Decision trees linking individual student need to large-scale accommodations for English learners: A white paper

August 25, 2015

Blake Myers and Rebecca Kopriva

When considering the decreased test performance of English language learners (ELLs) relative to non-ELLs, there are a variety of ways in which ELLs might be hindered in conveying their content knowledge during an assessment. One promising path towards overcoming this obstacle (and thus, towards getting a better read on what ELL students know) is to provide testing accommodations that serve to remove potential language-related burdens of traditional tests without affecting the content-related difficulty of the tests.

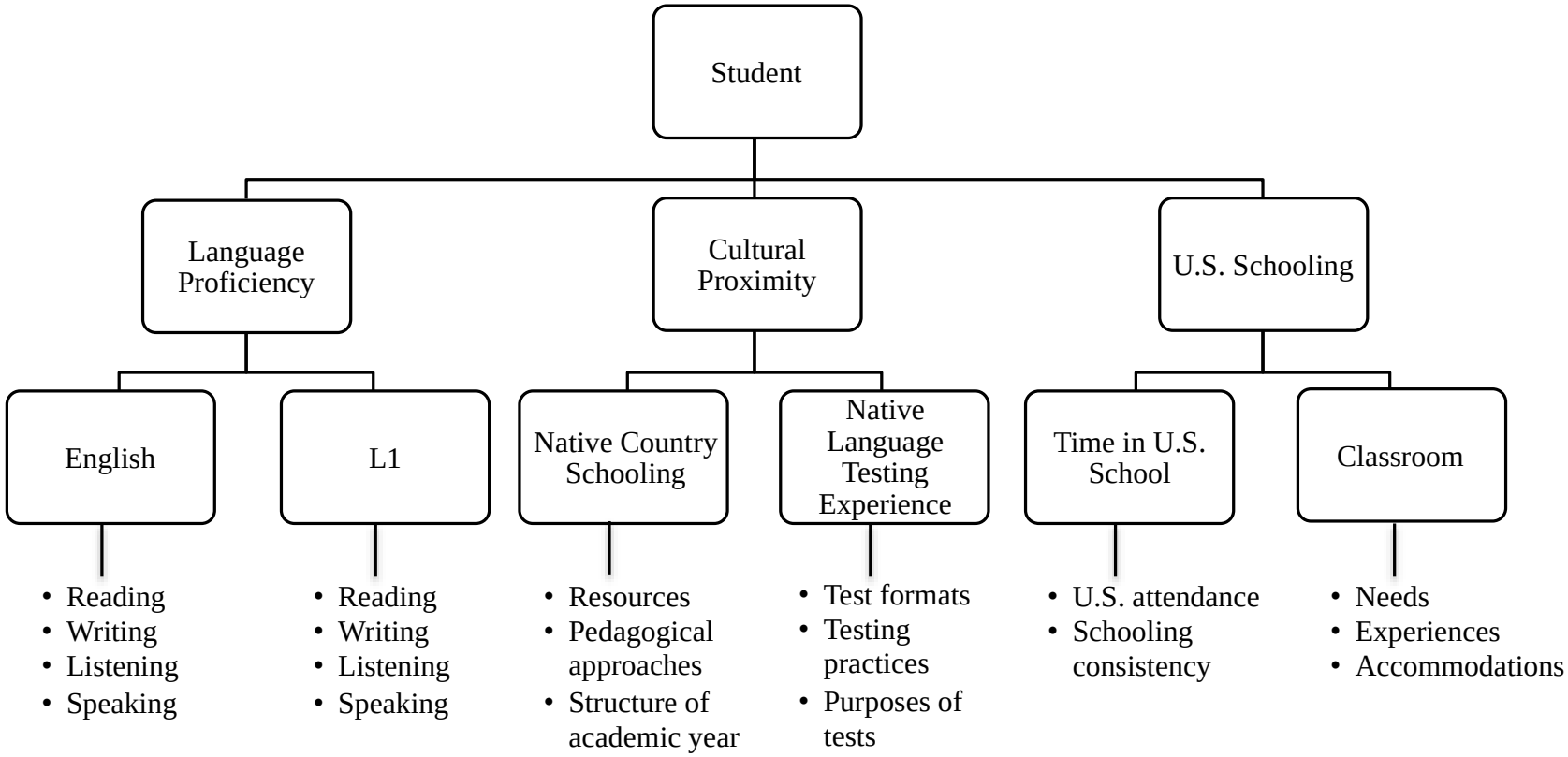
Though if this strategy is to succeed, there is yet a further issue that needs to be addressed. Namely, an increasing number of studies suggest that ELLs constitute a fairly heterogeneous group (Abedi 2004; Solano-Flores 2006; Martiniello 2007; Acosta et al. 2008; Solano-Flores & Trumbull 2008). Hence, an accommodation that is effective in removing content-irrelevant language obstacles for one ELL subgroup may well be ineffective in doing so for another ELL subgroup. In support of this, several studies reveal that an ELL's English proficiency level, as well as the language in which the student has been receiving content-based instruction, can significantly affect the impact that certain accommodations have on the student's test performance (Duncan et al. 2005; Kieffer et al. 2009; Cawthon 2010; Pennock-Roman & Rivera 2011; Li & Suen 2012a). Given such findings, the question arises as to which further student factors (or characteristics) might also be important when assigning testing accommodations to ELLs.

To date, recommendations and guidelines for matching particular accommodations to particular ELL subgroups, as provided by leading standardized test consortiums, tend to be either minimal or nonexistent (Abedi & Ewers 2013; PARCC 2013). And when recommendations are provided, they are typically given in terms of English language proficiency levels, with little consideration of other potentially relevant factors, such as native language literacy proficiency, native language oral proficiency, number of years in the U.S, grade level, and cultural proximity (PARCC 2013).

STELLA Taxonomy

With the aim of providing a systematic and effective approach to match particular accommodations with particular ELL subgroups, we present the Selection Taxonomy for English Language Learner Accommodations (STELLA). STELLA is an informant-based approach that utilizes information collected from multiple sources, such as a student's school file (which contains the student's English and non-English native language proficiency scores, as well as other information regarding the student's experience in the U.S. schooling system), a parent/guardian form (which summarizes information obtained through an interview with the student's parent or guardian on the student's home language proficiency and prior schooling experiences), and a teacher form (which is based on a teacher's observations of the student's language abilities and classroom-related experiences and preferences). The hierarchical organization of such data is represented in Table 1. Once collected, the information is consolidated by a set of conversion and decision-making algorithms, which together yield an individualized student profile that is matched with a specific set of recommended accommodations.

Table 1. Data collection chart.



Thus far, two main studies have been conducted with respect to the STELLA framework. In the first study, researchers looked at the relationship between STELLA-recommended accommodations, teacher-recommended accommodations, and randomly assigned accommodations (Koran & Kopriva 2006). Four ELL experts (three practitioners and one researcher) were asked to review completed STELLA forms for 114 students, though the experts had no knowledge of the particular accommodations that STELLA assigned to each student on the basis of this information. After completing the review, the experts used a 7-point scale (ranging from *completely optimal* to *completely inappropriate*) and gave blind ratings to five accommodations sets: i.e., a set of original teacher-recommended accommodations, a set of teacher-recommended accommodations after teachers viewed the completed STELLA forms for each student, a set of teacher-recommended accommodations after teachers viewed all of the information available for each student, a set of randomly assigned accommodations, and a set of STELLA-recommended accommodations. Using goodness of fit analyses, it was found that STELLA was a significantly better fit than both teachers and random, and that teachers were not significantly different from each other. Surprisingly, it was also found that teacher-recommended accommodations were not significantly different from randomly assigned accommodations.

A second study was carried out in order to examine the validity of STELLA-recommended accommodations (Kopriva et al. 2007a; Kopriva et al. 2007b). The aim was to examine whether ELLs who received STELLA-recommended accommodations performed significantly better on tests than ELLs who received inappropriate accommodations or no accommodations. To investigate this, 276 3rd and 4th grade South

Carolina ELL students who were spread across the range of English language proficiency were given a computerized mathematics test. In conjunction with the test, there were three possible accommodations (oral English, bilingual word translation, and picture-word translation), and students were randomly assigned to receive 0, 1, 2, or 3 of these accommodations. Subsequently, on the basis of further student data, each student was assigned to one of three groups: i.e., a group who received accommodations deemed proper by the STELLA framework, a group who received accommodations deemed improper by the STELLA framework, or a group who received no accommodations. The results from the study revealed that ELLs who received proper accommodations (as determined by STELLA) performed significantly better than ELLs who received improper accommodations or no accommodations. Moreover, ELLs who received improper accommodations performed no better than ELLs who received no accommodations. These findings provide support to the effectiveness of the STELLA framework and also highlight the importance of ensuring that students receive proper rather than improper accommodations.

STELLA Decision Trees

The Selection Taxonomy for English Language Learner Accommodations (STELLA) can be represented by way of five decision trees (depicted respectively in Figures 1-5). Consider some of the broad differences between the five trees.

Figure 1. Accommodations for ELLs who are receiving content-based instruction in English and have a beginner's English literacy proficiency.

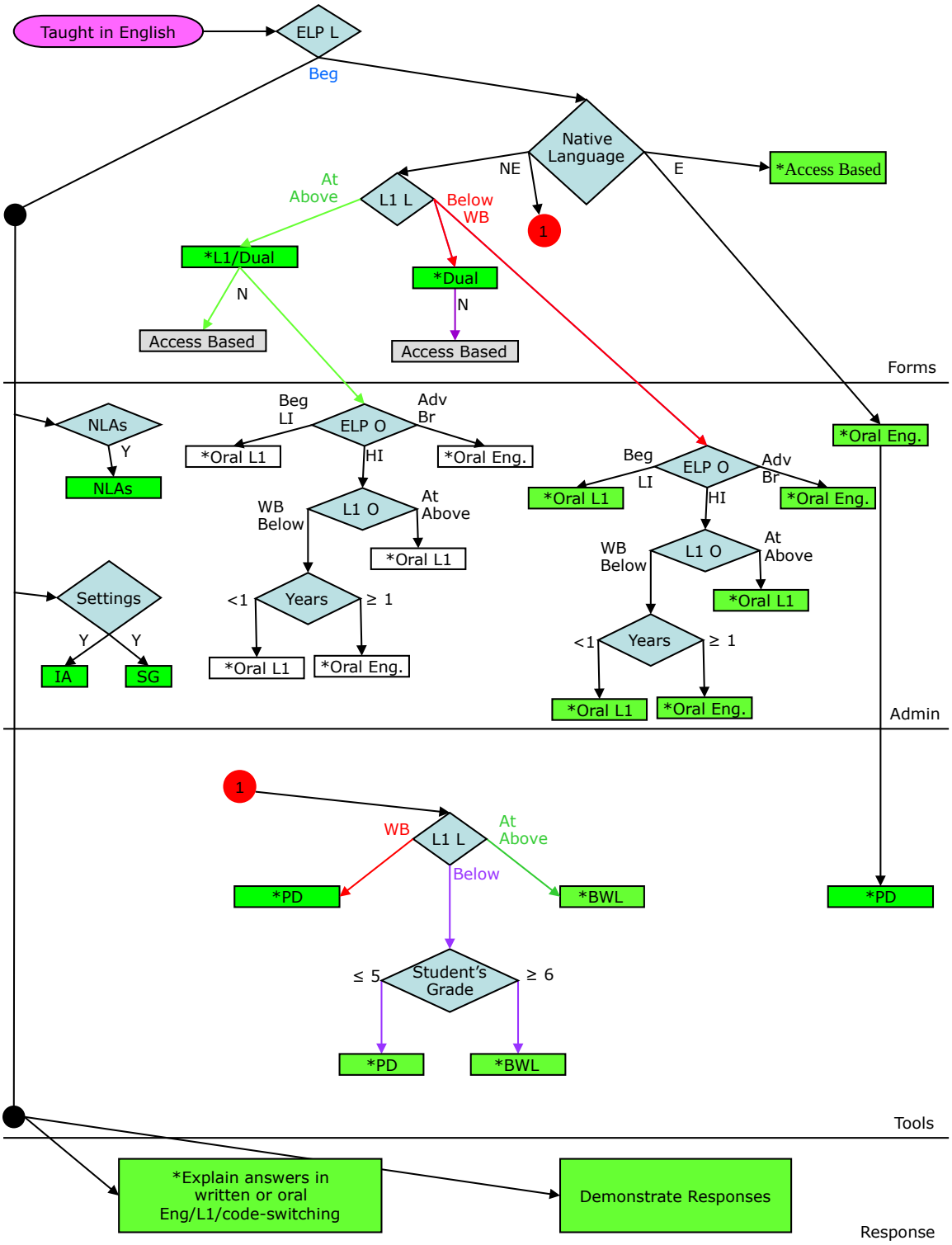


Table 2. Glossary for Figures 1-5.

Taught in English	Language of Instruction – i.e. English, L1, Dual
ELP R	Student Factor – e.g., ELP L, L1 L, Time
Access Based	Recommended 1st Choice Accommodation
*Access Based	Required (or *Strongly* Recommended) 1st Choice Accommodation
Access Based	2nd Choice Form Accommodation – due to 1st Choice Form Accommodation being unavailable
Oral L1	Recommended 1st Choice Admin/Tools Accommodation – due to the use of 2nd Choice Form Accommodation
*Oral L1	Required (or *Strongly* Recommended) 1st Choice Admin/Tools Accommodation – due to the use of 2nd Choice Form Accommodation
PD	2nd Choice Tools Accommodation – due to 1st Choice Tools Accommodation being unavailable

Table 3. Overview of the student factors represented in the decision trees.

Student Factors for Decision Trees		
Native Language		The student's native language: *English* (E) or *non-English* (NE)
ELP Reading ELP Writing	ELP Literacy	ELP Literacy (ELP L) is an aggregate variable based on (i) English proficiency in reading, and (ii) English proficiency in writing, the values of which may be either *beginner* (Beg), *low-intermediate* (LI), *high-intermediate* (HI), *advanced* (Adv), or *bridging* (Br).
ELP Listening ELP Speaking	ELP Oral	ELP Oral (ELP O) is an aggregate variable based on (i) English proficiency in listening, and (ii) English proficiency in speaking, the values of which may be either *beginner* (Beg), *low-intermediate* (LI), *high-intermediate* (HI), *advanced* (Adv), or *bridging* (Br).
L1 Reading L1 Writing	L1 Literacy	L1 Literacy (native language literacy; L1 L), is an aggregate variable based on (i) L1 proficiency in reading, and (ii) L1 proficiency in writing, the values of which may be either *way below* (WB), *below*, *at*, or *above* the levels typically found at the same grade level in the native country.
L1 Listening L1 Speaking	L1 Oral	L1 Oral (native language oral; L1 O) is an aggregate variable based on (i) L1 proficiency in listening, and (ii) L1 proficiency in speaking, the values of which may be either *way below* (WB), *below*, *at*, or *above* the levels typically found at the same grade level in the native country.
Years		The number of years that the student has been in the U.S.: *less than 1 year* (<1) or *1 year or more* (³1)
Time in U.S. Consistency in School Attendance	Time	Time is an aggregate variable based on (i) the amount of time the student has been in the U.S.—*high* (H) (more than 3 years), *medium* (M) (1-3 years), or *low* (L) (less than 1 year)—and (ii) the student's consistency in school attendance—*high* (H) (missed less than 1 month per year), *medium* (M) (missed 1-2 months per year), or *low* (L) (missed more than 2 months per year).
Student's Grade		Student's grade level: *grade 5 or below* (£5*)* or *grade 6 or above* (³6*)*
Settings		Teachers may recommend that a student be administered tests in a *small-group* (SG) setting or *independent-administration* (IA) setting.
Non-Language Assists		Non-Language Assists (NLAs) are additional non-language and non-setting accommodations recommended by teachers (e.g., extra time).
Structure of Schooling Testing Practices	Cultural Proximity	Cultural Proximity is an aggregate variable based on similarity between U.S. schooling and student's previous non-U.S. schooling, which includes (i) similarity in school structure (resources, pedagogical approaches, and structure of the academic year) and (ii) similarity in the aims and methods of testing, where *high* (H) is very similar, *medium* (M) is somewhat similar, and *low* (L) is dissimilar.

Table 4. Overview of the accommodations represented in the decision trees.

Decision Tree Accommodations	
Dual	A test with information presented in English on one side of the page and the student's non-English native language on the other side
L1/Dual	A test either translated entirely into the student's non-English native language (L1) or presented in a dual-language form
Access Based	An English version test that places extra emphasis on the clarity of content-related language and the avoidance of potential distractors
Oral Eng. Oral L1	Test questions are read aloud via an administrator, tape/CD, video, or computer in English (Oral Eng.) or the student's non-English native language (Oral L1).
Small Group (SG)	Small-group (SG) administration may be recommended if large-group administration interferes with test performance.
Independent Administration (IA)	Independent-administration (IA) may be recommended if both large-group and small-group settings interfere with test performance.
Non-Language Assists (NLAs)	Teachers may recommend additional non-language and non-setting accommodations, such as extra time.
Picture Dictionary (PD)	List of content-related words, where each word is paired with a picture illustrating the word's meaning
Bilingual Word List (BWL)	List of test-specific, but non-content-related, English words paired with equivalent words from the student's non-English native language
Eng. Gloss	List of key English words paired with English synonyms
Explain answers in written (or oral) Eng/L1/code-switching	Option to respond orally (with responses captured electronically) or in writing, and in either English (Eng), the student's non-English native language (L1), or a combination of both (code-switching)
Demonstrate Responses	A non-text-based avenue by which students can demonstrate or model their responses (e.g., via an interactive computer-based assessment)

The first three trees (i.e., Figures 1-3) are for students who have been receiving content-based instruction in English, and these trees are divided according to students' English language literacy proficiency:

(1) Figure 1 is for students with a *beginner's* English literacy proficiency;

(2) Figure 2 is for students with a *low-intermediate* level of English literacy proficiency; and

(3) Figure 3 is for students with either a *high-intermediate*, *advanced*, or *bridging* level of English literacy proficiency.

The latter two trees (i.e., Figures 4 and 5), by contrast, are for non-native English speaking students who have been receiving either dual-language instruction or instruction in their native language, and these two trees are divided according to students' (non-English) native language literacy proficiency:

(4) Figure 4 is for students whose native language literacy proficiency is *way below* the standard; and

(5) Figure 5 is for students whose native language literacy proficiency is either *above*, *at*, or *below* the standard.

Next, consider the internal organization of the five figures. Each figure is organized in a top-down manner and is divided into four tiers that correspond, respectively, to four

different types of testing accommodations; i.e., those labeled, "Forms", "Administration", "Tools", and "Response".

The top tier of each figure (i.e., that labeled "Forms") pertains to accommodations that affect the most general or wide-ranging linguistic aspects of a test: namely, the accommodations that determine the very language itself by which the test conveys its content. Once the general linguistic form of the test is determined, the second and third tiers of the figure (i.e., those labeled "Administration" and "Tools", respectively) help to determine how the test (which is translated into the recommended linguistic form) should be administered to the student, and what tools (e.g., picture dictionaries, bilingual word lists) should be given as further aids. Finally, the fourth (i.e., "Response") tier in each figure provides recommendations for pairing students with alternative ways of responding to test questions, such as responding orally, responding in one's native language, or responding via an interactive computer-based task.

Decision Tree Components.

The nodes in each tree can be broadly divided along three dimensions. The first dimension pertains to whether a given node is *diamond-shaped* or *rectangular-shaped*. Diamond-shaped nodes represent student factors (or characteristics), while rectangular nodes represent the testing accommodations that are recommended on the basis of some particular combination of such factors that hold for a given student.[1]

[1] While the majority of student information is collected for recommending accommodations via the decisions trees, some information is collected to provide appropriate pre-test classroom activities.

Consider, for instance, the key student factors in Figure 1: (i) the student's native language (for which the possible values are *English* and *non-English*); (ii) the student's literacy proficiency in his or her non-English native language (for which the possible values are *way below*, *below*, *at*, and *above* the standard); (iii) the student's English oral proficiency (for which the possible values are *beginner*, *low-intermediate*, *high-intermediate*, *advanced*, and *bridging*); (iv) the student's oral proficiency in his or her non-English native language (for which the possible values are *way below*, *below*, *at*, and *above* the standard); (v) the number of years that the student has been in the U.S. (for which the possible values are *less than one year* and *one year or more*); and (vi) the student's grade level (for which the possible values are *grade 5 or below* and *grade 6 or above*). (For more details on specific student factors and accommodations, see Tables 3 and 4.)

The second two dimensions along which the nodes can be divided apply only to rectangular nodes. They are *color* and *the presence or absence of an asterisk*. Regarding color, rectangular nodes are either *solid green*, *solid grey*, or *half green and half grey*.[2] Solid green nodes represent the optimal (or first-choice) accommodation for a given set of student factors. Moreover, if a solid green node contains an *asterisk*, the accommodation is *required* (or *strongly* recommended) as a first-choice accommodation. If, on the other hand, a solid green node *lacks* an asterisk, the accommodation is merely recommended (but not required) as a first-choice accommodation.

Solid grey nodes appear downstream from solid green nodes and represent accommodations that should be used when the first-choice (i.e., solid green node)

[2] All diamond-shaped nodes, and thus all student factor nodes, are colored blue.

accommodation is unavailable. Furthermore, the use of second-choice (i.e., grey node) accommodations often requires accompaniment by certain assisting accommodations (e.g., having an administrator read the questions aloud to a student). These assisting accommodations are represented by half green and half grey rectangular nodes, and are found downstream from the grey nodes that they are meant to accompany.

Lastly, in parallel to the solid green nodes, the nodes that are half green and half grey can be divided according to either the *presence* of an asterisk (in which case the accommodation is *required* to accompany the relevant grey node accommodation) or the *lack* of an asterisk (in which case the accommodation is merely recommended, but not required, to accompany the grey node accommodation).

Pairing Accommodations with Student Profiles.

As can be seen in Figure 1, each accommodation is paired with a unique set of student factors, which we term "student profiles". To illustrate, by beginning at the top of Figure 1 and moving downwards, the first (i.e., "Forms") tier of the tree represents three unique student profiles, each of which is sufficient for the recommendation of a given accommodation:

(p1) a profile for students who have a *beginner's* English literacy proficiency, and whose native language is English;

(p2) a profile for students who have a *beginner's* English literacy proficiency, whose native language is *not* English, and whose native language literacy proficiency is either *at* or *above* the standard; and

(p3) a profile for students who have a *beginner's* English literacy proficiency, whose native language is *not* English, and whose native language literacy proficiency is either *below* or *way below* the standard.

Continuing downward to the right half of the second (i.e., "Administration") tier, five more student profiles emerge, each of which is paired with a particular accommodation (or set of accommodations):

(p4) a profile for students represented by (p3), and whose English oral proficiency is at the level of a *beginner* or *low-intermediate* learner;

(p5) a profile for students represented by (p3), whose English oral proficiency is at the level of a *high-intermediate* learner, whose native language oral proficiency is either *below* or *way below* the standard, and who have been in the U.S. for less than 1 year;

(p6) a profile for students who are represented by (p3), whose English oral proficiency is at the level of a *high-intermediate* learner, whose native language oral proficiency is either *below* or *way below* the standard, and who have been in the U.S. for 1 year or more;

(p7) a profile for students who are represented by (p3), whose English oral proficiency is at the level of a *high-intermediate* learner, and

whose native language oral proficiency is either *at* or *above* the standard; and

(p8) a profile for students who are represented by (p3), and whose English oral proficiency is at the level of an *advanced* or *bridging* learner.

By continuing in this fashion, we arrive at still more student profiles that are expansions of the profile described in (p2), as well as profiles that are formed from the student factors in the subbranch extending from the red circle labeled with the numeral "1" (i.e., in the "Tools" tier of Figure 1). This yields yet another 9 unique student profiles that are sufficient for the use of a given accommodation, resulting in a total of 17 such profiles in Figure 1.

Specific Examples: What Different Profile Pathways Yield

Consider a more concrete example of the workings of the decision tree. Suppose that two students, *A* and *B*, have been receiving content-based instruction in English, have a beginner's level of English literacy proficiency, and are non-native English speakers. Then, the accommodation assignments for both *A* and *B* are to be determined by Figure 1. Beginning at the "Forms" tier of Figure 1, suppose that *A* has a native language literacy proficiency that is *above* the standard, while *B*'s native language literacy proficiency is *way below* the standard. Then, as a first-choice "Forms" accommodation for *A*, a testing format should be used in which written tests are either presented entirely in *A*'s native language, or in a dual-language form (i.e., a form where test content is presented in

English on one side of the page and *A*'s non-English native language on the other side of the page). By contrast, there is only one first-choice accommodation for *B*: namely, the test should be presented in a dual-language form. And as indicated by the asterisks, the respective first-choice form accommodations for both *A* and *B* are *required*.

However, there may be situations in which a first-choice accommodation for a given student is unavailable, and thus a second-choice accommodation must be used. Accordingly, suppose that while *A* receives a written test that is presented entirely in *A*'s native language, the first-choice accommodation for *B* (i.e., a dual-language form test) is unavailable. Then, *B* should receive the second-choice form accommodation: namely, a test presented in an *access-based* form (i.e., a form that places extra emphasis on the clarity of content-related language and the avoidance of potential distractors). Furthermore, the second (i.e., "Administration") tier of Figure 1 requires that an "Oral" accommodation be provided to *B*. With regards to the particular oral accommodation that should be given, suppose that *B*'s English oral proficiency is at a *high-intermediate* level, and that his or her native language oral proficiency is *above* the standard. Then, the second tier requires that *B* be administered tests in which questions are read aloud in *B*'s native language.

Once the aforementioned accommodations for both *A* and *B* are established, one can then move to consider which "Tools" accommodations should be given to *A* and *B*. Since we have already established that *A*'s native language literacy proficiency is *above* the standard, and that *B*'s native language literacy proficiency is *way below* the standard, the third (i.e., "Tools") tier in Figure 1 (specifically, the information in the subbranch

extending from the red circular node labeled with the numeral "1") indicates that *A* should be given a *bilingual word list*, while *B* should be given a *picture dictionary*.

Moreover, as represented in the vertically aligned subbranch at the far left side of the figure, certain accommodations are recommended on the basis of student factors that are *conceptually dependent* on the associated accommodation: e.g., the "Small Group" (SG) accommodation that is represented beneath the "Settings" node is recommended on the basis of the *conceptually dependent* factor of *being deemed suitable for receiving tests in a small-group setting*.

The nodes at the bottom (i.e., "Response") tier of Figure 1 indicate that *all* students who fall within the scope of Figure 1 (and thus both *A* and *B*) are to be given the opportunity to respond orally or in writing to test questions, and should be able to do so in either English, their native language, or a mix of English and their native language (i.e., code-switching). It is further recommended (but not required) that all such students be provided with some non-text-based avenue by which they can demonstrate or model their responses (e.g., via an interactive computer-based task), as suggested by the "Demonstrate Response" node.

Lastly, to illustrate the role of the half green and half grey nodes in the figures, consider one further example. Imagine that a third student, *C*, has been receiving content-based instruction in English, has a *low-intermediate* level of English literacy proficiency, is a non-native English speaker, and has spent a *high* amount of time in the U.S. Then, the accommodation assignments for *C* are determined by Figure 2. Thus, beginning at the "Forms" tier of Figure 2, imagine that *C* has a native language literacy proficiency that is *at* the standard. Consequently, *C* should be given tests in a dual-

language form. Though, suppose that a dual-language form test is unavailable. Then, *C* should receive the second-choice form accommodation: i.e., a test in an *access-based* form. And, as indicated by the "Administration" tier in Figure 2, *C*'s access-based test should be accompanied by one of the "Oral" accommodations. In particular, since the amount of time that *C* has been in the U.S. is *high* (as indicated above), *C* should be administered tests in which *questions are read aloud in English*. Finally, regarding the "Tools" and "Response" tiers of Figure 2, *C* should receive a bilingual word list, since *C*'s native language literacy proficiency is *at* the standard; and, *C* should further receive the same response accommodations that are recommended to students *A* and *B*, above, since *all* non-native English speakers represented in Figure 2 are to receive such accommodations.

Final Comparisons.

The meaning and function of the nodes and expressions in the remaining figures, i.e., Figures 3-5, are like those found in Figures 1 and 2, with a few small exceptions. For instance, while *all* non-native English speakers represented in Figures 1 and 2 should be given the option of responding to test questions either orally or in writing, and in either English, their native language, or a mixture of both, many of the students in Figures 3-5 (specifically, those who have a higher English literacy proficiency level) are recommended fewer options with respect to "Response" accommodations: e.g., the students represented in Figure 3 who have an *advanced* or *bridging* level of English literacy proficiency are to be given *no* response accommodations; and while students in Figure 3 who have a *high-intermediate* English literacy proficiency are to be given the

option to respond to test questions either in English, their native language, or a mixture of both, they do *not* have the option to respond *orally* (their answers must be in *written* form).

Figure 2. Accommodations for ELLs who are receiving content-based instruction in English and have a low-intermediate English literacy proficiency.

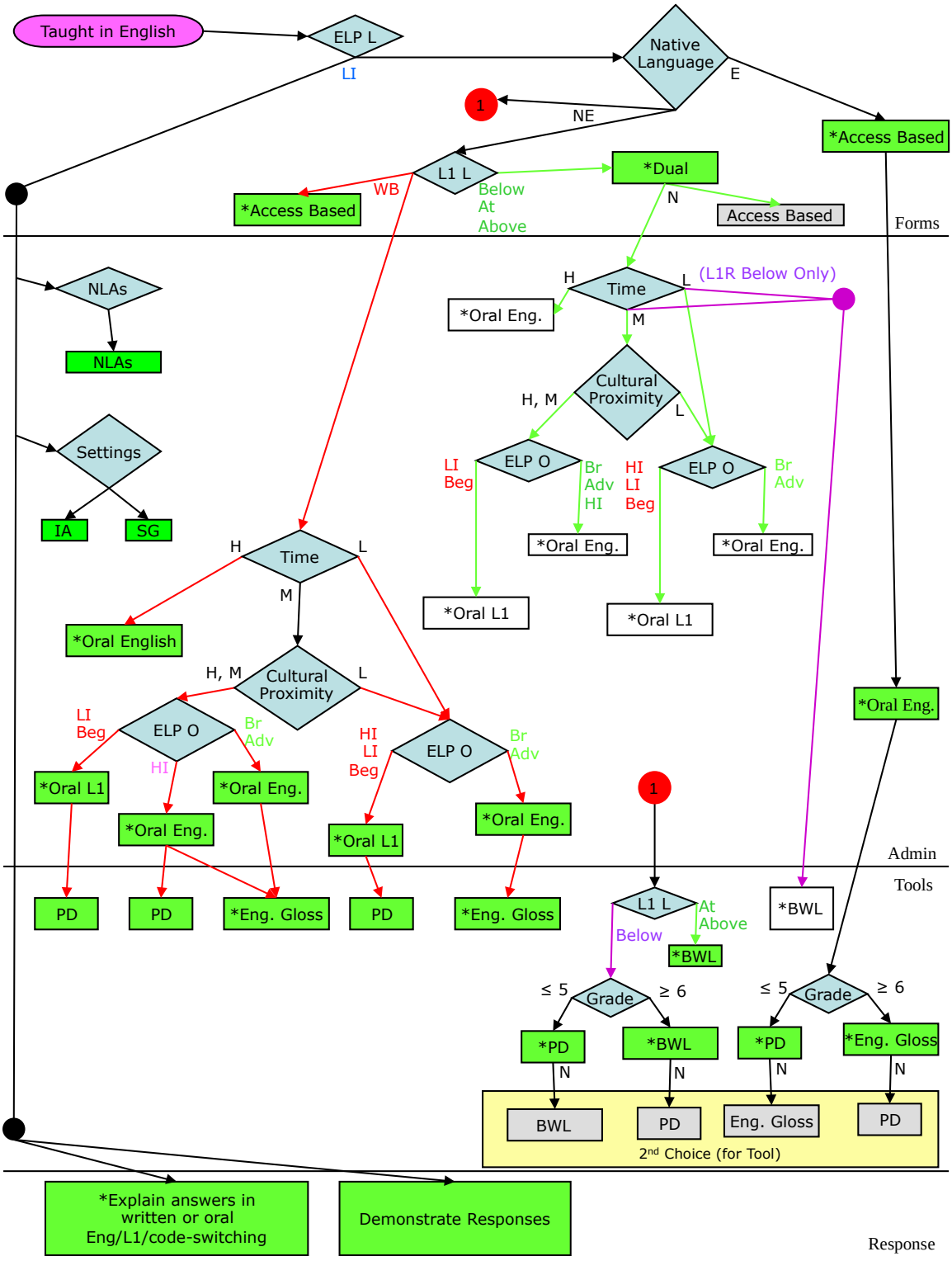


Figure 3. Accommodations for ELLs who are receiving content-based instruction in English and have a high-intermediate, advanced, or bridging English literacy proficiency.

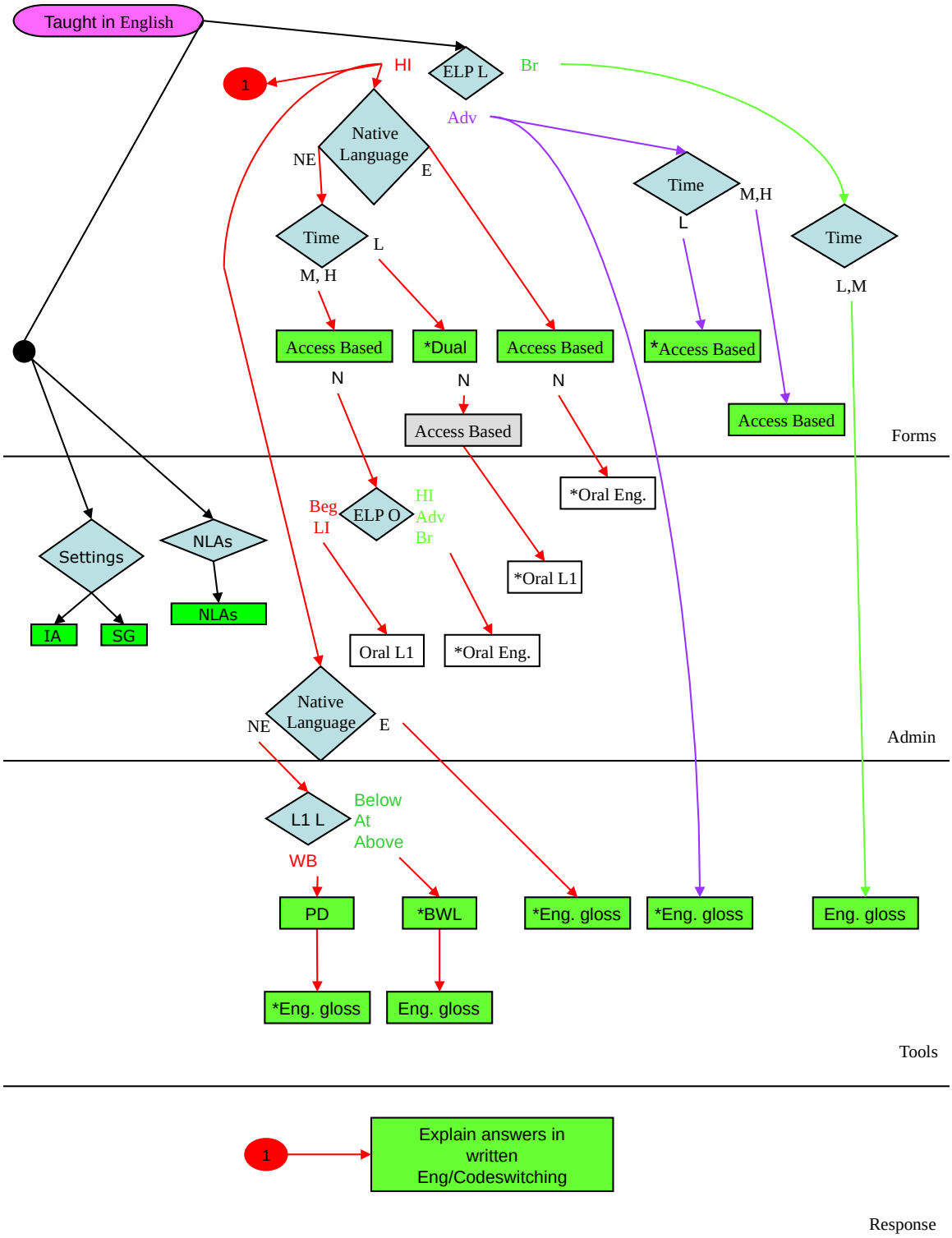


Figure 4. Accommodations for ELLs receiving dual-language or non-English language instruction and whose L1 literacy proficiency is way below the standard.

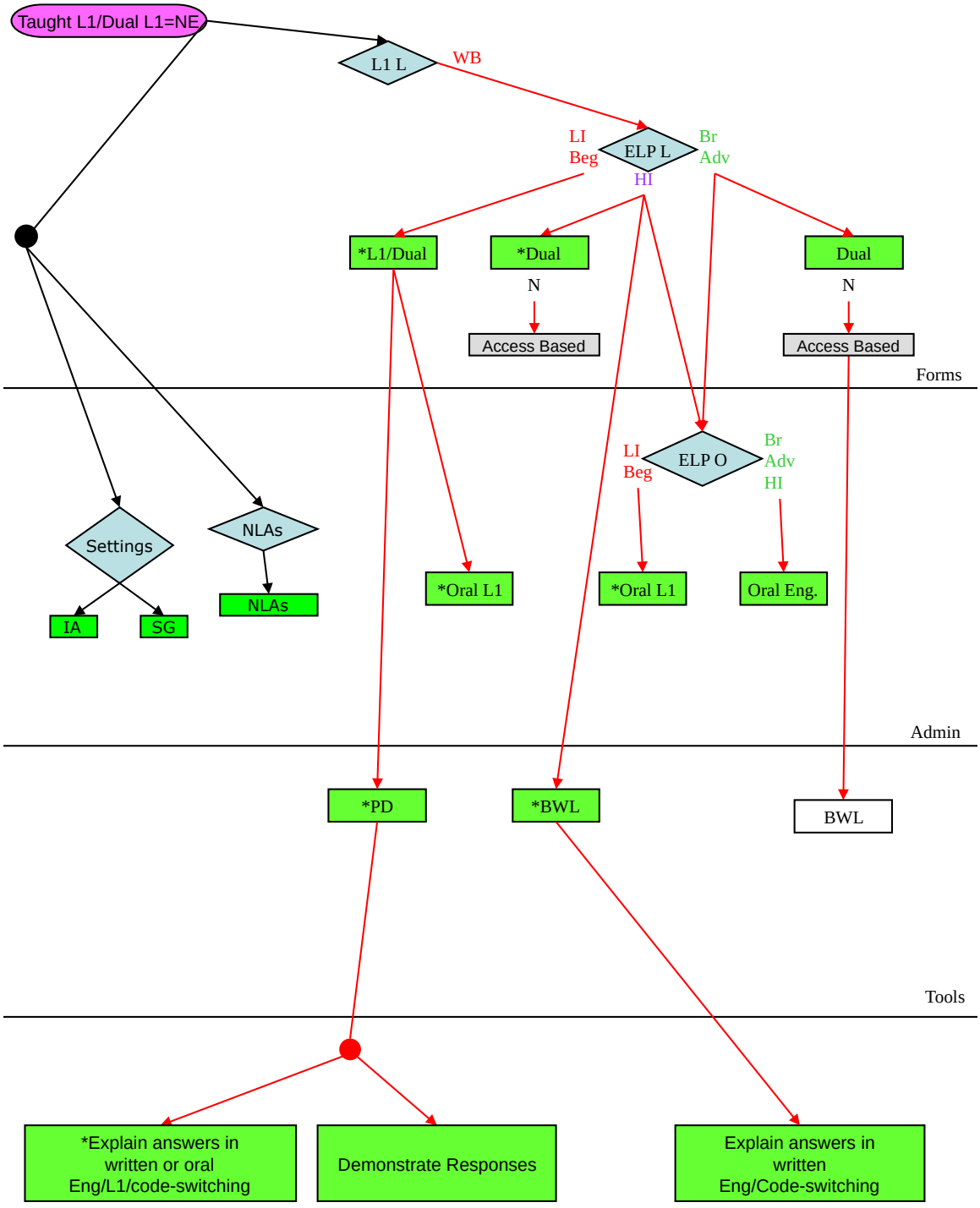
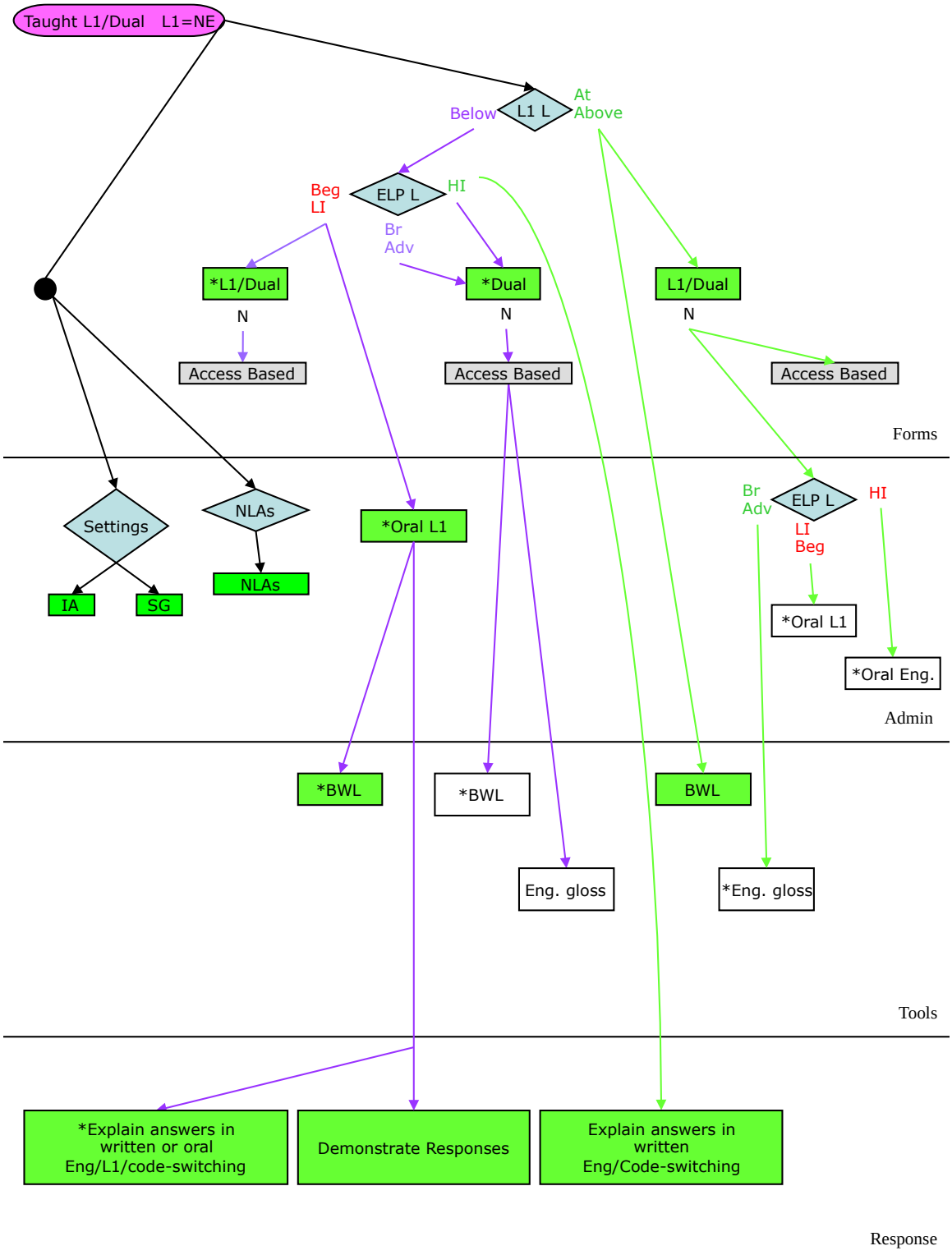


Figure 5. Accommodations for ELLs receiving dual-language or non-English language instruction and whose L1 literacy proficiency is above, at, or below the standard.



Implications and Next Steps

[…]

References

Abedi, J. (2004). The No Child Left Behind Act and English language learners: Assessment and accountability issues. *Educational Researcher*, 33: 4–14.

Abedi, J. (2006). *Accommodations for English language learners that may alter the construct being measured*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA.

Abedi, J., & Ewers, N. (2013). Accommodations for English language learners and students with disabilities: A research-based decision algorithm http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/08/Accomodations-for-under-represented-students.pdf

Abedi, J., Hofstetter, C. H., & Lord, C. (2004). Assessment accommodations for English language learners: Implications for policy-based empirical research. *Review of Educational Research*, 74: 1–28.

Abedi, J., Lord, C., & Hofstetter, C. (1998). Impact of selected background variables on students' NAEP math performance (CSE Tech. Rep. No. 478). Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing.

Abedi, J., Lord, C., Hofstetter, C., & Baker, E. (2000). Impact of accommodation strategies on English language learners' test performance. *Educational Measurement: Issues and Practice*, 19: 16–26.

Acosta, B., Rivera, C., & Shafer Willner, L. (2008). *Best practices in state assessment*

policies for accommodating English language learners: A Delphi study. Arlington, VA: The George Washington University Center for Equity and Excellence in Education. http://files.eric.ed.gov/fulltext/ED539759.pdf

Aguirre-Muñoz, Z. (2000). The impact of language proficiency on complex performance assessments: Examining linguistic accommodation strategies for English language learners (Doctoral dissertation, University of California at Los Angeles). Proquest Dissertations and Theses Full Text (Publication no. AAT 9973171).

Albus, D., Bielinski, J., Thurlow, M., & Liu, K. (2001). The effect of a simplified English language dictionary on a reading test (LEP Projects Report 1). Minneapolis: University of Minnesota, National Center on Educational Outcomes.

Albus, D., Thurlow, M., Liu, K., & Bielinski, J. (2005). Reading test performance of English-language learners using an English dictionary. *Journal of Educational Research*, 98: 245–254.

Anderson, M., Liu, K., Swierzbin, B., Thurlow, M., & Bielinski, J. (2000). Bilingual accommodations for limited English proficient students on statewide reading tests: Phase 2 (Minnesota Rep. No. 31). Minneapolis: University of Minnesota, National Center on Educational Outcomes.

Castellon-Wellington, M. (1999). The impact of preference for accommodations: The performance of English language learners on large-scale academic achievement tests (CSE Tech. Rep. No. 524). Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing.

Cawthon, S. (2009). Multiple constructs and effects of accommodations on

accommodated test scores for students with disabilities. *Practical Assessment, Research & Evaluation,* 14: 1-9.

Cawthon, S. (2010). Assessment accommodations for English language learners: The case of former-LEPs. *Practical Assessment, Research & Evaluation,* 15: 1-9.

Duncan, T. G., del Rìo Parent, L., Chen, W-H., Ferrara, S., Johnson, E., Oppler, S., & Shieh, Y-Y. (2005). Study of a dual-language test booklet in eighth-grade mathematics. *Applied Measurement in Education*, 18: 129–161.

Kieffer, M. J., Lesaux, N. K., Rivera, M., & Francis, D. J. (2009). Accommodations for English language learners taking large-scale assessments: A meta-analysis on effectiveness and validity. *Review of Educational Research,* 79: 1168–1201.

Kiplinger, A., Haug, C. A., & Abedi, J. (2000). A math assessment should test math not reading: One state's approach to the problem. Presented at the 30th Annual National Conference on Large-Scale Assessment, Snowbird, UT.

Kopriva, R. J., Emick, J. E., Hipolito-Delgado, C. P., & Cameron, C. A. (2007a). Do proper accommodations assignments make a difference? Examining the impact of improved decision-making on scores for English language learners. *Educational Measurement: Issues and Practice*, 26: 11-20.

Kopriva, R. J., Koran, J. & Hedgspeth, C. (2007b). Addressing the importance of systematically matching student needs and test accommodations. In C. Cahalan-Laitusis & L. L. Cook (Eds.), *Large-Scale assessment and accommodations: What works?* Arlington, VA: Council for Exceptional Children.

Koran, J. & Kopriva, R. J. (2006). *Teacher and STELLA assignment of test*

accommodations for English language learners: Does it work? Madison, WI: Institute for Innovative Assessment, University of Wisconsin-Madison.

Li, H., & Suen, H. K. (2012a). The effects of test accommodations for English language learners: A Meta-Analysis. *Applied Measurement in Education,* 25: 327-346.

Li, H., & Suen, H. K. (2012b). Are test accommodations for English language learners fair? *Language Assessment Quarterly,* 9: 293-309.

Martiniello, M. (2007). Linguistic complexity and differential item functioning (DIF) for English language learners (ELL) in math word problems. Unpublished PhD dissertation, Harvard University, Cambridge, MA.

Miller, E. R., Okum, I., Sinai, R., & Miller, K. S. (1999, April). A study of the English language readiness of limited English proficient students to participate in New Jersey's statewide assessment system. Paper presented at the Annual meeting of the National Council on Measurement in Education, Montreal, Canada.

Partnership for the Readiness for College and Career (PARCC). (2010). PARCC accessibility features and accommodations manual. http://www.parcconline.org/parcc-accessibility-features-and-accommodations-manual

Pennock-Roman, M. & Rivera, C. (2007). Test validity and mean effects of test accommodations for ELLs and non-ELLs: A meta-analysis. Washington, DC: National Center for the Improvement of Educational Assessment, WestEd, and the Assessment and Accountability Comprehensive Center. http://www.nciea.org/publications/RILS_MRCR07.pdf

Pennock-Roman, M., & Rivera, C. (2011). Mean effects of test accommodations for ELLs and Non-ELLs: A Meta-Analysis of Experimental Studies. *Educational Measurement: Issues and Practice*, 30: 10-28.

Solano-Flores, G. (2006). Language, dialect, and register: Sociolinguistics and the estimation of measurement error in the testing of English language learners. *Teachers College Record*, 108: 2354-2379.

Solano-Flores, G., & Trumbull, E. (2008). In what language should English language learners be tested? In R. Kopriva (Ed.), *Improving testing for English language learners: A comprehensive approach to designing, building, implementing and interpreting better academic assessments*. New York, NY: Routledge.

Wolf, M. K., Kim, J., & Kao, J. (2012). The effects of glossary and read-aloud accommodations on English language learners' performance on a mathematics assessment. *Applied Measurement in Education*, 25: 347-374.