reproduce the content that the teacher 'transferred' to them. With the emphasis on productive learning, it is rather about the application of knowledge and skills, in other words, what the learners can do after completing the learning process. Achievement is measured against the productive contribution a learner can make, instead of what the learner can reproduce.

- Behaviourism vs constructivism

According to a behaviouristic view of learning, a learning result is indicated by a change in the behaviour of a learner (Skinner, 1938; Venezky & Osin, 1991). According to a constructivist view, learning is seen as the construction of meanings by the learner (Cunningham, 1991; Duffy & Jonassen, 1991). Neither of these views can be regarded as exclusively right or wrong. It is, however, important to know that constructivism is presently accepted as the most relevant view of learning and that education policies, education models and education practices focus on constructivism.

- Teacher-centred vs learner-centred

In the past, education activities focussed on the strong points, preferences and teaching style of the teacher. That which would work best for the teacher, determined the design of the learning environment and the nature of activities. Teacher-centeredness is also characterised by a view that the teacher is the primary source of knowledge for learners. In a learner-centred environment, the focus is on the strong points, preferences and learning style(s) of the learner(s). The learning environment is designed according to the needs and possibilities of the particular learner group.

A further distinction between teacher-centeredness and learner-centeredness lies in the responsibility accepted for the learner's learning process and learning achievement. In a teacher-centred paradigm the teacher accepts this responsibility. Opposed to that, the learner accepts the full responsibility for his/her own learning in a learner-centred education paradigm. It is for this reason that self-directed learning plays such an important role in effective learner-centred education systems. Note however, that this does not mean that the teacher or educational institution has no responsibility to create a conducive learning environment, in which effective learning can take place.

- Teaching-centred vs learning-centred

[At this stage, it is important to indicate that the term education be seen as the macro term which includes the concepts teaching and learning (education = teaching + learning).]

Education activities in the past, were planned and executed from a teaching perspective. A teacher would plan a teaching session (lecture) based on what the best teaching methods would be to transfer the concerned subject content to the learners. The focus was on how to teach. In the new paradigm, education activities are planned and executed from a learning perspective. The emphasis is now on the learning activity and learning process of the learner. So the focus is on how the learning, which should take place, can be optimised. "In general, there must be a conversion from a teaching to a learning culture." (Arnold in Peters, 1999)

- Teaching vs learning facilitation

Teaching or instruction, as an activity of the teacher, is seen as an activity that relates to the 'transfer of content' (an objectivist view) within a teaching-centred education paradigm. The presentation/delivery of a lecture or paper falls into this category. The principle of learning facilitation follows a learning-centred education paradigm. Learning facilitation has to do with the teacher's activities, which focus on optimising the learner's learning process. Just as the word indicates, the emphasis is on the facilitation of learning.

Teachers cannot be regarded as the only source of knowledge and cannot focus on the traditional 'transfer of content' any longer. They need to focus on the facilitation of learning. "Instructional staff no longer are the fountainhead of information since the technology can provide students with access to an infinite amount of and array of data and information. The role of the instructor, therefore, changes to one of learning facilitator. The instructor assists students to access information, to synthesize and interpret it and to place it in a context - in short to transform information into knowledge." (Kershaw & Safford, 1998:294)

- Content-based vs outcomes-based

A content-driven approach to education is characterised by curriculum and education activities that focus on subject content. The emphasis is on the content that learners should master and a learner receives a qualification based on the nature, amount and level (difficulty) of subject content he/she has mastered. An outcomes-based approach to education focuses on the learning outcomes to be reached by the learners. A typical process for curriculum in an outcomes-based model is characterised by the formulation and selection of learning outcomes that a learner should reach - that which the learner must be able to do on completion of the learning process. The selection of subject content is based on the relevance thereof to enable the learner to reach the learning outcomes.

- Content-based evaluation vs outcomes-based assessment

Content-based evaluation follows a reproductive view of learning where a learner's achievement is measured by the quantity and quality of content that are reproduced. On the contrary, outcomes-based assessment refers to a productive view of learning where a learner's achievement is measured by the mastery learning outcomes.

3. Recent developments and trends in education

- From constructivism to social constructivism

Constructivist approaches are now also making way for social constructivism. Communities of Practice (COPs) are evolving and beginning to play a significant role in teaching and learning environments. The focus is on the effective and productive use of existing, social and natural resources for learning. The real expert is not the teacher, or any other person for that matter, but the community of practice.

Constructivism refers to learning as the construction of new meanings (knowledge) by the learner him/herself. Social constructivism refers to learning as the result of active participation

in a 'community' where new meanings are co-constructed by the learner and his/her 'community' and knowledge is the result of consensus (Gruender, 1996; Savery & Duffy, 1995).

- From knowledge production to knowledge configuration

Because of the development in the field of ICT, increasing amounts of information are accessible daily for many people in all parts of the world. The days when knowledge and information were limited to libraries, books and experts, are over. Knowledge production is making room for so-called knowledge configuration.

Gibbons (1998:i) expresses it as follows: "Universities have been far more adept at producing knowledge than at drawing creatively (re-configuring) knowledge that is being produced in the distributed knowledge production system. It remains an open question at this time whether they can make the necessary institutional adjustments to become as competent in the latter as they have been in the former."

Educational institutions should develop the necessary competent human resources in order to conduct and manage knowledge configuration effectively. "This requires the creation of a cadre of knowledge workers - people who are expert at configuring knowledge relevant to a wide range of contexts. This new corps of workers is described in the text as problem identifiers, problem solvers, and problem brokers." Gibbons (1998:i)

Where educational institutions greatly emphasised the generation of content for learning programmes in the past, the storage and re-use of content will become more important. The generating of certain content might possibly not even happen at or through the institution itself, but elsewhere. The educational institution could possibly, in such a case, give attention to the evaluation, processing and packaging of the content. "Over 90% of the knowledge produced globally is not produced where its use is required. The challenge is how to get knowledge that may have been produced anywhere in the world to the place where it can be used effectively in a particularly problem-solving context." (Gibbons, 1998:i)

These paradigm shifts in education have contributed to the ever-growing need to innovate our educational practice and to explore new learning paradigms. Cognisance needs to be taken of the fact that ICT developments are impacting educational practice and that we will, in the near future, experience shifts in learning paradigms.

4. Exploring and anticipating future learning paradigms

Learning paradigms are already starting to shift beyond the changes experienced in the 20th century in terms of the role of teaching and learning. While the role of the teacher first shifted from 'teaching' to 'learning facilitation', the latest shift is towards 'facilitated and supported enquiry'. Soloway (2003), for example, argues that inquiry into authentic questions generated from student experiences is now the central strategy for teaching.

The following is a summary of relevant highlights taken from the European Union's aims for 2010 (Oliveira, 2003):

- We should experience a shift from PC centeredness to ambient intelligence. The ICT environment should become personalised for all users. The surrounding environment should be the interface and technology should be almost invisible. There should be infinite bandwidth and full multimedia, with an almost 100% online community.
- Innovations in learning that we should expect are focused on personalised and adaptive learning, dynamic mentoring systems and integrating experienced based learning into the classroom. Research should be done on new methods and new approaches to learning with ICT.

- Learning resources should be digital and adaptable to individual needs and preferences. E-learning platforms should support collaborative learning. There should be a shift from courseware to performanceware focused on professional learning for work.
- ICTs should not be an add-on but an integrated part of the learning process. Access to mobile learning should be enhanced through mobile interfaces.

These highlights from the EU's bold but realistic aims for 2010 provide a couple of important indicators for the near future.

The knowledge economy and the accompanying commoditisation of knowledge and available information, have prompted a further step in the process. Nyiri (2002:2) quotes Marshall McLuhan: "The sheer quantity of information conveyed by press-magazines-film-TV-radio far exceeds the quantity of information conveyed by school instruction and texts." This observation does not even mention the magnitude of information freely available on the Internet. Therefore contemporary educational paradigms focus not only on the production of knowledge, but are beginning to focus more and more on the effective application/integration/manipulation/etc. of existing information and knowledge.

A new type of literacy is also emerging, namely information navigation. Brown (1999:6) describes this as follows: "I believe that the real literacy of tomorrow will have more to do with being able to be your own private, personal reference librarian, one that knows how to navigate through the incredible, confusing, complex information spaces and feel comfortable and located in doing that. So navigation will be a new form of literacy if not the main form of literacy for the 21st century."

According to Gartner (2003) the new knowledge economy is merely in its emerging stages and will only reach maturity from 2010 onwards. This is clearly indicated in figure 1 taken from Gartner (2003).

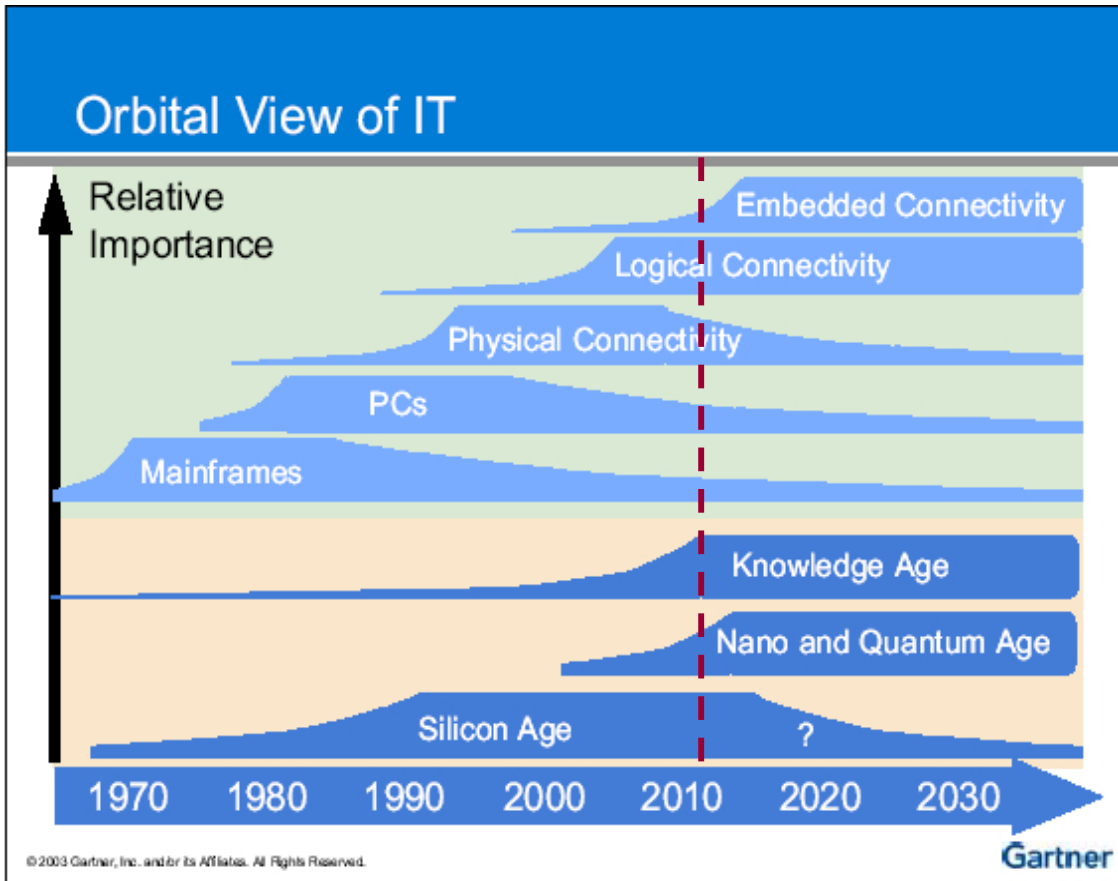


Figure 1: The rise of the knowledge era (Gartner, 2003)

We have already experienced enormous challenges in coping with the current overflow of available information. It is difficult to imagine what it will be like when the knowledge economy is in its prime...

It is estimated that by the year 2010 the world's knowledge will be doubling every 11 hours. "While the world's codified knowledge base (i.e. all historical information in printed books and electronic files) doubled every 30 years in the earlier part of this century, it was doubling every seven years by the 1970s. Information library researchers say that by the year 2010, the world's codified knowledge will double every 11 hours." (Bontis, 2002:22)

Just imagine the extensive information overload we will experience in a situation where the world's knowledge doubles every 11 hours! Not even to think about the growth after that...

This future scenario will have an enormous impact on information processing and most definitely on our learning processes and learning paradigms that are currently still very much founded in a content and knowledge production paradigm.

So what will future learning paradigms then look like?

To answer this question, we need to explore what lies **beyond constructivism**.

Figure 2 below summarises the paradigm shifts we have experienced in the past and proposes a possible paradigm shift envisaged for the future. A discussion of the paradigm shifts as shown in Figure 2 is presented in Table 1.

Exploring and anticipating learning paradigms beyond constructivism

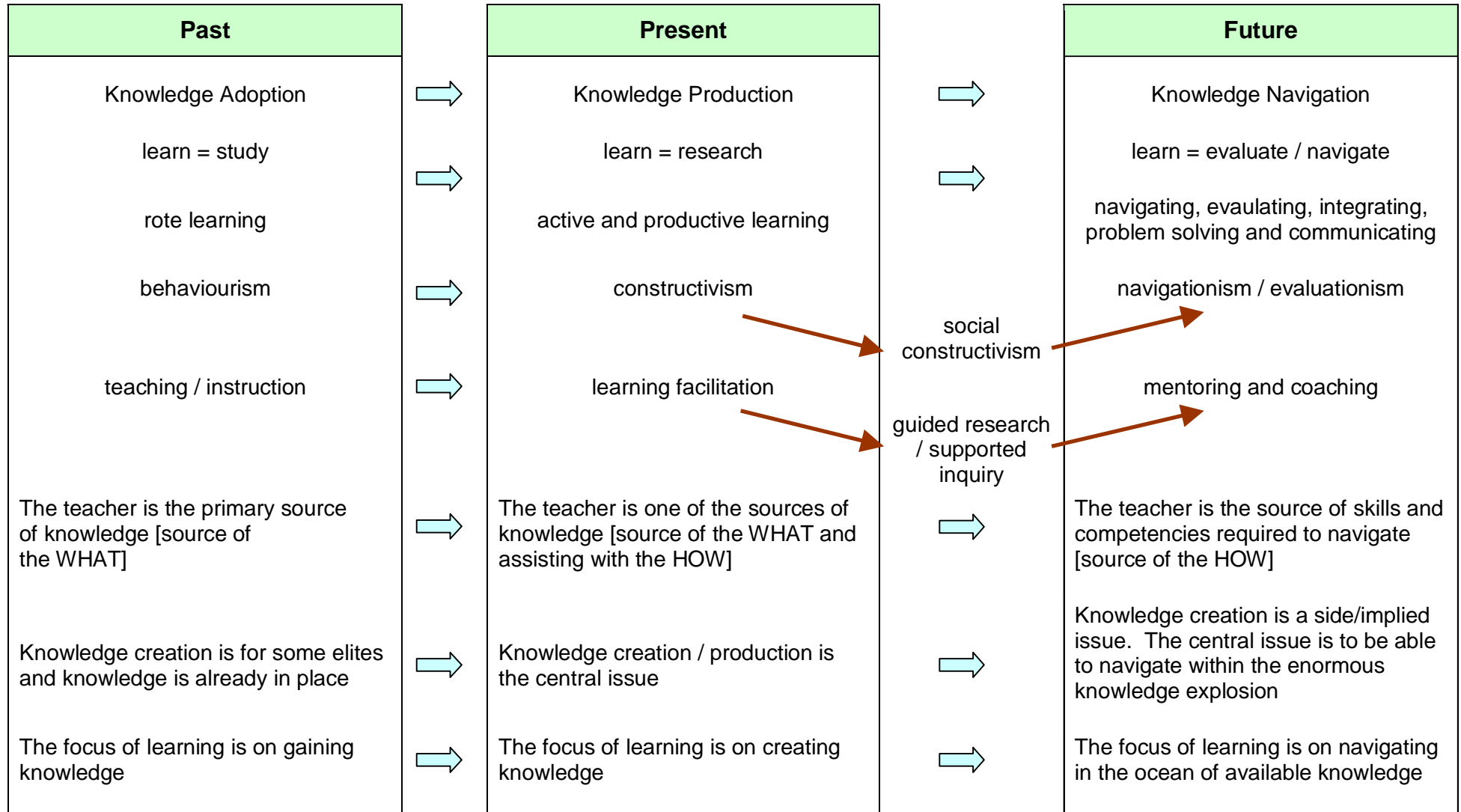


Figure 2: Exploring and anticipating learning paradigms beyond constructivism

Exploring and anticipating learning paradigms beyond constructivism		
Past	Present	Future
The knowledge adoption era:	The knowledge production era:	The knowledge navigation era:
<p>During this era the emphasis was on knowledge adoption. Learning was seen as the activity of studying. Successful learning took place when learners mastered the content and rote learning was the means through which this outcome was usually achieved. A change in the behaviour of the learners was the aim of this learning paradigm called behaviourism.</p> <p>In this paradigm, the role of the teacher was to teach. Teaching or instruction was the obvious activity of the master subject expert - the teacher - because he/she was the source of knowledge. The teacher was the 'sage on the stage' and the primary source of the WHAT that was to be taught. Knowledge creation was actually only for the elite and it was usually accepted that the knowledge was already there and learners just had to gain the knowledge - thus the focus of learning was on 'gaining' knowledge.</p>	<p>This is the contemporary learning paradigm where the emphasis is now on knowledge production. Learning is seen as the activity of inquiry and research. Successful learning takes place when learners are engaged in active learning tasks that guide them to create their own new meanings (knowledge). Productive and experiential learning are the means through which this outcome is usually achieved. The construction of new knowledge is the aim of this learning paradigm called constructivism.</p> <p>In this paradigm, the role of the teacher is to facilitate the learning process. Learning facilitation is the obvious activity of the teacher because he/she is only one of the sources of knowledge. The teacher is the 'guide on the side' that allows him to be only one of the sources of WHAT should be learned, but also the source of HOW to learn. Knowledge production/creation is the central issue of what teaching and learning is about - thus the focus of learning is on 'creating'/'producing' knowledge.</p>	<p>In this new learning paradigm that we are already rapidly moving towards, the emphasis will be on knowledge navigation. Learning is seen as the activity of exploring, evaluating, manipulating, integrating and navigating. Successful learning takes place when learners solve contextual real life problems through active engagement in problem solving activities and extensive communication and collaboration. The aim of these activities is not to gain or create knowledge, but to solve problems. Knowledge is, of course, being created in the process, but knowledge creation is not the focus of the activities per se. Navigating skills are required to survive in the knowledge era learning paradigm called navigationism.</p> <p>In this paradigm, the role of the teacher is to coach the learners in HOW to navigate - to be their mentor in the skills and competencies required in the knowledge era. The teacher is the 'coach in touch' with the demands and survival skills of the knowledge era. Knowledge navigation is the central issue of what teaching and learning is about - thus the focus of learning is on 'navigating' in the ocean of available knowledge.</p>

Table 1: Discussion of the paradigm shifts as shown in Figure 2

Thus I argue that ‘**navigationism**’ might be the new learning paradigm that lies beyond constructivism.

I am convinced that constructivism is a step we took - a very big leap over a long period of time [60 to 70 years] in the development of learning theory. I believe that we are at the brink of a new learning paradigm breakthrough. Constructivism has been the learning paradigm during the past few decades. And social constructivism is in my mind an intermediate or sub-step forward towards the new learning paradigm. ICT developments are impacting educational practice and we will, in the near future, experience their impact on learning paradigms.

I am **NOT** saying that constructivism is going to die. Not at all! I am not contemplating that navigationism will ‘replace’ constructivism or change learning theory. Constructivism will most surely remain within the heart of learning theory. But the focus of our learning activities will shift towards a new learning **PARADIGM**. In the same way, when the shift from behaviourism to constructivism took place (and is still taking place), it never implied that behaviourism died. Behaviourism is a very important part of our learning theory, but it is currently not the **FOCUS** of our teaching and learning activities. While we are promoting constructivist activities with learners and facilitating the learning process through being the ‘guide on the side’, it doesn’t imply that our learners do not have behaviourist outcomes (change in behaviour) as well. In the same way, constructivist outcomes will remain, but our **focus** in the knowledge era will shift towards **navigation**.

5. Paradigm shifts and role changes

The following two tables provide a concise summary of the past and envisaged educational paradigm shifts, as well as the past and envisaged role changes of role players within teaching and learning environments. Tables 2 and 3 also provide a key word summary of the most important issues in the preceding discussions in this article.

Paradigm shifts in education		
Past	Present	Future
<ul style="list-style-type: none"> • knowledge adoption 	<ul style="list-style-type: none"> • knowledge production 	<ul style="list-style-type: none"> • knowledge navigation
<ul style="list-style-type: none"> • behaviourism • objectivism 	<ul style="list-style-type: none"> • cognitivism • constructivism 	<ul style="list-style-type: none"> • navigationism
<ul style="list-style-type: none"> • instruction 	<ul style="list-style-type: none"> • learning facilitation 	<ul style="list-style-type: none"> • coaching and mentoring
<ul style="list-style-type: none"> • information gathering 	<ul style="list-style-type: none"> • information generation 	<ul style="list-style-type: none"> • information navigation
<ul style="list-style-type: none"> • knowledge provision 	<ul style="list-style-type: none"> • knowledge management 	<ul style="list-style-type: none"> • knowledge facilitation

Table 2: Summary of paradigm shifts in education

Role Changes in education			
Role Player	Past	Present	Future
	Knowledge Adoption Era	Knowledge Production Era	Knowledge Navigation Era
Learner	<ul style="list-style-type: none"> • knowledge adoption 	<ul style="list-style-type: none"> • knowledge production 	<ul style="list-style-type: none"> • knowledge navigation
Teacher	<ul style="list-style-type: none"> • instruction 	<ul style="list-style-type: none"> • learning facilitation 	<ul style="list-style-type: none"> • coaching and mentoring
Instructional Designer	<ul style="list-style-type: none"> • design of instruction • reduction of content 	<ul style="list-style-type: none"> • design of learning facilitation and learning activities • re-/configuration of knowledge 	<ul style="list-style-type: none"> • design of coaching and navigation activities • configuration of navigation tools
Information Specialist	<ul style="list-style-type: none"> • information gathering and provision • knowledge provision 	<ul style="list-style-type: none"> • information configuration • knowledge management 	<ul style="list-style-type: none"> • information facilitation • knowledge facilitation

Table 3: Summary of role changes in education

6. Conclusion

What lies beyond constructivism? Perhaps navigationism?

Are we planning for and anticipating the future? Are we ready to take the leap to the next learning paradigm? Or will the ever growing and demanding knowledge era catch us all off guard?

Institutions should move away from providing content per se to learners. We should focus on how to enable learners to find, identify, manipulate and evaluate information and knowledge, to integrate this knowledge in their world of work and life, to solve problems and to communicate this knowledge to others.

Teachers and educators should become the source of HOW to navigate in the ocean of available information and knowledge. We should become **coaches** and **mentors** within the knowledge era.

May this article stimulate further research to define navigationism and to describe the navigating skills we require to survive in the knowledge era.

References

- Bontis, N. (2002). The rising star of the Chief Knowledge Officer. *Ivey Business Journal*, March/April 2002: 20 – 25.
- Brown, J.S. (1999). *Learning, Working & Playing in the Digital Age*. Paper delivered at the 1999 Conference on Higher Education of the American Association for Higher

- Education, March 1999, Washington, USA.
- Collis, B. (1999). New didactics for university instruction: why and how? *Computers & Education*, 31(4) : 373 – 393. URL : <http://www.sciencedirect.com/science>
- Cunningham, D.J. (1991). Assessing Constructions and Constructing Assessments. *Educational Technology*, 31(5):13-17.
- Duffy, T.M. & Jonassen, D.H. (1991). Constructivism: New Implications for Instructional Technology? *Educational Technology*, 31(5):7-12.
- Gartner (2003). Emerging Technology Scenario. Paper delivered by Gartner analyst Nick Jones at the Gartner Symposium and ITxpo, 4 – 6 August 2003, Cape Town, South Africa.
- Gibbons, M. (1998). Higher education relevance in the 21st century. Paper presented at the UNESCO World Conference, Paris, France : i – ii & 1 – 60
- Gruender, C.D. (1996). Constructivism and Learning: A Philosophical Appraisal. *Educational Technology*, 36(3):21-29
- Kershaw, A. and Safford, S. (1998). From order to chaos: the impact of educational telecommunications on post-secondary education. *Higher Education* 35, 285 - 298
- Nyiri, K. (2002). *Towards a philosophy of m-learning*. Paper delivered at the IEEE international workshop on wireless and mobile technologies in education. August 29-30, 2002, Växjö University, Sweden.
- Oliveira, C. (2003). Towards a knowledge society. Keynote address delivered at the IEEE international conference on advanced learning technologies (ICALT). July 2003, Athens, Greece.
- Peters, O. (1999). The University of the Future - Pedagogical Perspectives. Paper presented at the nineteenth world conference of the International Council for Open and Distance Education, Vienna, Austria, 19-14 June 1999.
- Savery, J.R. & Duffy, T.M. (1995). Problem Based Learning: An Instructional Model and Its Constructivist Framework. *Educational Technology*, 35(5):31-38.
- Skinner, B.F. (1938). *The Behaviour of Organisms: An Experimental Analysis*. New York: Longman.
- Soloway, E. (2003). Handheld computing: Right time, right place, right idea. Paper delivered at the IEEE international conference on advanced learning technologies (ICALT). July 2003, Athens, Greece.
- Venezky, R. & Osin, L. (1991). *The Intelligent Design of Computer-Assisted Instruction*. New York: Longman