Chapter 6

Pedagogical forms for mobile learning: framing research questions

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Introduction

The mobility of digital technologies creates intriguing opportunities for new forms of learning because they change the nature of the physical relations between teachers, learners, and the objects of learning. Even the traditions of distance learning cannot offer the flexibility of these new kinds of interaction, so the rise of interest in 'm-learning' is understandable. The process begins, inevitably, as a technology solution devised for other requirements, in search of a problem it can solve in education. The history of technology in education has repeated this process so many times, with less than optimal effects for education, that educators need a means by which education holds the reins of the investigation, stating our requirements, and using these to evaluate each new technology, on our terms. Otherwise, we fail to optimise its value by underestimating what it might do, and by over-adapting education to accommodate to what it offers.

Stating our requirements of technology is a complex task. I have attempted to encapsulate them in the form of a framework against which new technology could be judged and used according to how it supports the different aspects of the learning process. This framework, published as the 'Conversational Framework' can now also be used to test what this new technology of m-learning contributes to the learning process.
However, setting the one against the other also provides an opportunity

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to critique the original Framework – to what extent does it succeed in capturing all the requirements of the learning process enriched as it now is by these new forms of learning? Is it powerful enough to provide a challenge to the new technology opportunities by generating new proposal for their use? And does mobile learning suggest new ways of developing the Conversational Framework? This paper chapter explores both questions.

What do mobile technologies contribute?

This section sets out to clarify what is critically different about mobile technologies, in order to then analyse the forms of pedagogy that are relevant.

What characteristics are intrinsic to mobile technologies?

In defining the pedagogies for mobile learning, it is important to be clear about what exactly m-learning contributes that is new and different from previous technologies of learning. Characterisations such as the following probably fail to capture it because they are also true for too many other technologies:

> Enable knowledge building by learners in different contexts.
> Enable learners to construct understandings.
> Mobile technology often changes the pattern of learning/work activity.
> The context of mobile learning is about more than time and space.
> (Winters, 2007)

And if we tried to characterise mobile technologies as mediating tools in the learning process, addressing:

- the learner and their personal relationships (peer groups, teachers, etc.),
- what the learner is learning (topic, relationship to prior experience, etc.),

and

- where and when learners are learning,

then it is unlikely that we could easily differentiate m-learning from any other form of distance learning. All these definitions would have been familiar to a learning technologist twenty years ago. The current wikipedia definition, for example, recognises its closeness to e-learning and distance education, but locates its distinctiveness in "its focus on learning across contexts with mobile devices" – it could be a book on a bus, although a much wider range of possibilities are proposed. Clearly there is still work to be done in characterising the critical factors that make it distinctive.

Other proposals for what is critical were shared at the WLE Symposium on M-Learning in February 2007, and these were more successful. John Cook suggested that 'learner-generated contexts' in mobile learning provide a more generic description of the value of digital technologies than the more common idea of 'user-generated content' in social software. Sara Price suggested that the key difference is digital representation of physical objects that are in the same location as the learner (Price, 2007). One such example is being able to augment physical objects with digital projection of e.g. shadows on a building, or to build knowledge of dynamic systems through mapping learners' actions in the real world with an inspectable digital representation. At the M-Learning Symposium, Niall Winters suggested that we have to address three mobilities in m-learning – learners, technology objects, and information – and the objects can be differentiated by being in:

- regional space – 3-dimensional physical space;
- network space – the social space of participants and technologies; or
- fluid space – learners, relations, and the object of learning.

The object therefore has to adapt to the context in which it is placed, i.e. variable in regional and network space, and fixed in fluid space. Both proposals capture something more than the flexibility, social relations, constructivism, and varying contexts characterised above, which are shared with many other learning technologies. The emphasis here is more on the nature of the physical environment in which the learner is placed, and hence the digitally-facilitated site-specific learning experience that is now possible with mobile technologies, that was not possible with a desktop and landline. We will therefore find the critical pedagogical contribution made by m-learning in that inelegant description of its particular learning context.

Another promising aspect is that motivation has become a focus for what m-learning offers that is different. It is clear that learners working with m-learning enjoy the process, and in a different way than, say, interactive gaming technologies. In particular, the affective forms of motivation afforded by aspects of m-learning are characterised as:

- control (over goals);
- ownership;
- fun;
- communication;
- learning-in-context;
- continuity between contexts.

(Jones, Issroff et al., 2007; Sharples, 2007)

At the M-Learning Symposium, the point was reinforced by Geoff Stead, who argued that m-learning is important for access, personalisation, engagement and inclusion, control over learning, ownership, and the ability to demand things, i.e. meeting the rights of the learner.

Features like control, ownership, and communication with peers all can contribute to suggest why m-learning might being 'fun'. 'Learning-in-context' and 'continuity between contexts' are also aspects of ownership and control which explain why these properties might make learning easier and effective.

How do mobile technologies support learning?

The intrinsic nature of mobile technologies is to offer digitally-facilitated site-specific learning, which is motivating because of the degree of ownership and control. What does this mean for what learners actually do?

The presenters at a 2006 Kaleidoscope Convergence Workshop on CSCL (Computer-Supported Collaborative Learning), entitled 'Inquiry Learning and Mobile Learning' collectively offered a wide range of learning activities that could be supported through mobile digital tools and environments:

- exploring – real physical environments linked to digital guides;
- investigating – real physical environments linked to digital guides;
- discussing – with peers, synchronously or asynchronously, audio or text;
- recording, capturing data – sounds, images, videos, text, locations;
- building, making, modelling – using captured data and digital tools;
- sharing – captured data, digital products of building and modelling;
- testing – the products built, against others' products, others' comments, or real physical environments;
- adapting – the products developed, in light of feedback from tests or comments; and
- reflecting – guided by digital collaborative software, using shared products, test results, and comments.

All these activities are possible in other forms of e-learning, but what may be critical to m-learning is the way they are integrated, to bring the best possible support to the learning process. To test this idea, we now turn to the next section which looks at the pedagogical challenges to m-learning, testing it against the requirements of the optimal learning process.

What are the pedagogical challenges relevant to m-learning?

The point of turning to new technologies is to find the pedagogies that promote higher quality learning of a more durable kind than traditional methods. By trying to understand what it takes to learn complex ideas or high level skills, we can develop the pedagogical forms that are most likely to elicit the cognitive activities learners need to carry out if they are to achieve the intended learning outcomes. Using this analysis we would then be able to evaluate the characteristics of m-learning defined in the previous section.

What does it take to learn (formal learning)?

What is learning? – transformation of what is encountered and augmentation of conceptual resources; teaching – the teacher's constructed environment, pencil and paper with lines – and what has been framed, the curriculum focus, which may not be figural for the learner, whereas in informal learning this is the learner's interest.

The Conversational Framework was developed by analysing the findings from research on student learning, and using these to generate the requirements of the teacher who is responsible for designing the learning process for their students (Laurillard, 2002). It is therefore common to all forms of learning, conventional, distance, digital, blended, as it is derived from research on 'what it takes to learn', and takes what is common from

a range of different kinds of study.

The form of the Framework defines a dialogic process between 'teacher' and 'student' on two levels, the discursive level, where the focus is theory, concepts, description-building, and the experiential level, where the focus is on practice, activity, procedure-building. Both levels are interactive, but at the discursive level the interaction will take a communicative form – the teacher describes, i.e. the teacher decides what is to be 'framed' (Kress & Pachler, 2007), the student asks questions, the teacher elaborates, the student states their own idea or articulation of the concept (i.e. their conceptual resources are 'augmented' in Kress and Pachler's sense). At the experiential level, the interaction is adaptive, where the student is acting within some practical environment to achieve a goal and experiences the results of their actions as changes in that environment, enabling them to see how to improve their action. The interaction at the experiential level benefits from the student adapting their actions in the light of the theoretical discussion. The interaction at the discursive level benefits from the students' reflection on their experiences. Similarly, the teacher's construction of a suitable learning environment benefits if it is adapted to their students' needs, and their explanations at the discursive level will benefit from reflecting on their students' performance at the experiential level. The whole process is the same for every teacher-student pair, but also links students with each other, by the same interaction type of communication at the discursive level. At the experiential level, the feedback between peers takes the form of shared comparisons of their outputs from actions on the environment. The symmetry and continual iteration of all these relationships is illustrated in Figure 6.1 (redrawn from Laurillard, 2002). The diagram shows the minimal interactions between the teacher and learners that would constitute a completely supported

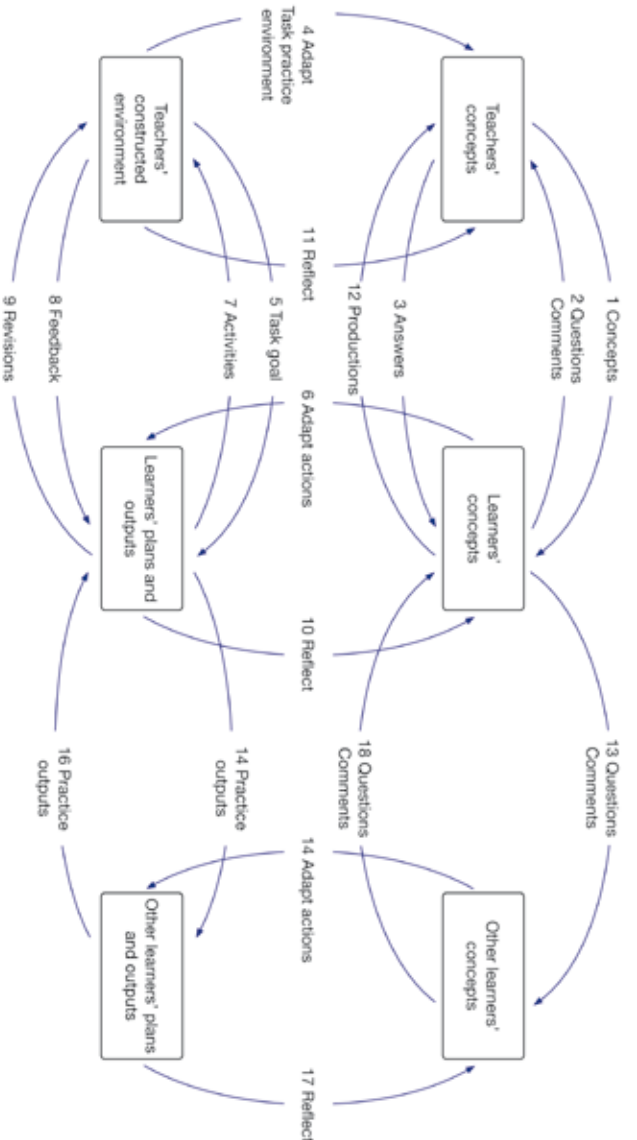

Figure 6.1: The Conversational Framework for supporting the formal learning process

learning process.

The Conversational Framework is designed to describe the minimal requirements for supporting learning in formal education. It can be interpreted as saying that, on the basis of a range of findings from research on student learning, if the learning outcome is understanding, or mastery, the teaching methods should be able to motivate the learner to go through all these different cognitive activities. In that sense it should be able to act as a framework for designing the learning process.
For example, it claims that

- learners may be motivated to think about the theory if they have to use it in order to act in the environment to achieve the task goal;
- their motivation to practise repeated actions will be higher if the feedback on their action is intrinsic, i.e. showing the result of their action in such a way that it is clear how to improve it;
- they will be motivated more to reflect on that experience if they are required to produce some version of their own idea to the teacher at the discursive level – this would traditionally be an essay, or a report, or a model, depending on the discipline.

Similarly, for peer collaboration it claims that

- learners will be motivated to improve their practice if they can share their outputs with peers;
- and will be motivated to improve their practice and augment their conceptual understanding if they can reflect on their experience by discussing their outputs with peers.

So each of the activities within the Conversational Framework plays its part in motivating other activities, creating a continual iterative flow of

attending, questioning, adapting, experimenting, analysing, sharing, commenting, reflecting, articulating … all the forms of active learning that research tells us count as what it takes to learn. The learners may take themselves around these iterative loops, and good learners do, given the means to do it, but poor, or unmotivated learners need the teacher to construct their learning environment in such a way that they can scarcely avoid being active learners. This is one reason why we look to digital technologies to support learning – they can provide both communication and experiential environments in support of the learning process. But they do not necessarily do it. Sadly, few educational applications of technology go beyond the provision of access to ideas, which does not mark them out from books.

So the Conversational Framework provides a way of checking that a teaching design motivates what it takes for students to learn, and in particular, provides a way of analysing what each teaching method and each new technological tool brings to the learning process by asking the same question of both: how much of the Framework does it support? Lecture notes on the web, digital libraries, and podcasts provide exactly the same value as lectures in this analysis. By contrast, the supervised workshop for student groups provides the most complete coverage of the Framework – discussion, practice, feedback, sharing of outputs, articulation of a final product – and the right combination of new technologies, such as a collaborative modeling environment, would provide the same value as the traditional workshop.

One argument for m-learning proposed at the m-learning Symposium by Alice Mitchell suggested that it can provide games to support decision-making skills in professional contexts, or provide tools to make games.

She based her theoretical argument on Kolb's 'learning cycle' which rehearses the student in double-loop learning – introduction, action, feedback, digest. The Kolb cycle covers the parts of the Conversational Framework that express the teacher's description of ideas or theory ('introduction'), the learner's action (action to achieve the task goal), intrinsic feedback from the environment ('feedback') and reflection on the experience ('digest'). In fact, it is possible to show that m-learning covers more than that, in the ways it is normally implemented.

We can understand this best by setting exemplars of m-learning designs against the pedagogical requirements defined by the Conversational Framework. Instead of the flow of activity around the cycles illustrated in the diagram, we can also express these in the following questions, for ease of analysis, where numbers refer to the labels of activities in Figure 6.1:

Does the m-learning design motivate students to:

a access the theory, ideas or concepts (activity 1)?
b ask questions of (i) the teacher, or (ii) their peers (2, 13, 18)?
c offer their own ideas to (i) the teacher, or (ii) their peers (2, 13, 18)?
d use their understanding to achieve the task goal by adapting their actions (5, 6, 7)?
e repeat practice, using feedback that enables them to improve performance (8, 9)?
f share their practice outputs with peers, for comparison and comment (14, 16)?
g reflect on the experience of the goal-action-feedback cycle (10)?
h debate their ideas with other learners (13, 18)?
i reflect on their experience, by presenting their own ideas, reports,

designs (productions) to peers (17, 18)?

j reflect on their experience, by presenting their ideas, reports, designs (productions) to their teachers (12)?

Consider as an exemplar a learning design that uses mobile technologies to support learners in developing an understanding of the thesis in an art exhibition. A typical learning design might be as follows:

- teacher introduces the work of the artists; provides extracts of the catalogue linked to key paintings for students to read in advance; answers questions (1, 2, 3);
- teacher provides a guide for students to work in pairs in the gallery, guiding them through the key paintings and the relations between them, including instructions to take notes to bring back to class (4, 5);
- students work in pairs in the gallery, using the guide, making notes, with the teacher moving between them (5, 6, 7, 11);
- in the next class discussion, students are asked to report on what they noticed and the notes they took (1, 2, 3, 10, 12);
- the teacher ends the discussion by summarising their comments in terms of the intended thesis (1).

This covers a good proportion of the activities, assuming that each stage is well designed. For example, the students will succeed in adapting their initial ideas to the task requirements if the guide assists them to do that, e.g. by setting a challenging goal, such as to look for ways in which the style of one artist resembles another, and contrasts with a third for a similar subject, and reminding them of the principles they discussed in class that differentiate schools of painting. If, on the other hand, the guide simply said 'look at paintings X and Y and make notes on how they are similar', this much less challenging task does not require them to reflect

back on their theoretical concepts to adapt them to the task in hand. It is the integration of the linked activities that builds the learner's motivation on any one activity.

It could be argued that there is an opportunity for students to share their 'practice outputs' in the form of the notes they take. But there is no special motivation to do this. As long as they make notes (7) to bring to the class, that is all that is required. Sharing ideas and outputs may happen, but it is not facilitated.

By contrast, a typical m-learning activity could build in more opportunities for digitally-facilitated site-specific activities, and for ownership and control over what the learners do (shown in italics):

- teacher introduces the work of the artists; provides extracts of the catalogue linked to key paintings for students to read in advance and download to their mobile devices; answers questions (1, 2, 3);
- teacher provides a guide for students to work in pairs in the gallery with digital codes for each painting (see Price, this volume on "tangible flags"), guiding them through the key paintings and the relations between them, including instructions to identify features in particular paintings, upload their answers and check against the teacher's model answer, set quiz questions to challenge other pairs, answer challenges from other pairs, record these and their observations on each painting, uploading these to a shared website, and take notes to bring back to class (4, 5,);
- students work in pairs in the gallery, using the guide, making notes, checking their observations against the teacher's, setting and answering challenges with other students, recording and uploading their ideas and observations, with the teacher moving between them

(5, 6, 7, 8, 11, 13, 14, 15, 16, 17, 18);

- in the next class discussion, students are asked to report on what they noticed and the notes they took, using the whiteboard to display their records and notes from the gallery, e.g. the "MediaBoard" (Cook, Bradley et al., 2007) (1, 2, 3, 10, 12, 13, 14, 16, 17, 18);
- the teacher ends the discussion by summarising their comments in terms of the intended thesis, by means of an edited version of the students' outputs collected in the form of a collaborative digital catalogue of the exhibition, and made available on the school website (1, 12).

This analysis shows how much richer the m-learning experience can be, as interpreted through the Conversational Framework, primarily because the mobile devices digitally facilitate the link between students and data while they are in the site-specific practice environment. The digital facilitation provided by the teacher is to set up motivating collaborative and competitive transactions between the students, motivated also by the prospect of contributing to a product at the end of the process. In the earlier version the learning design ends with the teacher's summary – the ideas owned once again by the teacher, for all that the summary may refer to the points made by the students. The m-learning design can display the students' contributions at the end – they maintain ownership. It would be possible to achieve the non-digital equivalent of this learning design, but it would be hard to manage, and paper technology does not facilitate the process.

The only part of the Framework not covered by this learning design is the 'revisions' activity (9). This is because there is only 'extrinsic' feedback on the students' actions. The former design achieves no feedback – students make notes to address the task goal, but have no way of knowing if these are good, or appropriate. With the more specific task set in the m-learning

design – to identify certain features in a painting – the teacher can make the model answer available on a website, so that when the student uploads their answer it is revealed and they can compare it with their own. This is 'extrinsic' feedback, showing they are right or wrong, but not motivating any revision of their action. By contrast, 'intrinsic' feedback would show them the result of their action in such a way that they could see how to revise and improve it, thereby motivating the revision activity (9). However, if the m-learning design asked the learner to, say, identify the item in a painting that symbolises 'wisdom', and they see the model answer as different from their own, this would help them identify the concept in a different painting. It would act as 'intrinsic' feedback if there are further similar questions, thereby prompting improved practice. It is the kind of tuition that a teacher can provide on an individual basis, but is very hard to do with a class. Providing feedback is one way in which m-learning can improve the quality of the learning experience. Using the Conversational Framework to check the design might also challenge it to set up the task in a way that provides also intrinsic feedback, thereby promoting practice and improvement.

The Conversational Framework can therefore provide a powerful way of critiquing both traditional and digital learning designs, illustrating in a reasonably formal way why digital forms offer a better integrated, and more motivating learning environment. By using the findings on research in student learning to generate a set of requirements for teaching, it shows what it takes to support learning, in formal education. In particular, it takes us beyond the typical endorsement of a technology resource, the 'you can…' approach to design, which offers the user a wide range of options and opportunities. Instead, it proposes the 'try this…' approach, which provides a default pathway through the environment, engaging the

student explicitly in tasks that elicit the kind of cognitive activity it takes to learn that idea, concept or skill. In the former design approach, the learner 'can' engage with difficult ideas in a variety of ways, but may not. Without guidance and motivation they may choose to take a cognitively easier pathway, thereby failing to engage properly with difficult or complex ideas. The Conversation Framework shows that it is not sufficient for the teacher just to 'tell' the story of their subject in book or lecture. To support the learning process fully, they have to engage the learner in all the types of activity it proposes.

The analysis also enables us to (a) critique how m-learning operates and what more an m-learning design needs to complete the coverage of the Framework, and (b) critique the extent to which the Framework fully expresses the richness of the learning experiences supported. This is the focus for the next section.

What does it take to learn (informal learning)?

The move to mobile learning has opened up the opportunity for learning to be digitally-facilitated in any location, whether defined as a learning environment or not. The m-learning research community is therefore also interested in 'informal learning'. The most obvious contrast with formal learning is the absence of a teacher, and therefore the absence of which means there is no defined curriculum, externally-defined learning goals, formative and summative assessment, and or formal task structures. There is no longer a 'teacher constructed environment' in which the learner is operating, but the more uncertain context of the real world. Learning may still take place, of course, but no part of the learning process is driven by 'the teacher', or anything representing them. Taking account of this, the Conversational Framework describing informal learning is

therefore simpler, as in Figure 6.2. The diagram shows the minimal interactions between the learner and their world, and with other learners that would constitute an optimally productive informal learning process. In the absence of the teacher, the learner defines their own task goal, and other learners and the world of experience act as arbiters of the learner's actions and productions.

This raises the question of the extent to which the 'continuity between contexts' feature of m-learning, can provide continuity between formal and informal learning contexts. The idea of a 'learner-generated context' is an important one for giving learners a sense of ownership and control over their learning, but formal and informal learning involve very different 'contexts' for learning. Learners have to be aware of the difference. If, for example, they treat a formal learning context as if it were informal, and set about acting on their own task goal, and interpreting feedback in those terms, they may well learn something, but not necessarily what the teacher designed, so their 'production' may not be valued. It is the distinction John Cook makee at the Symposium between the informal/ private space "where there is no right answer" and the formal space where there usually is. In the informal context, in the absence of a teacher, learners have to set their own task goal, generated from their world experience, or what Kress and Pachler refer to as the learners' "own interest" which directs their attention, rather than an externally defined problem (Kress & Pachler, 2007). They may find it difficult to set a task goal that is appropriate for the site specific environment and their ability to act on it, in which case participating in a social learning environment may be of considerable help, either in proposing more realistic goals, or by sharing model outputs.

This interpretation characterises informal learning as being entirely in the

hands of the learner, not guided by anyone and certainly not educators – they are not there, and that is what I see as the defining difference between the two forms of learning. Curators are present in a museum or art gallery, guides in an exhibition space, as are many others with a story to tell in informal contexts – authors, journalists, programme-makers, film-makers, parents, friends, colleagues, bosses – but although the opportunity to learn from others is always present in informal learning contexts, they have no authority over the learner, no power, and no sanctions. So the learner can ignore, use, or contradict them at will. This makes their motivation in such contexts entirely governed by their peers or social group, and by the behaviour of the world, in terms of their task goals and feedback. In a formal learning context the key agents are teachers, educators, facilitators, advisers as well as learners. In the informal context the only key agents are the learners themselves and the 'others' they choose to act as agents in defining the focus of interest, the task goals, and the feedback.

The Conversational Framework suggests that maintaining contact and sharing outputs with other learners would give a more optimal learning experience in an informal context, just as in the formal context. The two contexts are generated and negotiated in very different ways, however, and even the consistency of tool (mobile phone or pda) does not assure continuity. In this volume, John Cook and others demonstrate a form of continuity between contexts in his example of a 'learner-generated context' (Cook, Bradley et al., 2007), but in fact his pedagogical design took care to construct the learner's experience of the remote context, as well as providing formal assessment of their activities, and the opportunity for social construction of their knowledge in a shared uploading environment, together with a very clear formal assessment judgment of their attainment

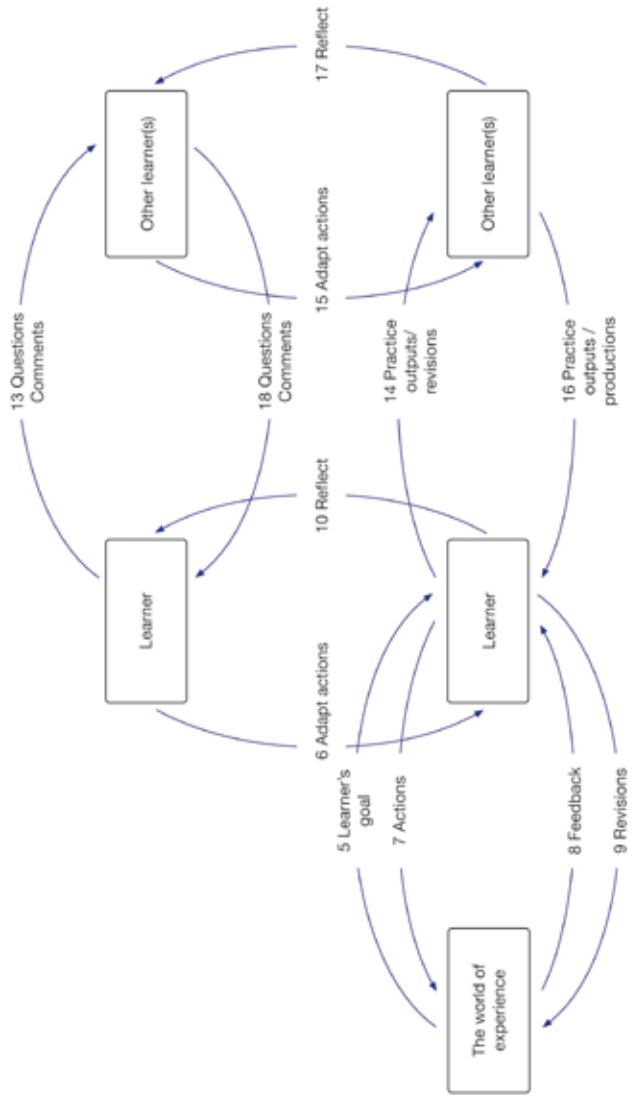

Figure 6.2: The Conversational Framework for supporting the informal learning process

of the intended learning outcomes. It was a very supportive learning design, which covered a good proportion of the Framework. The virtue of the m-learning environment here was precisely that it supported the formal learning process by maintaining continuity between the teacher-directed f2f context and the learner's remote peer learning context. In that sense, the 'continuity between contexts' is demonstrated. But this cannot be interpreted as meaning that m-learning necessarily provides continuity between formal and informal learning environments, where in the latter the learner is wholly self- and peer-directed. This will only be assured when the pedagogic design facilitates that continuity, as in John Cook's example.

The Conversational Framework can also be used to propose improvements to design. It is very difficult to achieve intrinsic feedback for informal learning, or learning in an environment that is ungoverned by the teacher, such as an exhibition space. To achieve meaningful feedback that shows the learner how to improve their action and attain the task goal, the teacher has to set up the kind of task for which the learner will reliably find intrinsic feedback in that environment. The example of finding the representation of 'wisdom' in a painting, discussed above, would not be so easily translated to an exhibition space about which the teacher has little advance information, and feedback from the real world would be too uncertain. To meet this requirement of the Conversational Framework, the teacher would have to set a task goal similar to a research project, such as 'test your hypothesis of the relationship between the characteristics of the event and the characteristics of the company running it', so that the collection of data would enable the students to refine their hypotheses. The MediaBoard would then elicit different hypotheses and evidence for a later collaborative debriefing. Designing the m-learning activity

to meet the Conversational Framework requirements in this way then helps to generate a more focused and hopefully more productive learning experience.

What are the research challenges for m-learning?

The preceding sections have interpreted the opportunities offered by m-learning in terms of the Conversational Framework, in order to test the extent to which m-learning can and does achieve good pedagogic support for the learning process. The analysis has certainly shown the importance of unpacking the form of 'the teacher's constructed environment', and in that sense challenges the Conversational Framework as a simple expression of how the teacher can support what it takes to learn. M-learning, being the digital support of adaptive, investigative, communicative, collaborative, and productive learning activities in remote locations, proposes a wide variety of environments in which the teacher can operate. One research question might be, therefore, 'how do we characterise and represent the different forms of the teacher's constructed environment that best support learning'? This is a question for learning in general and for the development of pedagogic theories such as the Conversational Framework.

The Framework also provides a challenge to the design of m-learning, as we have seen. It requires a quite rigorous approach to working out how to support all the component learning activities, in remote locations, with learners guided only by the tasks set, the information available online, the characteristics of the world they are in, and peer support. It is worthwhile to develop these detailed pedagogic forms for two reasons: (i) it is more likely that learners will succeed in engaging with the richness of the m-learning environment, and (ii) it will help to develop the specific

pedagogies of m-learning in a way that can be built upon and shared with other teachers. From this analysis, two important research questions for m-learning could therefore be expressed as:

> What are the pedagogic forms specific to m-learning that both fully support the learning process and exploit the richness of the remote environment?
>
> What are the best ways for teachers to construct different kinds of remote environment in support of the learning process?

M-learning technologies offer exciting new opportunities for teachers to place learners in challenging active learning environments, making their own contributions, sharing ideas, exploring, investigating, experimenting, discussing, but they cannot be left unguided and unsupported. To get the best from the experience the complexity of the learning design must be rich enough to match those rich opportunities. This chapter is proposed a way in which teachers can plan for optimal learning designs that fully exploit mobile technologies.

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