Chapter 5
Toward a Model of L2 Dynamic Assessment

Abstract This chapter reviews the L2 DA studies that have been conducted to date. The majority of these concern classroom assessment contexts. Three features critical to DA interactions and based on Feuerstein's MLE attributes are presented. These concern the quality of mediator–learner dialoguing, the coherence of DA sessions, and the object of L2 DA programs. The discussion then turns to a DA program for advanced learners of L2 French based on these principles. The protocols of L2 DA interactions considered in other parts of the book are taken from learners in this program, and so the present discussion also serves to contextualize those examples.

5.1   Introduction

As explained in Chapter 1, DA is relatively unknown in Applied Linguistics. An early exploratory piece by Guthke et al. (1986) was discussed in Chapter 3 as an example of Guthke's Lerntest approach. This chapter considers the remaining L2 DA studies that have been conducted to date: one in the interventionist tradition (Kozulin and Garb, 2002) and one in the interactionist tradition (Antón, 2003) as well as three studies that at the time of writing are in various stages of implementation (Ableeva, in progress; Erben et al., forthcoming; Summers, in progress). Our review also includes two studies that I refer to as dynamic-like assessments (Schneider and Ganschow, 2000; Grigorenko et al., 2000). In addition to work that has been explicitly framed as L2 DA, the ZPD research of Aljaafreh and Lantolf (1994) is also described because it is an excellent illustration of an interactionist methodology as an ESL tutor cooperates with learners to co-construct ZPDs during one-on-one writing sessions. Importantly, the Aljaafreh and Lantolf study emphasizes, perhaps more than the L2 DA work to date, that the quality of mediation offered to learners is essential to promoting development in the ZPD.

Although these studies represent an important start to understanding DA's relevance to the L2 field, it is equally evident that a coherent framework for implementing DA in the L2 classroom has yet to be articulated. This chapter outlines three features, based on Feuerstein's MLE attributes, that are crucial to DA interactions. In brief, these concern the quality of mediator–learner dialoguing, the coherence of DA sessions, and the object of L2 DA programs. The discussion then turns to a DA program for advanced learners of L2 French based on these principles. The protocols of L2 DA interactions considered in the following chapters are taken from learners in this program, and so the present discussion also serves to contextualize those examples. But before we can consider how DA principles might focus and redirect interactions in the L2 classroom it will be instructive to review how others have applied DA to problems of L2 development.

5.2 Dynamic-like Assessments in an L2 Context

5.2.1 Teaching Metalinguistic Awareness Strategies to L2 Learners with Dyslexia

Schneider and Ganschow (2000) suggest the potential usefulness of DA procedures in helping at-risk L2 learners, particularly those with problems arising from dyslexia. Building on their earlier research and that of their colleagues (e.g., Schneider, 1999; Sparks and Ganschow, 1993a, b), the authors suggest that awareness of metalinguistic strategies could be especially helpful for learners with dyslexia. Following the work of Baker and Brown (1984), they distinguish two types of metalinguistic awareness – *knowledge of* the linguistic rule system and knowledge of *strategies for applying* their metacognitive system. Importantly, however, DA is described by these authors neither as an integration of assessment with instruction nor even as an interactive type of assessment but, rather, as an ongoing "assessment cycle" in which teachers collect data on learners' metalinguistic awareness and then use this information to focus instruction on specific problem areas (p. 76). They suggest that through interaction in the classroom, L2 learners can be helped to develop the knowledge and skill necessary to improve their performance.

It is not clear from Schneider and Ganschow's description what makes their approach dynamic. To recall our discussion from the preceding chapter, the notion of an assessment cycle in which classroom assessments are used to inform teaching is generally referred to as formative assessment. In that chapter I argued that what distinguishes DA from formative assessment is sensitivity to the ZPD, which entails dialogic cooperation between mediator and learner. Indeed, it will be remembered that in Feuerstein's MLE approach the initial DA sessions and the subsequent Instrumental Enrichment program are united in that both involve mediating learners as they engage in tasks they could not complete on their own. Schneider and Ganschow make no mention of cooperation during the assessment phase of their

cycle. In fact, they provide no empirical evidence to validate their proposals or to illustrate their techniques. One is left to wonder how DA informs this work, as simply connecting the results of an assessment to instruction does not, in itself, qualify the approach as dynamic. Until the authors address this issue their proposals will be of limited use in designing a DA framework for the L2 classroom.

5.2.2 Testing for Foreign Language Learning Aptitude

Grigorenko et al. (2000) report on their use of a foreign language aptitude test based on a theory of learning they developed known as CANAL-F (Cognitive Ability for Novelty in Acquisition of Language (Foreign)). The essence of the theory is that learning, including foreign language learning, can be understood as the ability to cope with novelty and ambiguity (p. 392). The authors developed a formal testing instrument, the CANAL-FT, precisely to measure learners' ability to deal with novel problems. In particular, the test presents learners with information about and exemplars of an invented language, Urusulu, and then requires them to use this information to work through a series of tasks. Along the way, they are presented with additional information about Urusulu, and their success at interpreting this information and using it to make accurate predictions about the language is taken as an indication of their language learning ability. The CANAL-FT is comprised of nine subtests that target specific language areas such as semantics, syntax, and morphology.

According to Grigorenko, Sternberg and Ehrman, the CANAL-FT qualifies as an example of DA because it measures "the processes of knowledge acquisition at the time of the test" (p. 393). In other words, for these authors the test is dynamic because it measures language learning ability while examinees attempt to learn a language. However, at no point during the administration of the test is the examinee offered mediation, either in the form of hints, suggestions, prompts, or leading questions, or through interaction with another person. Thus, according to the description of DA given by two of these authors and cited in Chapter 1 (Sternberg and Grigorenko, 2002, p. vii), the work reported in this study does not adhere to DA principles because it does not include an intervention. One could argue that the procedure has a certain ecological validity as a language learning test since the examinees are in fact learning a language, but this does not render the procedure dynamic. Indeed, what the authors seem to be implying is that the CANAL-FT is in itself a dynamic instrument but, as described in Chapter 1, it is the procedure through which an assessment is administered that makes it dynamic or not. Any test instrument, including the CANAL-FT, could be administered in a dynamic manner – that is, with the provision of mediation – or in a non-dynamic manner. The description given by the authors indicates that the CANAL-FT, as currently administered, falls into the latter category. I will therefore not consider it further and will turn to procedures that meet the criterion of offering learners mediation in order to understand and promote development.

5.3   Interventionist L2 DA

Although Vygotsky scholar Alex Kozulin is currently head of research at Feuerstein's International Center for the Enhancement of Learning Potential (ICELP), he and his colleagues do not follow the interactionist approach to DA pioneered by Vygotsky and Feuerstein in their work with ESL students. Due to the large numbers of adult immigrants to Israel who are included their research, Kozulin and his colleagues have relied upon an interventionist format in which a mediation phase is sandwiched between a non-dynamic pretest and posttest. The one published study that has come out of this ongoing work (Kozulin and Garb, 2002) reports on the authors' use of a dynamic procedure targeting their participants' ESL reading comprehension skills. The pretest consisted of a short text in English followed by a set of comprehension questions. Following a non-dynamic administration of the test, classroom teachers who were trained as mediators reviewed the test with their students, "mediating for them the strategies required in each item, building together with the students process models for each item, and indicating how strategies can be transferred from one task to another" (p. 119). It should be noted that the goal of this mediation stage was not simply to improve learners' performance on the posttest (a near identical reading passage to the pretest) but, rather, to promote development. To that end, mediation focused on general comprehension strategies that could be used on various texts, regardless of vocabulary and grammatical structures. The mediation stage also included a series of four practice texts that learners read, attempting to apply the comprehension strategies in order to answer questions that accompanied each text.

Unfortunately, Kozulin and Garb's study, like much published DA work, fails to provide protocols or examples of DA interactions, and their description of the procedures lacks detail. One interesting aspect of their work is the manner in which they report the outcomes of the DA procedure. Rather than generating a qualitative report of each learner's performance before, during, and after the mediation stage, the authors endeavored to capture the learners' abilities with a single score. They devised a formula to calculate what they call a Learning Potential Score (LPS), somewhat reminiscent of Budoff's gain score (see discussion in Chapter 3). Kozulin and Garb define the LPS as the difference between the learner's pretest and posttest scores. Again paralleling Budoff's approach to DA, Kozulin and Garb used these scores to group students as low, intermediate, and high, and instructional recommendations were made for each group.

The issue of how the results of DA procedures should be reported is important for classroom practitioners. In Chapter 8 I outline an approach to profiling the development that emerges from DA interactions and how this can be systematically captured and tracked over time. The method I propose is qualitative in nature and takes account of various aspects of mediator–learner dialoguing. It is difficult to imagine how the complexities of DA sessions can be reduced to a single score such as Kozulin and Garb's LPS. Such an approach must certainly overlook important aspects of development. Indeed, as I will illustrate in the coming chapters learners' independent performance on a pretest or posttest may not change but this should not be taken to mean that development has not occurred. This important fact may

be lost in more quantitatively oriented approaches to DA but it is apparent in mediator–learner dialoguing.

5.4   Interactionist L2 DA

Antón (2003) reports on an interactionist DA procedure for placing learners in an advanced university level L2 Spanish program. Interestingly, Antón does not consider the pedagogical implications of DA in her work; she makes no mention of development occurring through the procedures but chooses instead to highlight DA's potential to provide a more complete and nuanced view of learners' abilities, which in turn led to more accurate placements in the Spanish L2 program. In this regard, Antón's work remains somewhat tangential to the classroom in that DA is not connected to instructional practices and remains a one off assessment. Nevertheless, her study argues strongly in favor of the validity of DA by demonstrating that the DA procedure was in fact superior to the NDA methodology by revealing important differences among students.

The interactive nature of Antón's approach is best illustrated in her assessment of the participants' oral proficiency. Students were shown a short film about a family traveling through Spain and then were asked to orally construct a narrative using the past tense to retell what happens in the film. They were evaluated on the basis of accuracy in their use of vocabulary as well as sentence-level grammar, with particular attention given to their control over the past tenses. The examiner was free to interrupt the students at various points in order to prompt them and to give them an opportunity to attempt the narration again. Students who responded to this form of prompting and improved their performance upon the retelling were taken to be at a higher level of proficiency than those students who were unable to improve. In Vygotsky's terms, the relevant abilities were in the process of maturing in those students who improved as a result of mediation; that is, the abilities were not yet fully matured but lay within their ZPD. Note that the following protocols have been translated into English, and Spanish is used only where absolutely necessary.

The first example occurred immediately after the student had completed the narration task. The examiner (E) was asking some questions about the student's (S) narration, and then stops to comment on the student's use of verb tense.

1. E: You started the story in the past and then, half way you switched
2. S: Yes, yes
3. E: To the present.
4. S: Yes, yes. I heard
5. E: Do you want to try again using the past? And you can ask me.
6. If there is a verb you do not remember it's OK.
7. S: Yes, yes, from the beginning?
8. E: Perhaps from the middle
9. S: In the past, yes, yes.
10. E: Did you realize that you made the switch?
11. S: Yes, yes, I heard.

Antón reports that the student was then able to renarrate the story from the middle, using the appropriate past tense forms with only occasional errors.

Following Vygotsky's description of the differences between two children's abilities that only become manifest through interaction, Antón rightly argues that had this learner been evaluated only on the basis of his solo performance, his ability to control the past tense would have been underestimated. It was only through interaction with the examiner – and this, it should be noted, was quite minimal – that the depth of the student's understanding became clear. While he had not fully mastered the past tense in Spanish, the DA procedure revealed that these functions were, as Vygotsky would say, within his ZPD.

For the purpose of comparison, an additional protocol from Antón's study is presented here. In this example, another student completing the same task exhibited the same problem maintaining the use of the past tense. In fact, this learner relied primarily on the present tense throughout. Once again, the examiner offered the learner a second chance after pointing out the mistake. This time, however, the student responds differently. He attempts to comply but exhibits a number of problems, including marking appropriate person features (using first person instead of third person forms). In fact, he is only able to use certain structures when the examiner presents him with a choice between two options.

12. S: She … arrived at the wall of the bus and … waited with her friends at
13. the wall [Here the student uses the Spanish word *pared* "wall" instead of
14. the appropriate *parada* "stop"]
15. E: Wall or stop?
     Pared o parada?
16. S: Stop
     Parada
17. E: Do you know what *pared* is?
18. S: wall.
19. E: It's a very similar word, isn't it?

In this case, the source of the problem was lexical in nature. This was important for the overall assessment of the learner's abilities since proficiency was determined on the basis of mastery of Spanish grammar and vocabulary. In the next example, they have returned to the narrative but the student's performance begins to break down as he struggles with the past tense.

20. S: *Jugué al tennis*
     I played tennis
21. E: *Jugué o jugó*
     I played or she played?
22. *S:* Jugó
     She played

A bit later in the session, a similar problem arose when the student was attempting to narrate the fact that one of the characters returned home to eat lunch.

23. E: ….*Muy bien. Y aquí dijo, que hizo?*
    Very good. And here you said, what did she do?
24. S: *Comí*
    I ate
25. E: *Comí o comió?*
    I ate or she ate?
26. S: *Comió*
    She ate
27. E: *Comió*
    She ate

Thus, while the first student in Antón's study was able to improve his performance after a simple one-time reminder, the second student was not. In fact, the second student was unable to produce the correct verb form without a very explicit form of assistance – the choice between two alternatives. While this form of mediation was enough for the learner to get past the problem at that particular moment, it did not carry over since a similar situation with the verb *comer* arose later in the same session. In Feuerstein's terms, the learner was not able to transcend to the new problem.

What is important to bear in mind is that if Antón had administered these assessments in a non-dynamic fashion, both learners would have likely received similar diagnoses. Specifically, both would have been evaluated as unable to consistently and correctly use the past tense during production of oral Spanish. However, the dynamic procedure revealed that the learners did in fact have different levels of control over these structures. Through DA, Antón was able to detect these different levels and consequently placed the students in different classes. I now consider three additional L2 DA studies that are currently underway and that make use of both interventionist and interactionist principles in the achievement of various goals.

5.5   Ongoing L2 DA Work

The studies I describe here have not been completed at the time of writing, and so they will not be discussed in the same detail as those above. The first of these is tied directly to the L2 classroom and involves the development of listening comprehension among learners of L2 French. Ableeva (in progress) is following an interactionist approach to collaborating individually with learners as they listen to a variety of authentic recordings, including radio broadcasts, commercials, and interviews. In a small-scale pilot study that preceded her current project, Ableeva (forthcoming) found that important differences among learners were often masked in non-dynamic procedures because for some learners the recordings were simply too difficult but for others their comprehension problems were the result of a failure to recognize a single lexical item or bit of cultural information. This means that the nature of the mediation she offered during DA ranged from explaining the meaning of a word to taking learners step by step through the entire listening activity.

An important feature of Ableeva's work is that, following the *Graduated Prompt* approach to DA (see discussion in Chapter 3), she has built in a series of near, far, and very far transfer tasks. In this way, Ableeva plans to further distinguish learners – and also have additional opportunities to promote their development – by collaborating with them as they engage in increasingly difficult listening comprehension tasks. As I argue later in this chapter, because development involves more than successfully completing a given task, recontextualizing one's abilities is crucial to DA's goal of understanding and promoting development. It is therefore a primary component of our framework for classroom-based L2 DA.

Erben et al. (forthcoming) are working to implement DA principles in a much broader context than the classroom. These authors are pursuing an initiative to reformulate an English to Speakers of Other Languages (ESOL) teacher certification exam as a dynamic procedure. Working within a college of education at a large research university in the southeastern USA, Erben and colleagues are functioning in a high stakes assessment context in which state mandates require the use of formal examinations to certify the competencies of university students graduating with an ESOL endorsement. To meet this requirement, the college of education requires all teacher trainees to earn passing scores on a standardized, multiple-choice ESOL exam. Erben and colleagues are endeavoring to introduce DA into specific ESOL courses, including those focusing on teaching methodologies, as well as introducing an interventionist DA form of the ESOL exam. Their goals, then, include devising an assessment procedure that is more sensitive to individuals' levels of knowledge and ability as well as familiarizing teacher trainees and faculty with DA in hopes that it may become a part of their instructional approach. It is easy to imagine the potential impact of this work as the trainees eventually take up teaching positions themselves and perhaps incorporate DA into their own classrooms.

One of these authors, Summers, is also preparing a doctoral dissertation that explores the possibility of administering DA through computers. Computer-based tests have been around for some time and clearly offer advantages over other assessment administration procedures. Summers (in progress) is following principles of interventionist DA to develop mediation to accompany specific tasks and items on a computer-based assessment of reading comprehension with learners of L2 French. Importantly, the mediating prompts will also be accessible to learners via computer. In this way, it will be possible to track learners' errors as well as the forms of mediation they used throughout the assessment. This information will be generated automatically by the computer. A number of studies in the general education literature have already been reported on computer-based applications of DA. I will discuss this work in more detail in Chapter 9, when I suggest additional areas of DA research that are relevant to the L2 domain. I now turn to the work of Aljaafreh and Lantolf (1994), which demonstrates principles of mediator–learner interactions that I will subsequently build on in outlining a framework for classroom-based L2 DA. At first glance, these interactions appear similar to those reported by Antón (2003) but as we will see Aljaafreh and Lantolf were not interested in identifying differences among learners as much as in helping them develop.

5.6   Co-constructing a ZPD with L2 Learners

Aljaafreh and Lantolf (1994) report on their collaboration with ESL learners struggling to control various grammatical features during the production of compositions for an intensive writing class. Following a clinical methodology, a mediator met individually with three students in the writing class and targeted their use of tense, modal verbs, prepositions, and articles. The sessions were presented to the participants as a tutoring opportunity in which the students would bring written work they had prepared for their class and, through interaction with the mediator, they would make revisions. The sessions were held on a weekly basis for a period of eight weeks.

As mentioned earlier, this study was not specifically framed as DA. However, the goal of this work was to promote language development, understood in a Vygotskian sense, and as such the mediator in this study endeavored to co-construct a ZPD with the participants, interacting with them in order to diagnose areas of difficulty and to help them gain control over the relevant structures. In fact, the authors describe this process as "one of continuous *assessment* of the novice's needs and abilities and the *tailoring* of help to those conditions" (Aljaafreh and Lantolf, 1994, p. 468, italics in original).

An important feature of this study was that the mediator did not approach the interactions with a prespecified set of hints and leading questions but instead allowed the mediation to emerge from his collaborations with the learners. In this way, the interactions involved a constant cycle of mediating moves on the part of the tutor, learner responses, and then appropriate adjustments to mediation (becoming either more or less explicit). Although Aljaafreh and Lantolf did not develop an inventory of responsiveness to characterize the learner's contributions to the interactions, their analysis of the sessions did lead to a regulatory scale that captures the relative degree of explicitness of mediation that the learners required. This is reproduced in Fig. 5.1.

The scale comprises 13 forms of mediation in all, arranged from most implicit to most explicit. At the implicit end of the scale the tutor prompts the learner to merely read a particular sentence containing an error without indicating whether the sentence contains errors. In some instances, this minimal level of prompting was enough for the learner to catch mistakes and attempt corrections. When this failed to produce any response from the learner, the tutor then might say something like "Is there anything wrong in this sentence?" If this also was insufficient to elicit an appropriate response from the learner, the tutor would then move to an even more explicit form of mediation and so on until the learner was able to locate the problem and make corrections. Eventually, if necessary, the tutor would explicitly correct the error himself, possibly accompanying the correction with a detailed explanation if he felt that the learner did not comprehend even when the solution was provided.

The following two protocols (reported by Aljaafreh and Lantolf, 1994, pp. 473–474) illustrate how these interactions were carried out. Note that in both cases the

0. Tutor asks the learner to read, find the errors, and correct them independently, prior to the tutorial.
1. Construction of a "collaborative frame" prompted by the presence of the tutor as a potential dialogic partner.
2. Prompted or focused reading of the sentence that contains the error by the learner or the tutor.
3. Tutor indicates that something may be wrong in a segment (e.g., sentence, clause, line)-"Is there anything wrong in this sentence?"
4. Tutor rejects unsuccessful attempts at recognizing the error.
5. Tutor narrows down the location of the error (e.g., tutor repeats or points to the specific segment which contains the error).
6. Tutor indicates the nature of the error, but does not identify the error (e.g., "There is something wrong with the tense marking here").
7. Tutor identifies the error ("You can't use an auxiliary here").
8. Tutor rejects learner's unsuccessful attempts at correcting error.
9. Tutor provides clues to help the learner arrive at the correct form (e.g., "It is not really past but some thing that is still going on").
10. Tutor provides the correct form.
11. Tutor provides some explanation for use of the correct form.
12. Tutor provides examples of the correct pattern when other forms of help fail to produce an appropriate responsive action.

Fig. 5.1 Regulatory scale – implicit (strategic) to explicit (Aljaafreh and Lantolf, 1994, p. 471)

learners were struggling with the same problem – the use of the article "the" with "United States" – but that the kind of mediation offered by the tutor (T) varied according to the learners' needs.

1. T: … There's also something wrong with the article here. Do you know
2. articles?
3. N: Articles, yes.
4. T: Yeah, so what's …
5. N: Eeh on my trip to …
6. T: What is the correct article to use here?
7. N: Isn't to is … no … eeh … article?
8. T: What is the article that we should …
9. N: It.
10. T: No. Article … You know the articles like the or a or an
11. N: The trip … my, is not my? No … the trip?
12. T: My … yeah it's okay, you say my trip.
13. N: My trip.
14. T: Okay.
15. N: To United States
16. T: Yeah, USA, what article we need to use with USA?

17. N: <u>A</u>, <u>an</u>, <u>the</u>
18. T: <u>The</u>, which one?
19. N: But <u>the</u>?
20. T: Okay, do we use <u>the</u> … preparing my trip to … <u>the</u> USA?
21. N: Aaah ah (utters something in Spanish) ah, okay when I use when I use
22. USA use with article
23. T: okay.

In contrast, the tutor's interactions with another learner in the following excerpt from a session are markedly different.

24. T: "In the same day I mailed them … to …" okay alright. What about also
25. …is there something else still in this sentence?
26. F: to the.
27. T: Hum?
28. F: the
29. T: okay, "to the" … yeah, "to the US."

These two protocols are an excellent example of the use of an interactionist DA procedure to differentiate between two learners who, on the surface, are experiencing the same problem but in fact are at different levels of development. In the case of the first student, his affirmation that he knows what articles are is not supported by his subsequent performance; indeed, he even has trouble locating the error. In the case of the second learner, only a leading question from the mediator is required for him to self-correct. Similar to Antón's (2003) work, then, these learners would likely have been misdiagnosed as having the same level of language ability when in reality they did not. Unlike Antón, however, Aljaafreh and Lantolf were also interested in supporting learner development.

As I suggested earlier in this chapter, an important feature of working in the ZPD is that it brings to light aspects of development that remain hidden if one considers only whether performance is correct or incorrect. In particular, a change in the type of mediation an individual requires may also indicate development. In the following example, Aljaafreh and Lantolf (1994, p. 479) present a learner who is struggling with verb tense during two sessions one week apart. In the first session, he is working with the mediator on marking tense in the modal phrase "I called other friends who can't went do the party."

30. T: Okay what else? … what about the verb and the tense? the verb and the
31. tense …
32. F: Could
33. T: Okay, here.
34. F: Past tense.
35. T: Alright, okay, "who" alright "could not." Alright? And? …
36. F: To.
37. T: Here [points to the verb phrase], what's the right form?
38. F: I … go.
39. T: Go. Okay, "could not go to" that's right "to the party …"

When the learner's performance during this session is compared with his responsiveness to mediation a week later when the same problem arises, a very different picture of his abilities emerges.

40. T: Is there anything wrong here in this sentence ? "I took only Ani because
41. I couldn't took both" … Do you see anything wrong? … Particularly here
42. "because I couldn't took both"
43. F: Or Maki?
44. T: What the verb verb … something wrong with the verb …
45. F: Ah, yes …
46. T: That you used. Okay, where? Do you see it?
47. F: [points to the verb]
48. T: Took? okay.
49. F: Take.
50. T: Alright, take.

In the latter session the learner is more responsive throughout. At first, of course, his responsiveness is somewhat misdirected as he interprets the tutor's question as referring to the meaning of the sentence, and so he responds accordingly by clarifying the other person included in "both." Then, when the mediator targets the verb with a more explicit question, the learner succeeds in providing the correct form. The learner's responsiveness clearly indicates his development between the two interactions. In the first session, the tutor had to point to the specific verb phrase in order to focus the learner's attention on the source of the problem; in the second session, it is the learner who points to the verb phrase in response to the tutor's questions. Thus, even though this student required support during both sessions, his level of understanding and control over the grammatical feature in question appears to have changed. Had Aljaafreh and Lantolf framed this activity as an assessment, the resultant picture of the learner's abilities would have certainly varied depending on whether the procedure was carried out dynamically or statically. That is, in a non-dynamic approach this change in the learner's level of ability would have likely gone undetected, and it would have been concluded in both sessions that he was not able to control English verb tense. It is only through cooperating with the individual that his ongoing, maturing understanding can be understood.

Before moving on, an interesting follow-up to this study was conducted by Nassaji and Swain (2000) that is relevant to the issue of tailoring mediation to an individual's needs. These authors sought to determine whether or not mediation sensitive to the learner's ZPD was necessary to improve performance or if any kind of mediation would be sufficient to help the learner move beyond what he could do independently; if both types of mediation are indeed helpful, then which one is best suited to promoting development? In a small-scale study, Nassaji and Swain paired a tutor with two ESL learners. With one of the learners, the mediation was dialogic as in the Aljaafreh and Lantolf (1994) approach. The tutor attempted to co-construct a ZPD with the learner by beginning the corrective interaction at the implicit end of the regulatory scale and moving systematically toward the more explicit end as necessary, depending on the learner's responsiveness to the mediation. With the

other learner, the tutor made no attempt to attune mediation to the ZPD but instead randomly selected implicit and explicit mediating moves from Aljaafreh and Lantolf's regulatory scale. In other words, the degree of explicitness or implicitness of the help was not determined by the learner's responsiveness. The specific grammatical feature under analysis in the study was use of articles in English (a, an, the, and 0). The results of the study showed that the learner receiving negotiated mediation in the ZPD had actually been less accurate than the non-ZPD student when independently producing the initial composition but nevertheless showed greater improvement as a result of the mediation, outperforming the non-ZPD student on the final composition task. In addition, the authors note that the ZPD learner "exhibited consistent growth over time, a pattern not observed in the non-ZPD student's performance" (Nassaji and Swain, 2000, p. 48).

As we saw in Chapter 2, Vygotsky's vision of a development-oriented pedagogy clearly requires dialogic negotiation between mediator and learner. Of the L2 DA studies conducted to date, the work that has perhaps come closest to organizing instruction around the ZPD is that of Aljaafreh and Lantolf (1994), although these authors did not fully consider the potential of tutor–learner interactions as assessment. Nevertheless, their study stands out because it highlights the importance of the quality of mediation in promoting L2 development, and it is therefore directly relevant to our purpose of outlining a theoretically-grounded approach to DA in the L2 classroom, which is the topic of the remainder of this chapter.

5.7   Principles of Classroom-based L2 DA

In Chapter 3 we saw that of the existing DA methodologies, the one that is most relevant to classroom interactions is Feuerstein's MLE approach. In what follows, I argue that three of the essential MLE attributes described by Feuerstein (Feuerstein et al., 1988) and discussed in Chapter 3 – intentionality and reciprocity, transcendence, and mediation of meaning – offer an excellent point of departure for classroom-based L2 DA. I suggest how these constructs may be applied to the particular problems of L2 development. I then describe a university-level DA program for advanced learners of L2 French organized according to these principles.

5.7.1   Quality of Mediator–Learner Dialoguing

Earlier it was explained that Feuerstein understands *intentionality* as the most fundamental MLE attribute because it emphasizes that mediators must approach their interactions with learners as an opportunity to intervene in and support development. This implies that mediators must have an understanding of the processes of development and how they can be optimally supported. For instance, relying on intuition alone might suggest that feedback should always be explicit in order to

maximize the potential for learner uptake. While this position may have "common sense" appeal, it is not sensitive to the dynamics of the ZPD, which compels us to offer mediation that is neither too implicit (in which case it would fail to be useful to learners) nor overly explicit as this would fail to reveal learners' precise level of ability. It is therefore incumbent upon mediators to decide, during the unfolding of their interaction with learners, the forms of mediation that simultaneously support learners while allowing them to remain as agentive as possible. As the work of both Antón (2003) and Aljaafreh and Lantolf (1994) show, mediation can sometimes be very implicit but under other circumstances must be quite explicit, and this is determined by where an individual is in the ZPD at a given moment. For this reason, *intending* to mediate development in the L2 classroom entails being open to providing any form of mediation learners require without concern for standardization of the procedure or adherence to a set repertoire of mediating techniques. Recall that the hierarchy of mediating moves developed by Aljaafreh and Lantolf emerged from their analysis of tutor–learner interactions and does not represent an exhaustive inventory. (Indeed, it is difficult to imagine what a "complete" list of mediation would look like!) While one may certainly enter an interaction with a plan that includes forms of mediation that might be offered, interaction in the ZPD requires that this plan be altered and perhaps even abandoned at any moment.

The emergent nature of mediation during DA is simultaneously a stimulus for and response to learners' contributions, or what Lidz (1991) refers to as *learner reciprocity*. In the preceding chapter we saw that Lidz (1991, p. 110) proposed *reciprocity* to draw researchers' attention to learners' "level of receptivity" to mediation, and her proposed reciprocity scale helps to round out the picture of DA interactions by complementing Feuerstein's notion of *intentionality*. In other words, while the former addresses the mediator's task of providing forms of support appropriate to learners' level of development, the latter underscores the active role played by learners themselves in the interaction. Elsewhere I argue that *reciprocity* takes us beyond the binary interpretation of learner responses (correct or incorrect) characteristic of NDA and broadens the scope of our analyses to include the ways in which learners negotiate mediation as they collaborate with a mediator to jointly brainstorm ideas, raise questions, discuss problems, propose alternatives, and evaluate solutions (Poehner, forthcoming). Indeed, this represents an important departure even from standardized approaches to DA in which learners are restricted to responding to only the mediation that is offered, and their responses are taken as an indication of whether more mediation is needed.

In that paper I further submit that successfully constructing a ZPD with learners involves moving beyond a model in which mediation is likened to a medication or treatment that is administered to individuals in measured dosages. I suggest that a more suitable metaphor is to see DA interactions as a dance: neither dancer's moves can be understood in isolation from their partner and the dance itself is only possible as a joint activity in which both contribute. Moreover, in this dance both may lead because as learners' abilities develop they take on increasing responsibility for performance. In fact, *reciprocity* itself may be regarded as mediation; that is, the learner's attempts to mediate the mediator by requesting specific forms of support,

questioning the mediation that is provided, and even refusing the mediator's offer to help. Taken together, *intentionality* and *reciprocity* represent a radically different framework for instruction and assessment in the L2 classroom in which abilities and the processes of their development are dynamic and so too must be the teacher–learner interactions that promote development.

5.7.2   Coherence of DA Interactions

While *intentionality* and *reciprocity* call our attention to the need to carefully calibrate the quality of classroom interactions according to learners' growing agency, the notion of *transcendence* adds a third element to this system – the task that is the focus of mediator–learner collaboration. In Chapter 2 we saw that Vygotsky's early ZPD work focused on the problem of IQ scores as predictors of school success. An important insight from this research is that some of the children in the study mastered all the tasks that comprised their grade-level curriculum and consequently could develop no further. As explained in that chapter, Vygotsky later described teaching and learning as leading development in a non-teleological manner, as there are always new problems to solve and new forms of mediation available. Cast in this light, Feuerstein's conceptualization of *transcendence* is essential to ZPD collaborations because it ensures that learners will continue to encounter problems and tasks that lie beyond their current abilities and therefore represent opportunities for development (see Poehner, 2007).

Without *transcendence* DA would not succeed in fully integrating assessment and instruction because *transcendence* demands full coherence from one interaction to the next. As I have argued throughout this book, every DA session is framed according to development in the ZPD, which means that assessment cannot be a one-time, stand-alone activity that is separate from instruction. Thus, in Feuerstein's model an initial DA serves as the basis for Instrumental Enrichment, and at various points during the IE program learners may repeat the initial DA in order that their development may be tracked over time. However, this does not mean that IE is aimed at instruction and DA at assessment. Interactions during any given session may be reported in a more or less formal manner, but all sessions involve learners and mediators collaboratively carrying out tasks of increasing difficulty.

5.7.3   Object of L2 DA Programs

The third attribute essential to DA in the Feuersteinian tradition is *mediation of meaning*, and this is especially relevant to DA in the L2 classroom because it concerns the object of mediator–learner interactions. To be sure, DA is first and foremost about development (see Lantolf and Poehner, forthcoming), but aside from this supra-construct dynamic procedures can target the development of basic

cognitive functions, as in Feuerstein's work, or abilities and knowledge tied to specific domains such as mathematics or language. Kozulin (1998, p. 88) refers to Feuerstein's IE as a *supplementary cognitive intervention program* because it supports the development of basic psychological functions and is not a part of any school curriculum. He contrasts IE with *cognitive infusion programs*, which seek to promote higher psychological functions through the study of specific content domains. He argues that in a pedagogy based on Vygotskian principles:

> There is no opposition between cognitive mechanisms and content knowledge for the simple reason that content appears here in a conceptual form that defines not only the content but also the type of reasoning involved. Because sociocultural theory emphasizes the historical character of human cognition, the conceptual structure of disciplinary knowledge appears here as a veritable form of human thinking. (Kozulin, 2003, p. 33)

Domains of knowledge, then, all have their own underlying logic, their own unique concepts that serve as "symbolic devices" for representing their object of study, for highlighting specific aspects of that object, and for organizing relationships among the various categories and principles that form the domain (Kozulin, 1998, p. 161).

This has led to a number of Vygotsky-inspired pedagogies intended to help learners internalize conceptual knowledge, most notably the approach known as *concept-based instruction (CBI)* associated with Vygotsky's student Piotr Gal'perin. In brief, CBI can be distinguished from other pedagogies by (a) an insistence that the object of study be presented to learners in its full conceptual form from the earliest stages of instruction; and (b) a prescription of stages through which learners must pass on their way toward full internalization of conceptual knowledge (for a review of pedagogical applications of Gal'perin's theories, see Negueruela, 2003). According to Gal'perin, the academic difficulties experienced by many students may be attributed to an inadequate orientation to the object of study. This, in Gal'perin's view, occurs because educational programs frequently breakdown sophisticated theoretical concepts into smaller, supposedly more manageable, bits of information that are presented to learners in a fixed sequence. Although such an approach is intended to facilitate learning, it often leaves learners to connect the dots on their own, which some are able to do more successfully than others. The result is that many learners are left with a partial or inaccurate understanding of important concepts in their domain of study. To redress these shortcomings, CBI takes as its starting point the central concept in a field (e.g., measurement in mathematics or communication in language), introduces it to learners in its entirety to maintain the integrity of the concept, and then proceeds to systematically present other concepts and their interrelationships. To aid learners' internalization of difficult concepts, CBI advocates providing material representations of abstract knowledge in the form of models, charts, tables, and diagrams. In addition, learners are encouraged to verbalize their developing understandings, which helps teachers to verify the quality of their understanding but also facilitates internalization.

Applications of CBI to L2 pedagogy have only recently begun to be explored (e.g., Negueruela, 2003; (see Lantolf and Thorne, 2006). Ferreira and Lantolf (forthcoming) describe an ESL writing program organized around the central concept of genre. These authors attempted to use genre as a means of sensitizing

students to the purposes and conventions associated with the various kinds of writing that constituted the academic ESL curriculum at a large North American university. Serrano-Lopez and Poehner (forthcoming) report the results of implementing a concept-based approach to teaching L2 Spanish locatives, a problematic feature of the language for English-speaking learners. In this study, the traditional rule-based approach to instruction was abandoned in favor of explaining the spatial relations underlying the Spanish prepositions. Importantly, these relations often conflict with English concepts of space, but learners came to develop new conceptual understandings in part through the use of clay models representing the relations encoded by the prepositions. The most extensive L2 CBI study to date is that of Negueruela (2003), which focused on teaching English-speaking learners about the concepts of tense, mood, and aspect in Spanish. Negueruela provides a detailed description of the materialization and verbalization stages of development and also documents learners' struggle with and resistance to the methods (see also Negueruela and Lantolf, in press).

In summary, successfully implementing DA in the L2 classroom requires a commitment to development-oriented collaboration with learners, and this involves carefully interpreting learners' moves in order to attune mediation to their needs. Without flexible, dialogic interaction one cannot hope to co-construct and maintain a ZPD with learners. Furthermore, the tasks and activities that are the focus of mediator–learner interactions must be organized and sequenced so as to continually challenge learners because this enables them, with support from the mediator, to stretch beyond their present abilities. Finally, at the curricular or programmatic level, L2 instruction should have as its goal learners' internalization of conceptual knowledge. In the next section I describe a L2 DA program built upon each of these principles.

5.8   DA of Oral Communication Among Advanced Learners of L2 French

5.8.1   Advanced Learners of L2 French

The L2 DA program described here was implemented at a large research university in the northeastern USA. Like many American universities, this institution sequences its undergraduate curriculum so that students specializing in a foreign language follow several courses focused on developing their proficiency before moving on to the study of literature. Students are encouraged to study abroad during their third year at the university and then return for advanced courses, which in some rare cases may include graduate-level literature courses. In the undergraduate French program at this university, fourth-year students enroll in an advanced oral communication course that functions as part of their capstone experience.

While DA procedures can certainly be adapted for use with language learners at all levels, a number of reasons motivated the decision to develop a DA program for

advanced levels of language study. Advanced language learners have the ability to produce longer stretches of discourse than beginning learners and are more likely to have select problems than beginners, whose limited knowledge of the language leads to numerous challenges. Of course, this does not mean that we should assume all advanced language learners to be homogeneous. Although this population is largely underrepresented in the SLA research literature, practical experience suggests that the different paths learners take to arrive at this level will yield a highly heterogeneous population in many regards. This diversity means that, relative to the course curriculum, individual learners will have different distances to traverse developmentally and will require different forms of mediation. In addition, this particular course's focus on advanced oral communication was also attractive in light of the current resurgence of interest in the assessment of oral proficiency (see Swain, 2001; McNamara, 2001). In fact, Johnson (2001) has even called for rethinking the ACTFL-OPI from a Vygotskian perspective, suggesting the potential relevance of concepts from SCT such as mediation and the ZPD.

The advanced L2 French oral communication course is organized according to "language functions" including persuasion, description, argumentation, informational, and creative or poetic function. In addition, students are required to consistently and appropriately use both a formal and an informal register of French during class activities (directions as to which register to use are given prior to specific activities). Throughout the semester, students give oral presentations, either individually or in groups, demonstrating the various language functions. Students are also routinely given opportunities to have small group discussions in class, during which they must use the relevant functions and registers. Although formal grammar instruction is not part of the course, students are often advised to purchase one of the many commercially produced reference guides. Instructors typically provide corrections of learners' grammatical mistakes but often choose not to devote class time to grammar teaching as learners at this level are expected to have a high degree of grammatical proficiency.

Owing to its experimental nature, the L2 DA program we will consider was designed to supplement rather than replace regular course instruction. Students were not required to participate in the program as part of the course but did so voluntarily outside of scheduled class time. In the following chapters we will consider the mediator's interactions with six participants in this program: Amanda, Donna, Elaine, Jess, Nancy, and Sara (all pseudonyms). All were native speakers of English who had studied French exclusively in formal settings; none had stayed in a French-speaking country for an extended period.

5.8.2   Organization of the L2 DA Program

The L2 DA program was structured to offer students individualized interactions with a mediator one to two times per week for a period of eight weeks. Upon first meeting with the mediator, learners were asked to compose two oral narratives in

French based upon brief video clips they watched. Narration activities were chosen as a means to understand learners' language abilities due to the wide range of linguistic structures required by such a task, including selective use of verb tenses (past tenses but also potentially the present and future tenses), aspect (perfective and imperfective), moods (indicative, conditional, and subjunctive), and methods of reporting speech (directly and indirectly), among others. In this way, learners showcased a variety of abilities, any of which could have required remediation.

The video clips upon which learners' narratives were based were from the film *Nine Months*, a comedy from the mid-1990s starring Hugh Grant, Julianne Moore, and Robin Williams that recounts the misadventures of a couple who unexpectedly find they are going to have a baby. This film was selected because it was hoped that its well-known comedians and light-hearted subject matter would help to ease some of the tension learners might feel about undergoing an assessment. The film was also in English, the native language of all the students, which helped to ensure that they had a solid understanding of the scenes they were asked to narrate. In addition, the film offered several clips that combined sequences of action and dialogue that provided ample material for the learners' narratives.

During their initial meeting, learners first composed a narrative without any interaction with the mediator. Observing their independent performance in this way enabled the mediator to gain a sense of each individual's current level of functioning, including potentially problematic areas worth investigating during DA. Immediately following completion of this task, learners watched another video clip and were again asked to construct a narrative but this time they did so through cooperation with the mediator. Following the DA principles outlined above, the interactions were highly dialogic, with the mediator free to pursue any problems that arose. The non-dynamic and dynamic narrations helped the mediator to identify each learner's ZPD according to the difficulties that arose as well as the quality of mediation and reciprocity that characterized the interaction.

The insights gained into learners' abilities during this initial session were used as the basis for subsequent meetings over a six-week period. Each interaction followed a similar organization in that the mediator and learner watched a new video clip and then collaboratively developed a narrative in French around what they had seen. For all learners, a recurring problem concerned the use of verbal tense and aspect in French (discussed below), and so this became a major focus of discussion. To be sure, other issues emerged during mediator–learner interactions that required attention, including lexical and phonological questions and problems pertaining to preposition usage and syntax. While each of these difficulties was addressed during the sessions in which they occurred, learners' struggles with verbal tense and aspect were ongoing and so a systematic, conceptual approach to remediation was followed. This is described in detail in the next section, but first I will outline the final stages of the DA program.

After six weeks of individualized enrichment sessions, the original dynamic and non-dynamic narration activities were repeated, allowing the mediator and learners to better understand any development that occurred during the program. Two transcendence tasks were then introduced to illuminate the degree to which learners

were able to recontextualize their abilities as they encountered new and more challenging problems. The first transcendence (TR) session paralleled tasks learners had previously completed in that they once again were asked to compose a narrative based on a video clip. However, the task differed in two very important ways. The video clip this time was taken from the film *The Pianist,* which is a different genre from *Nine Months*. It is a grim depiction of the true story of one man's survival during the Holocaust. As such, the emotional response and the attention this film demands are very different from the comedy used in the earlier DA sessions. Second, the specific clip learners viewed included only one line of dialogue. The scene involves a series of violent images and a sequence of events portraying a Jewish uprising against the German army and the latter's retaliation. The second transcendence activity (TR2) differed from the other tasks in an even more important way: the medium of the prompt itself. Instead of a video clip, learners' narrations were based upon their reading of an excerpt from Voltaire's *Candide*. In this instance, the prompt itself was in the same language as the learners' renarration (i.e., French), although given that the text was from the eighteenth century it diverged from contemporary French in several ways. For example, even the verbal forms used to encode aspect were a source of some difficulty because the literary *passé simple* was used by the author rather than the more common *passé composé*. TR2, then, challenged the learners to both read and comprehend in the L2 as well as to retell the story in their own words.

5.8.3   *A Concept-based Instructional Approach to Verbal Aspect*

As mentioned, it became apparent during the initial DA session that verbal tense and aspect was a source of difficulty for all learners. In French, past events, actions, and states of being may be described using either the *passé composé* or the *imparfait*. The *passé composé* emphasizes a given action as perfected, or completed, at some point before the present time while the *imparfait* makes no references to the perfection or completeness of the action. Thus, the *passé composé*, or present perfective, and the *imparfait*, or present imperfective, may both be used to describe any action. For instance, *John entered the room* and *John was entering the room* both refer to the same event but emphasize different aspects of it. In the first, it is clear that John has finished entering the room but in the second the action is referred to as ongoing and one expects that it is providing a background to another event. Both aspects convey different meanings, and the aspect a speaker chooses depends upon how he wishes to frame or situate past actions.

For English-speaking learners of French and other languages that similarly mark aspect, this distinction is notoriously difficult. Indeed, Swain (1985) reports that even advanced French immersion students after years of study continue to struggle with the *passé composé* and *imparfait* during narrative tasks. Harley (1986, p. 73) conducted a study in a Canadian French immersion program and found that students who had received between 1000 and 3500h of instruction still experienced

great difficulty encoding verbal aspect. Thogmartin (1984) describes the distinction between the *passé composé* and the *imparfait* as "one of the most frustrating [topics] for the beginning student of French to master or for the pedagogue or grammarian to describe in a way that will be helpful to the student in conceptualizing the problem and correcting his own errors" (p. 344).

In part, the problem may stem from the fact that English often uses the same forms for both perfective and imperfective aspect. For instance, the statement *Paul was sick* can portray Paul's condition as either ongoing or completed, while in French this would be rendered as either *Paul était malade* or *Paul a été malade*. However, the manner in which students are instructed is a major reason this distinction remains cloudy for so many learners. In her review of techniques used for teaching the *passé composé* and the *imparfait* in high school and university French textbooks, Dansereau (1987) observes that explanations are not explicitly linked to the linguistic concepts of perfective and imperfective aspect (p. 33). Instead, she notes that aspect is "always mixed in with and lost among other explanations" which tend to be "vague, incomplete, contradictory, and generally poor" (ibid.). Blyth (1997, p. 54) points out that most French and Spanish textbooks confuse related but separate grammatical categories, mistakenly referring to the perfect and imperfect as temporal (i.e., tense) differences rather than aspectual. Citing Garrett (1986, p. 140), he charges that textbook presentations of aspect are "seriously misleading as explanations, sometimes actually wrong" (ibid.). He concludes that although aspect is a key grammatical concept, it is poorly understood by most learners of L2 French and Spanish because instructors themselves do not have a full conceptual grasp of it (p. 51).

If one follows Dansereau's (1987) argument, the problem can be traced to the failure of textbooks to present grammatical information in a coherent, conceptually organized, format. She suggests that aspect is not *explained* as much as it is *described* in relation to specific sentence-level examples (pp. 33–34). This allows for the identification of key words that students come to associate with the functions of these forms. In her view, "to fill a student's head with notions of 'completion,' 'duration,' 'number of times,' 'state,' 'action,' and so forth is to doom him to confusion, frustration, and incorrect usage" (p. 36). Instead of approaching the distinction between the *passé composé* and the *imparfait* as a series of descriptive rules-of-thumb to be memorized, Dansereau suggests focusing instruction on the linguistic concept of aspect, and this is precisely the aim of a CBI approach.

The French L2 DA program sought to improve learners' control over the *passé composé* and the *imparfait* by engaging them at the conceptual level and correcting any misunderstandings of verbal aspect. This approach was largely informed by Negueruela's (2003) Spanish L2 CBI program, which included verbal aspect among its topics. Drawing on Bolinger's (1991) formal accounts of aspect and Bull's (1965) pedagogical recommendations for Spanish L2 teachers, Negueruela developed explanations and supporting visual representations to help his students arrive at a conceptual understanding of the *preterito* and the *imperfecto* in Spanish. As French is also a Romance language, it uses aspect in ways that are very close to Spanish, and so Negueruela's explanations and examples were adaptable for use with L2 French learners.

In summary, the DA program implemented with advanced learners of L2 French supplemented the instruction they received in the oral communication course. At the same time, the presentation of the *passé composé* and the *imparfait* was qualitatively different from the treatment this distinction receives in most textbooks and language classes because it focused on the linguistic concept of aspect. As such, DA interactions endeavored to help learners develop a new theoretical understanding of this feature of French that they could use to regulate their functioning in the language. The DA program can thus be thought of in Kozulin's (2003) terms as *cognitive infusion*. In addition, careful attention was given to both the mediating moves and reciprocating behaviors that were made as the mediator and learner cooperatively completed the narration tasks. As learners began to function more autonomously mediation was recalibrated, and eventually the tasks became more demanding in order to provide opportunities for further development.

5.9 Conclusion

My goal in this chapter has been to review existing L2 DA studies as well as connect advances in DA theory and methods to the L2 classroom. Interactionist DA's preference for dialogue and cooperation over standardization makes it particularly well suited to the emergent demands of co-constructing a ZPD with classroom learners. In this regard, the work of Antón (2003) and Aljaafreh and Lantolf (1994) is especially relevant as these illustrated learners' differential responsivity to mediation and the signification of various forms of mediation.

These insights, along with key constructs from Feuerstein's MLE approach, are the basis for the principles I outlined for instituting a classroom-based L2 DA program. Specifically, I argued for the following: (a) mediators must be willing to provide any support necessary to foster learner development; (b) mediating moves must be sensitive to learners' changing needs as indicated by their implicit and explicit contributions to DA; (c) every interaction coheres around the ZPD, and this entails an awareness of the shifting dynamics of mediator–learner dialoguing but also an intentional effort to complexify tasks in order to continually challenge learners; (d) L2 development from this perspective involves the internalization of theoretical knowledge and so the approach taken to remediating underlying problems and confusions should be based on linguistic concepts. The L2 French DA program I described was informed by each of these principles. Of course, this program represents only one possible approach to employing DA to understand and promote L2 development. That said, the program did yield important insights and benefits to the learners and illustrated many of the advantages of L2 DA. These are explored in detail in the next two chapters.