

## *Towards a knowledge-sharing scaffolding environment based on learners' questions*

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### **Abstract**

This article describes a web-based communicative space (a Dynamic Frequently Asked Questions environment—DFAQ) in which learners consult one another using questions, and in which both the flow of interaction and its artefacts become a resource available to a community of learners. Anecdotal evidence suggests that learners embarking on their first year of university study enter a world that is essentially text-based and are inclined to view text as an authority, as something fixed that closes rather than opens up enquiry. Motivated by the need to scaffold learners' engagement with academic text, we developed the DFAQ in which learners asked questions and other learners responded. The article discusses the learning activity that led to student consultation and provides a critical review of the environment based on student interviews. Our conclusion is that the environment provides learners with a unique 'space' in which to access questions and responses that they might not have generated themselves. Furthermore, given the environment's capacity to recruit, hold and focus attention as well as model appropriate questioning behaviour, we think that it does indeed provide a space that scaffolds learners' engagement with the text.

### **Introduction**

In order to meet the diverse learning needs of heterogeneous learners, we devised a project which aimed to scaffold learners' engagement with textuality. Mindful of the cognitive complexity of a classroom, we sought to develop an environment that would emancipate learners to question text without feeling inhibited and for this, anonymity was important. Bell and Davis (1996) have noted that a classroom is a complex cognitive environment because each learner has different knowledge, skills, abilities and experience. We saw this individuality as a challenge and an opportunity. The challenge

lay in how to facilitate knowledge sharing. The opportunity was in the learners' ability to help each other and to together build a source of knowledge, a new resource that would provide scaffolding for learners' learning. We borrow from Wood *et al* (1976) and use scaffolding in this context in the following manner: the environment must recruit learners' interest, it must keep the learners focused and oriented towards task-related goals, and must provide models of what appropriate questions and answers look like, in order to give learners opportunities to develop their critical engagement skills. That is, the environment (with the lecturer's input) acts as a bridge between what the learner knows and can do and what the learner needs to be able to know and do (Vygotsky, 1992).

Cecez-Kecmanovic and Webb (2000, 310) postulate that web-based technologies extend the communicative space of learners, and they outline three characteristics of the new extended space that affect learning conditions:

- Unrestricted participation in a group activity as long as technical access is available
- Permanent recording of learner interactions, including flow of interactions in a period of time
- Any-time-any-place access to these records by participants, learners and instructor alike

We developed a web-based environment of this kind. The long-term goal of this project is to create a web-based communicative space for learners in which they consult one another using questions, and in which both the flow of interaction and its artefacts become a resource available to a community of learners.

### **The context**

The project is located within a postgraduate module in the Education Department at the University of Cape Town (UCT). Learners registered for the module 'Learning and Cognition' were given access to this environment. As a consequence of South Africa's tumultuous history, learners at UCT come from diverse educational backgrounds and have different learning needs. To meet these needs, we designed a learning environment capable of facilitating learners' discursive interaction with both their classmates and their lecturer. Our assumption that learning requires cooperation and that learners can learn from one another is informed by the Vygotskian notion of mediation within the zone of proximal development. It is here that learning happens, in the space between what learners can achieve independently and what they can achieve with guided assistance that learning happens.

#### *The Dynamic Frequently Asked Questions environment*

The DFAQ environment (Ng'ambi, 2002a) is web-based. Within it, each FAQ creates a room or virtual space in which a conversation (a) occurs, (b) may occur or (c) has already occurred (Ng'ambi, 2002b). We built into the environment some intelligence capable of anticipating the user's future questions and of pre-empting predicted questions through a proactive response (Ng'ambi, 2002c). The DFAQ does not come pre-packaged with questions and responses, but the environment is populated with

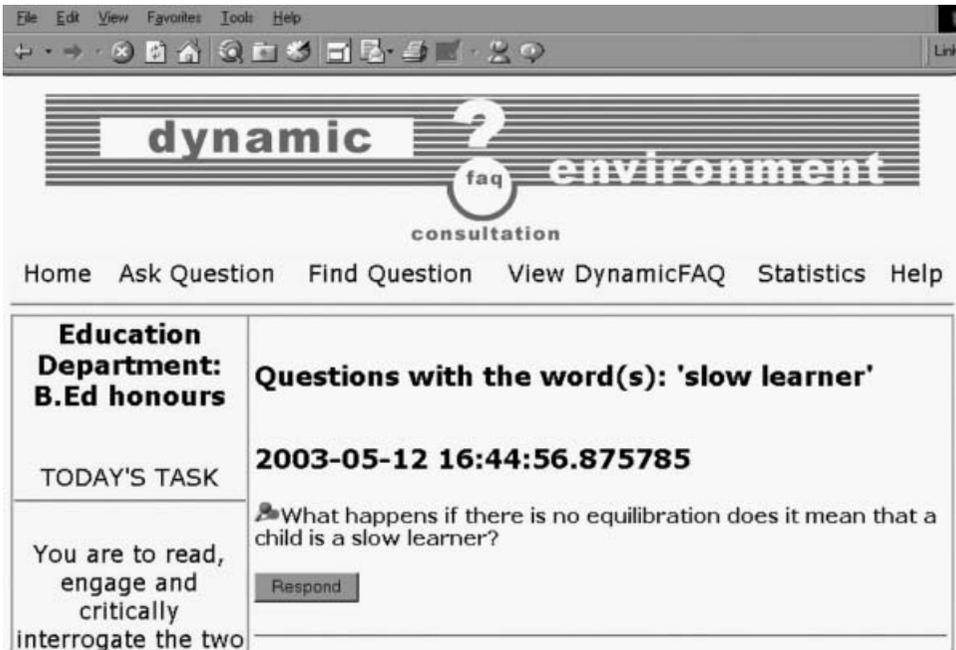


Figure 1: Part of the DFAQ environment web site

questions and responses as learners ask and respond to each other. Figure 1 shows part of the environment.

The dynamic nature of the DFAQ means that the environment creates the FAQ lists as questions are posted. This is in contrast to the many FAQ lists where questions and responses are predetermined and the users limited to 'read only' material.

In recent trials Text 1 and Text 2 (see below) were placed within the DFAQ environment by the lecturer and learners interrogated the texts. These two texts were selected because they were directly related to the course content and sufficiently challenging to create cognitive conflict in learners, forcing them to generate multiple questions about the texts.

All the FAQs (questions asked by individual learners) were made available to the whole class so that learners could choose the ones to which they wanted to respond. Both the questions and responses were posted anonymously.

**Text 1:** The Construction of Knowledge

Knowledge is not determined strictly by the knower, or by the objects known, but by the exchanges or interactions between the knower and the objects (between organism and the envi-

ronment). The fundamental relation is not one of simple association but of assimilation and accommodation; the knower assimilates objects to the structures of his actions (or of his operations), and at the same time he accommodates these structures (by differentiating them) to the unforeseen aspects of the reality, which he encounters. (Piaget, 1992, 140–141)

### **Text 2: Equilibration**

The study of regulation has shown us how equilibration is achieved in its three forms: between the subject and the objects, between the schemes or sub schemes on the same hierarchic level, and between their differentiations and their integrations into superior totalities. We must stress that cognitive equilibration never achieves a stopping point; even on a temporary basis, and that this situation is not to be regretted. The fact that states of equilibrium are always exceeded is the result, on the contrary, of a very positive force. Any knowledge raises new problems as it solves preceding ones. This is evident in the experimental sciences where the discovery of the causality of a phenomenon raises the question of the cause of the causality and so forth. By no means does equilibrium constitute a stopping point, since any finished structure can always give rise to new requirements in fresh substructures or to integrations in greater structures. (Piaget, 1977, 11–12)

### **Observations**

During a two-hour computer laboratory session, a class of 25 learners asked 154 questions in the DFAQ environment. Many of the questions they posted were fairly basic ones about the content, such as ‘What is assimilation?’ and ‘Who was Piaget?’ Below we present three examples of questions that elicited responses from both the lecturer and the class.

Extract 1 illustrates one of the most frequently asked questions regarding Piaget’s notion of ‘equilibration’. Most learners grappled with this rather complex issue and most asked questions about it. We have selected this extract because learner E1 was the only learner who asked for three examples of equilibration, no doubt anticipating that one example might prove insufficient to arrive at an understanding of this concept. The response received from a fellow learner is illustrative and located within a local context familiar to many other learners. It is typical of peers’ responses to questions.

#### **Extract 1 (Learner E1)**

##### **Give three illustrative examples to clarify the difference between assimilation and accommodation**

This question has now been visited 9 time(s).

Last posted: 2003-03-17 16:43:56.240473

- A child in Tutume in Botswana sees water when it’s being bathed. It assimilate that this is a colourless liquid and tasteless. There is not much accommodation. The child may go with the mother to fetch water at a nearby stream. The child assimilate that water comes from a stream and accommodate that a stream is larger than a bath. There isn’t much profound cognitive shift. One day the mother

decides to take the child to Cape Town and they stay at Sea Point. The child is flabbergasted by what he sees. What's this huge rolling water? He has never seen anything like this. The Water is blue and it's moving. The child has never seen such a vast expanse of water. The child can assimilate very little. There is huge accommodation. The child cognitive structures have to shift hugely. This thing is not that stream in the bush back home. This is called the sea. The child might move close to the shallow part and play a little with the water. Oh God! the water is salty unlike the water back home. This is accommodation. This is learning and this has huge pedagogic implications.

In Extract 2 we present a further example of the type of questions learners asked regarding equilibration. This question differs slightly from the first extract in that it explicitly demands an explanation of the dynamic process underlying equilibration. Learner E2 received two responses to this question. Both these responses are indicative of different ways of interpreting a question. What is also interesting to note from this extract is that the responses to the question, which utilise theoretical terms such as 'assimilation', almost necessarily point the learner in the direction of further enquiry. Consequently, we observed several questions, such as 'What is assimilation?', arising from these responses.

### **Extract 2 (Learner E2)**

#### **How can equilibration be achieved?**

This question has now been visited 16 time(s).

Last posted: 2003-03-17 16:51:40.122497

- With the right amount of assimilation and accommodation, but it is only reached for a moment, because equilibration never 'stops'.
- In order to achieve a balance, we need to rely on resources to overcome cognitive conflict; these resources can be people, books or our own actions.
- Equilibration can be achieved when there is a balance between assimilation and accommodation.
- We agree that equilibration cannot be achieved, even on a temporary basis. An individual drifts towards equilibration in their learning experiences as the complementary processes of assimilation and accommodation interplay. The new knowledge creates cognitive conflict, taking the individual to a new cognitive level, with new challenges.
- Equilibration could also be achieved by giving learners practical example which they are familiar with. By so doing it make them to assimilate and accommodate at the same time.

In Extract 3 many learners seem to have found Learner E3's question tricky to answer. It remained in the environment unanswered until lecturer LX responded. This kind of question helps the lecturer to understand sources of misunderstanding and to address these later in a face-to-face class. Where learners posted incorrect responses to the environment, the lecturer provided learners with the correct answer, illustrating how she generated that answer. The lecturer did not directly reward questions and responses online, but good answers and questions were rewarded in two ways. First, the environment provides a facility for learners and the lecturer to rate a particular response as 'very good', 'good', 'poor' or 'very poor'. Learners could see these ratings and tell at a glance what qualified as a 'good' versus a 'poor' response, in the eyes of their peers and the lecturer. Second, the lecturer selected good questions and responses for discussion during the face-to-face lectures.

**Extract 3 (Learner E3)**  
**Is the knower the teacher?**

This question has now been visited 5 time(s).  
Last posted: 2003-03-17 16:38:37.203498

- Goodness, if ONLY we WERE the knower of everything :-) No, actually, anyone who is acting on the world and constructing knowledge is in the process of becoming a knower; what Piaget refers to here as the knower, is the child. But all of us are in the process of becoming knower.

**Reflections on learner experiences**

What we can see from the above extracts is that learners' questions and responses provided a potentially rich learning resource for their peers. This is particularly evident in Extract 1, where one learner uses a very practical example from his/her own life to explain a very dense theoretical concept. It is worth mentioning that three members of the class furnished this example in the module's examination. While we are not yet able to make any firm claims about this environment's efficacy, the learners' ability to appropriate other learners' responses into their examination answers certainly suggests that this environment has potential as a learning resource.

In order to ascertain learners' experiences of this environment, we interviewed participants. Below are unedited extracts from four interviews.

*Learner 1*

- (a) '...I am not one to talk much in public and I find it difficult still at the moment still and what I find nice about this environment is that I can now ask questions and get my answers without having people looking at me and I can even attempt to

answer some of the questions without that uncomfortable feeling that you get when you are face to face with people.'

- (b) '...definitely and get a better idea learning from one another as opposed to, I mean because you definitely have a different dimension of learning among your peers or people in your own situation as opposed to just a lecturer, so to have both is absolutely amazing.'

*Comment*

One of our design goals was to create a 'low risk' environment through anonymous interaction. Salmon (2000, 44) argues that success in using computer conferencing seems to come where most networking occurs and where there is openness and freedom to explore with little risk attached. By making the postings anonymous, we went even further than Salmon, who was writing about conferences in which identities were known.

*Learner 2*

- (a) 'I went online and I found these questions, so it just sort of helped me when I did the assignment, the way other people put it... because English is not my first language so it is nice to see how other people put it, the words they use, their vocabulary.'
- (b) 'And that's the amazing thing with the site was that there's so many different questions 'cause of the different ways people learn, that you're actually looking at, for me, what was learnt, in so many different ways, that at the end of the day, you're looking at it up here, as a, really as an educated person, and have a very good understanding.'
- (c) 'a week or two weeks later can see how the questions were answered and some of the questions were really, you can actually smile because you can see where the learner who most probably tried to answer the question was trying to engage in giving the right answer, but the answers were not always spot on the way you were satisfied, but you could look at another response and another response and in that sense it was actually very interesting to see what other learners had written about a question that another person asked or posed to them.'

*Comment*

We observed that as additional knowledge was gained (through reading other people's questions and responses) some questions either became less popular (dropped down the FAQ list) or the interpretation of what a question meant changed (Ng'ambi, 2002b). For example, during the first session their posted questions were of the type, 'What is equilibration?' As the project progressed (presumably as they learnt, since responses to questions was happening at the same time), questions started to get more complex, for example 'What happens if there is no equilibration, does it mean that a child is a slow learner?' It now appears that learners may have gained questioning skills, vital for academic literacy, through the reading of other learners' questions. Edwards (2002, 90) explains that participants in online forums have to try to imagine the context within which a fellow contributor's message comes, or to fill in the gaps of what they

think they know about it, in order to interpret it and respond. We argue that the reflective process of context imagination, gap filling, interpretation and responding is complex and can be a slow process for learners whose first language is not English. The environment provided a self-paced communicative space that may have contributed to getting everyone involved.

#### *Learner 3*

- (a) 'Whereas this way you can actually look at certain groups of learners who are struggling with different things, and actually, um, then tailor it so that the areas that need more time, you can address, before it becomes an issue. You can actually go and look at that, and then structure your next, um, lesson accordingly; or you next... you know, actually do a semester plan or a term plan or whatever.'

#### *Comment*

Our chief goal was to provide space for learners with questions to ask fellow learners to help them to find answers. The texts were sufficiently challenging that there was compelling motivation for struggling learners to ask questions: no additional motivation was required other than the need to collaborate in helping one another to find answers to their questions, in other words a pursuit for usable knowledge. Edwards (2002, 89) contends that for usable knowledge to be constructed, participants need to see the value to them in participating.

Learner 3's experience must be seen in the context of how the lecturer picked up questions from the environment and addressed them in the face-to-face session. Learners received extra materials on 'equilibration' after the lecturer had read their questions and responses on the topic.

#### *Learner 4*

- (a) 'I found that we as learners did not have that much interaction but once we were engaged on site there was a lot more interaction going on—you start and it takes the fear that you are the only one out there that does not understand, and you start realising that actually there is a lot of similar questions and I just found afterwards for me that I spent more time with learners than before... and then, going back and looking at some of the other peoples' questions, just having this absolute relief of... we're all in the same boat.'
- (b) 'this is what the environment does, it gives you the chance to reflect and internalise what you have read and then realising this is what somebody wants to answer you could go back and say, "No man, this is not completely right", and then you could actually add your response to what his responses were.'
- (c) 'a lot of them [questions] I came to know because of other learners' questions.'

#### *Comment*

Learning is a mental process, impossible to observe directly. Learners are comforted to know that they are not the only ones having difficulties in understanding a concept.

Lecturers need to know what learners do not understand. The environment immediately mirrored the class's knowledge and informed the lecturer.

## **Discussion**

*Did the online environment scaffold learners' engagement with the text?*

An effective scaffolding environment must be able to recruit learners' attention, keeping them focused and oriented towards task-related goals, and provide models of appropriate behaviour, in this instance, critical engagement skills. Initially, the novelty of the DFAQ environment recruits learners' attention, and their interview responses confirm that it holds their attention. While recruiting learners' interest is the first step in any learning task, it is also essential for our purposes that the environment is able to provide models of appropriate questioning behaviour. We want to see learners' critical questioning skills develop in relation to academic text. We argue, based on learner interview data and our experience of developing learning materials from the question database, that the environment provides learners with a unique 'space' in which to access questions and responses that they might not have generated themselves. Given the environment's capacity to recruit, hold and focus attention as well as model appropriate questioning behaviour, we think that it does indeed provide a space that scaffolds learners' engagement with the text.

*Does this environment influence the development of learning materials that are sensitive to learners' needs?*

Questions serve as important indicators of learners' current knowledge. By recording learners' questions in a database, we are able to build up a valuable teaching resource about what it is that the learners think they know and what they struggle with. We can look at the learners' questions and tailor our materials to meet the needs we see expressed in those questions. For example, as many learners struggled to grasp the concept of Piagetian 'equilibration', the lecturer redesigned lectures and assignments to help learners to master the concept. The questions also indicated that many learners were extremely unfamiliar with the kind of questioning required in the humanities. Consequently, we incorporated into the course scaffolding that explicitly models appropriate questioning behaviours when interrogating academic text.

## **Conclusion**

We have described a project in which learners built a knowledge-sharing resource through a consultative environment. Using sample extracts, we have discussed how learners asked questions and what responses they received from peers. Empirical evidence shows (see Extract 1—Learner 1) that once a learner has an understanding of a concept, he or she is in a good position to find suitable vocabulary and examples to explain that concept to peers, possibly better than a lecturer. The learners' consultation base was enlarged because every learner had access to every other learner through a common environment in which personal identities were concealed but learners' individual voices were preserved. Interviews with learners revealed that normally they only consulted friends when they had questions but that the environment provided a wider consultation spectrum. Our view is that posting questions anonymously enabled many

learners to participate: they were not hindered from expressing themselves. Ng'ambi (2002b) postulates that the use of questions as a teaching tool allows for easy identification of where learners are 'coming from', hence creating an earlier understanding of misconceptions and misunderstanding they bring to the course.

We have built a dynamic FAQ environment in which learner consultations result in a knowledge resource created by learners for learners. Our trials show that various issues merit further investigation by the Multimedia Education Group.

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