How not to acquire tone: Cross-linguistic influence in prosody

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Abstract

Tone poses persistent problems in the acquisition of Cantonese: even fluent non-native speakers have difficulty in recognizing and producing tones accurately. Among many factors contributing to this difficulty is cross-linguistic influence at the prosodic level. This chapter considers how such influence takes place in both bilingual children and adult second language learners. In children acquiring English and Cantonese simultaneously, cross-linguistic influence arises in the development of prosody: some bilingual children apply prosodic templates from English to Cantonese, treating Cantonese bisyllabic words as trochaic with a high-low pattern overriding the lexical tones (Mok & Lee 2018). The high-low pattern corresponding to stressed and unstressed syllables in English is characteristic of English-dominant children, and is also attested in L2 learners of Cantonese. In a case study (Mak & Matthews 2011), a fluent L2 speaker with English as L1 frequently substituted the high level tone 1 for other target tones, following the English trochaic (strong-weak) template. There was also evidence of falling intonation patterns undergoing transfer, resulting in non-target low and low falling tones. We interpret these non-target patterns as instances of cross-linguistic influence at the prosodic level. A stressed syllable in English overlaps phonetically with a high tone syllable in Cantonese, consistent with the role of structural overlap as a source of cross-linguistic influence.

The challenge of Cantonese tones

Lexical tone is known to pose a major challenge in the acquisition of Cantonese as a second language (L2). Studies since Li & Richards (1995) and Smith (1995) have observed that even fluent L2 speakers continue to confuse Cantonese tones in both comprehension and production. However, few details are known concerning the acquisition of tone by English speakers: for example, are some tones or tone pairs more difficult to distinguish than others? If so, what are the main sources of difficulty? Some specific claims have been made: for example, Whelpton (1998) states that learners have problems distinguishing between the middle and lower tones (presumably between T3 and T6, and/or T4 and T6).

Most recent descriptions of Hong Kong Cantonese recognize six tones (Bauer & Benedict 1997, Matthews & Yip 2011). The three additional 'checked' tones (*rusheng* 入聲) recognized in the Chinese tradition need not be distinguished for the purposes of language teaching, since the 'checked' tones can be thought of as level tones curtailed by the unreleased consonant: for example, *sik1* 識 'know' shares the high level tone of *si1* 詩 'poem' (Yip & Matthews 2017: 7). Adding to the challenge they pose, the six tones are closely packed into the tone space: four tones begin at around the same pitch level (the 25, 23, 22, 21 contours) and are distinguished only by the later portions of the pitch contour (Khouw & Ciocca 2007: 113). Pitch contours for the six tones of Hong Kong Cantonese are shown in in Figure 1.
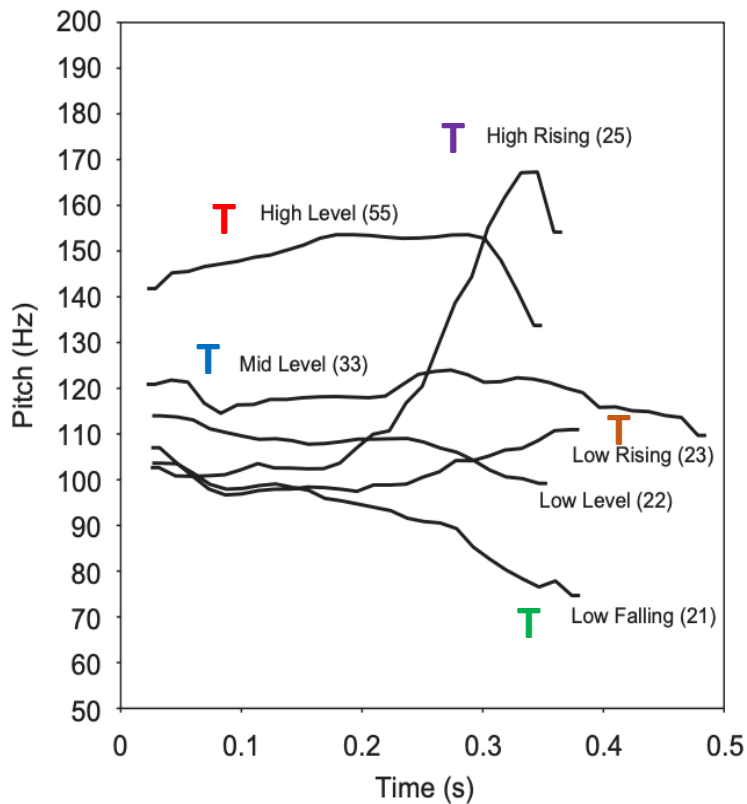
Figure 1 The 6-tone system in Hong Kong Cantonese (based on Francis, Ciocca, Ma and Fenn 2008)

Making the task more complex still is the fact that even many native speakers have difficulty distinguishing the six 'standard' tones. The low rising T5 tone is especially vulnerable to merger with either the high rising T2 or the mid level T3 tone, so that individual speakers may have one of a number of different five-tone systems (Bauer et al 2003; Matthews and Yip, 2011:37). A learner who relies on such a native speaker for input will naturally acquire a five-tone system, or face additional difficulty in acquiring the 6-tone system as presented in classes and textbooks.

This is a very real possibility, given that many of the more successful L2 learners learn their Cantonese primarily from a spouse or significant other (Boyle 1997).

Transfer of first language phonological features

As in other areas of Second Language Acquisition (SLA), transfer from the learner's first language is to be expected at the level of prosody (Lai 2002, 2003). Today, as the study of third language acquisition and multilingualism has progressed, this may be extended to transfer from any other languages of which the learner has knowledge (De Angelis 2007). For example, many learners of Cantonese as a third language (L3) have some knowledge of Mandarin as L2, which may influence their perception and production of Cantonese tones.

For speakers without knowledge of tone languages, it is possible that L1 prosodic features undergo transfer in ways which impact learners' perception and production of tone in Cantonese. Such influence is the focus of this study, taking English as the L1. We address the following questions:

- (how) does cross-linguistic influence affect production of tone in the acquisition of Cantonese?

- (how) does structural overlap apply to prosodic features?

- does cross-linguistic influence occur at a prosodic level where overlap arises?

Cross-linguistic influence in prosody

English and Cantonese have quite different suprasegmental systems: English has primary and secondary stress, together with a range of intonation patterns (Roach 2009), while Cantonese has six lexical tones and makes more limited use of intonation patterns (Chang-Flynn 2003, Fox et al 2008). These contrasting prosodic systems may interact in various ways.

One influential proposal in the field of bilingual development identifies structural overlap as a condition for cross-linguistic influence (Hulk and Müller 2000, Yip & Matthews 2007). That is, one language system will tend to influence another in the areas in which the two languages have overlapping structural properties. In the domain of prosody, such overlap arises between stressed syllables (in English) and high tone (in Cantonese). In English, the main acoustic features of stressed syllables are the following (Roach 2009):

1. high or high falling pitch (F0)

2. greater amplitude

3. longer duration

Of these features, the high pitch on a stressed syllable in English potentially overlaps with the high level tone in Cantonese. In Cantonese, Tone 1 is pronounced with either a 55 or 53 contour (on a conventional scale from 1-5, where 5 is the highest pitch). While the 55 contour is dominant in Hong Kong Cantonese, there is variation so that the particles 先 sin1 and 添 tim1 'too', for example, can be pronounced with a 55 or 53 pitch contour (Matthews & Yip 2011: 408). Interestingly, this variation closely matches the realization of lexical stress in English, where a stressed syllable may be pronounced with high level pitch (as in PICture, where the

short stressed syllable carries a high pitch without a noticeable fall) or with high falling pitch contour (as in PAINTing, where the pitch tends to fall over the course of the stressed syllable). This variation adds to the overlap between stress and tone at the acoustic level.

Whereas the high pitch of an English stressed syllable overlaps acoustically and perceptually with Cantonese tone 1, the other acoustic features (amplitude and duration) do not overlap with Cantonese tone. In the acquisition of English as a second language, there is evidence that Cantonese speakers perceive pitch (F0) as the main cue to English stress. Chan (2008) compared minimal pairs such as INsight (noun) vs. inCITE (verb) by manipulating the three acoustic correlates of stress (pitch, amplitude and duration) in a perception task. It was found that of these three parameters, only pitch was used as a cue by Cantonese native speakers to recognize the stressed syllable. This is evidence that Cantonese speakers perceive stress as high pitch.

Further evidence for correspondence between stress and tone comes from English loan words in Cantonese. Tones are assigned to loanwords following three main patterns (Lai 2004, Lai et al. 2011):

(i) High tone (T1) assigned to stressed syllables, as in the noun *project => po1zek6.*

(ii) Low tone (T6) assigned to pretonic unstressed syllables, as in the verb *present =>* *pi6sen1*, and syllables with epenthetic vowels as in *si6dik1* 士的 'stick'.

(iii) Rising tone (T2) assigned to some final syllables, as in *professor => pou6fet1saa2,* apparently by analogy with changed tones (*bin3 jam1* 變音) which typically occur on the final syllables of nouns (as in *laam4jan4 -> laam4jan2* 男人 'man').

The association between stress and high tone may be expected to apply in both directions: not only can tone affect stress, but stress can affect the realization of tones (Lai, 2004; Lai et al. 2011). For example, in the Min dialect of Fuzhou, the tonal contour is not fully realized in weak syllables (Wright, 1983).

In the case of Cantonese as a second language, we may ask how tone and stress will interact for English-speaking learners. Specifically: do learners superimpose English word stress and/or sentence intonation on Cantonese syllables? If so, what will be the effect on Cantonese tone production? Will superimposed stress result in a high tone, which in turn could be perceived as Cantonese Tone 1 (T1)? Will boundary low tones or falling intonation at the end of phrases result in a low or low falling tone (which might be perceived as T6 or T4) being produced at the end of the Cantonese phrase? In the acquisition of Mandarin as L2, learners have been observed to produce the falling tone 4 in place of other target tones (Chiang 1979, White 1981), though an empirical study by Harrison (2008) failed to support this hypothesis.

Based on these patterns, we can hypothesize that in English speaking learners of Cantonese,

(i) Stressing a syllable will result in a high tone 1

(ii) Destressing a syllable will result in a low tone such as T6 (low level, 22) or T4 (low falling, 21)

Prosodic transfer in Cantonese-English bilingual children

One area where the interaction of tone and prosody can be observed is the development of Cantonese in bilingual children. One of the first studies to have documented such an effect in Cantonese is Lai's (2006) case study of a Cantonese-English bilingual child, Charlotte.

Charlotte's Cantonese is influenced by English, which is considered her dominant language (Yip & Matthews 2007: 79) in various domains, including that of prosody. For example, she often produced the sentence-final particle aa3 啊 with a low falling pitch contour, leading the syllable to be perceived and transcribed as *aa4* 呀:

(1)　　my　saam1 aa4　(Charlotte, 2;8.6)

　　　my　clothes sfp

　　'My clothes'

This utterance sounds like a question ("Are those my clothes?") due to the low-falling pitch contour on the particle *aa4*, but from the context it can be understood to be a statement ("These are my clothes"). In the following dialogue the child's utterance is clearly a declarative statement in response to the adult's question, but again it is perceived as a question due to the falling intonation.

(2)　　ADULT: me1　lei4　gaa3 ?

　　　　　　　what　PRT　SFP

　　　　　　　'What is it?'

　　CHILD:　Kelly　dress aa4 .

　　　　　　　Kelly　dress　SFP

　　　　　　　'Kelly's dress.'

Lai (2006) suggests that Charlotte used *aa4* in this non-target way due to her English-like prosody. She often shows dropping of intonation towards the end of an utterance even when speaking Cantonese. It therefore appears that she applied the intonation pattern for simple declarative sentences in English when producing code-mixed declarative sentences, as in (1) and (2), leading her to produce the particle transcribed as *aa4* 呀 with a low-falling tone.

Further evidence for transfer at the prosodic level is presented in Mok and Lee's (2018) study of tone development in bilingual children. Their study used spontaneous production data produced by five children from the Cantonese-English bilingual children from the YipMatthews corpus in CHILDES archive (Yip & Matthews 2007), including Charlotte and Llywelyn. Among the non-target Cantonese tones produced by Charlotte at age 2, 38% were perceived by native speakers as Tone 1 (Mok & Lee 2018:13). This apparent overuse of Tone 1 was attributed to a 'prosodic template' of the form 'high-low' (Mok & Lee 2018: 12). Charlotte frequently produced *leng1-leng4* for *leng3-leng3* 靚靚 'pretty', where the target mid-level tone is obliterated entirely by the imposition of the 'high-low' prosodic template. Whereas monolingual children pronounce *bo1bo1* 波波 'ball' with two high level tones, the bilingual child Llywelyn produced a pattern *bo1bo4*. Similarly, Llywelyn used *ce1ce4* for *ce1-ce1* 車車 'car' (Llywelyn produced 29 tokens of this term, indicating that the pattern is systematic). The researchers attributed these forms to an English trochaic template [stressed-unstressed] realized as a [high – low falling] tone sequence, as in English disyllabic words such as *baby* and *doggy*.

Apart from overusing T1 specifically in the 'high-low' template, Mok & Lee (2018: 12) suggest that these two children used T1 as a default tone. This is also a possible strategy in adult learners, as discussed below.

Prosodic transfer in adult learners

Mak & Matthews (2011) presented a case study on the acquisition of Cantonese tone. The learner was fluent second-language speaker of Cantonese. 'John', an American who had been living in Hong Kong for over 7 years at the time of study, was married to a native speaker of Cantonese and acquired Cantonese through a combination of short courses, self-study and daily practice with his wife and colleagues. He also acted in minor roles in Cantonese-language TV dramas and practiced Kung Fu as an amateur. This involvement in grass-roots Cantonese culture meant that he was exposed extensively to colloquial Cantonese.

A background questionnaire was developed based on Li and Richards (1995). The questionnaire included questions about the learner's experience in learning and using Cantonese. An interview was conducted in Cantonese based on the learner's answers to items in the questionnaire. Tones of words produced by the learner in the interview were notated as they were perceived by the native speaking interviewer, as in (3):

(3) Interviewer: 你上咗幾多堂啊?

    Nei5 soeng2 zo2 gei2 do1 tong4 aa3?

  'How many lessons did you attend?'

 Learner: 「濕」堂   (target: 十 堂)

   sap1 tong4   (target: sap6 tong4)

  'Ten lessons'

Here the first syllable, with a target low level tone (T6), was produced at a high pitch, so that the syllable was perceived as *sap1* instead of the target *sap6* (the character 濕 *sap1* 'wet' is chosen arbitrarily from the tone 1 morphosyllables with this pronunciation to represent the error).

Despite being a fluent speaker, the learner's overall accuracy rate in tone production was only 50%. The major error patterns seen in the production data are summarized in Table 1.

Table 1 shows the accuracy rate, the rate of Tone 1 substitutions, and other substitutions for each target tone.

Target tone	Produced correctly	Produced incorrectly	% correct	T1 substituted	Other tone substituted
T1	40	57	41%	n/a	59%
T2	46	43	52%	40%	8%
T3	24	23	51%	38%	11%
T4	28	41	40%	33%	27%
T5	9	9	50%	33%	17%
T6	52	29	64%	33%	3%
Total	199	202	50%	n/a	n/a

Table 1. Overall accuracy and rate of substitutions by target tone (from Mak & Matthews 2011)

First, these results reveal that even at the high level of conversational proficiency attained by this learner, production of tones remains a prominent non-target feature. The learner's overall accuracy in tone production is exactly 50%, ranging from 40% for T4 to 64% for T6.

Second, the most common error is substitution of the high level Tone 1. T1 is substituted for all the other target tones 2 to 6, with the frequency of substitution of T1 ranging from 33% to 40%. Examples of substitution of T1 are the initial syllables of the following:

(4)   lik1si2 for lik6si2 歷史 'history'

(5)   zi1mok6 for zi6mok6 字幕 'sub-title'

The speaker frequently substituted T1 for all six target tones. In most cases, these substitutions are unidirectional: T1 was substituted for T2 in 40% of instances, but T2 was never substituted for T1. In the case of T1 and T3, however, the substitution seemed to occur in both directions. How might these patterns be explained?

One possible explanation is that T1 is a default tone, used when the speaker is unsure of the target tone or has no knowledge to apply. However, this would not explain the low accuracy rate of 41% for T1 as target (Table 1), or the frequent substitution of T3 for T1. It is also unclear what would motivate such a default: across languages, default tones are typically mid or low, rather than high (Odden, 1995:451, 465).

Our first hypothesis predicts that transfer of English stress will result in non-target high tones being produced. This potentially accounts for the substitutions of T1, if the syllables concerned can be considered stressed. There are at least two ways in which the target syllable in Cantonese could correspond to a stressed syllable in English:

(a) Lexical stress may be superimposed on non-high-tone syllables

(b) Phrasal stress may be superimposed on non-high-tone syllables

We next consider these possibilities separately.

Lexical stress superimposed on non-high tone initial syllables

The following cases from the recording show a non-target high tone on the initial syllable of the word, corresponding to a stressed initial syllable in English:

Target:　　　　Produced:

(6)　　歷史 lik6si2　　**lik1**si2 '**his**tory'

(7)　　練習 lin6zaap6　　　**lin1**zaap6 '**prac**tice'

(8)　　字幕 zi6mok6　　　**zi1**mok6 '**sub**-title'

At least two interpretations of this pattern are possible:

(a) The learner adopts a defaults stress pattern in which the first syllable is stressed. This would be parallel to the prosodic templates attributed to bilingual children by Mok & Lee (2018) as discussed in section 3 above.

(b) The learner equates the target Cantonese word with its English counterpart and gives it a similar prosody: for example, 歷史 *lik1si2* is pronounced with the prosody of HIStory, giving **lik1**si2.

Our data do not currently distinguish between the (a) and (b) options, but both accounts are consistent with hypothesis 1 (transfer of English stress results in a perceived T1). It is entirely

possible that both (a) and (b) influence tone production. That is, a trochaic (strong-weak) template is adopted by default for disyllabic words, and reinforced in specific cases by the prosody of the corresponding English word. Some evidence for a lexical effect (option b) comes from words where a non-target T1 is pronounced on the second syllable:

(9)   ming4**baak1** for ming4baak6 'underSTAND'

(10)   hoeng1**gong1** for hoeng1**gong2** 'Hong KONG'

These words have stress on the final syllable in English. It is possible that the learner transfers the prosody of the English word to its Cantonese translation equivalent, resulting in a high tone in final position in these particular words. This hypothesis would need to be tested using a larger speech sample.

Phrasal stress superimposed on non-high tone syllables

A second way in which superimposed stress could result in non-target T1 is through phrasal stress. In the cases discussed in 4.1, stress is apparently applied to the first syllable of a Cantonese word, corresponding to the initial stress of the English counterpart. In the following sentence, there is another possible explanation for the non-target T1, namely, that the speaker is stressing the number of years that certain expatriates have spent in Hong Kong without learning to speak Cantonese:

(11)   二十幾年啦, 佢哋都好驚講嘢

        Ji6sap6 gei2 nin4 laa3, keoi5dei6 dou1 hou2 geng1 gong2 je5   (target)

         '(even after) **20-**<u>odd years</u>, they're still afraid of speaking.'

(12)   **Ji1**sap6 gei2 nin4 laa3, keoi5dei6 dou1 hou2 geng1 gong2 je5   (produced)

'(even after) **20-**odd years, they're still afraid of speaking.'

Since this example also involves a stressed initial syllable as in TWENty, it is also compatible with the accounts based on lexical stress outlined in 4.1.

Similarly, in the following example, 好多 *hou2 do1* is pronounced *hou1 do1*: with a non-target high tone:

(13)   有**好**多 course

Jau5 hou2 do1 course (target)

'there are **many** courses'

(14)   Jau5 **hou1** do1 course   (produced)

'there are **many** courses'

Here the high tone may result from stressing of *hou1* corresponding to the emphatic stress on *many.*

Low tones superimposed on non-low tone syllables in phrase-final position

Substitution of low tones (T4 and T6) at the end of the phrase was commonly seen in the data, for example:

(15)   十八個**鐘**

sap6baat3 go3 zung1   (target)

(16)   十八個「仲」

sap6baat3 go3 **zung6**   (produced)

'18 hours.'

In this case, the target tone one was pronounced at a low pitch at the end of the phrase, leading the word to be perceived as an erroneous tone 6. This substitution can be analyzed as the result of applying a 'boundary' low tone to the final syllable of the phrase.

(17) 最難聽係啲音

Zeoi3 laan4 teng1 hai6 di1 jam1   (target)

(18)   最難聽係啲「任」

Zeoi3 laan4 teng1 hai6 di1 jam6. (produced)

'The hardest (thing) to perceive is the tone.'

Ironically, in making his point about the difficulty of tones the learner demonstrates this very difficulty, pronouncing 音 *jam1* 'tone' as「任」*jam6*.

Similarly, there are cases of the low-falling tone (T4) being substituted for another target tone at the end of a phrase. The target syllable 我 *ngo5* 'I' was produced correctly with a rising tone at the beginning of the sentence, but with a falling tone at the end of the sentence, resulting in the interpretation 'I am a goose':

(19)   我係**我**

ngo5 hai6 ngo5   (target)

 'I am me (that's the way I am)'

(20)   我係「**鵝**」

o5 hai6 **ngo4**. (produced)

'I am a goose'

Similarly, at the end of a sentence the learner produced the T1 syllable *ngaam1* 'correct' with a sentence-final low falling intonation contour, sounding like 癌 *ngaam4* **'cancer':**

(21)   **講得唔啱**

gong2 dak1 m4 ngaam1

'said it wrongly'

(22)   **講得唔 「 癌」**

gong2 dak1 m4 **ngaam4**

'said it no cancer'

This pattern appears to result from a falling intonation superimposed on phrase-final syllables. The English intonation pattern is described as a fall indicating finality (Roach 2009: 147). This would be exactly parallel to the overuse of tone 4 by the bilingual child Charlotte as discussed in section 3 above. This finding is also parallel to the observation that English-speaking L2 learners

of Mandarin overuse the high falling tone 4 in final position (Chiang 1979), based on the overlap between the phrase-final fall in English and the high falling T4 in Mandarin.

Failure to realize high tones

We may recall that in addition to overusing tone 1, the learner also fails to produce it in certain contexts, frequently substituting tone 3 (see Table 1). This pattern suggests that the learner has identified the tonal contour correctly, but has failed to produce it with sufficiently high pitch for it to be perceived as T1.

One factor may be that function words are treated as unstressed syllables, preventing realization of high tones. For example, the connective 因為 *jan1 wai6* calls for a high level tone on the first syllable, but the learner sometimes pronounced it with a lower tone which is perceived as T3:

(23) 因為

   jan1 wai6   (target)

   'because'

(24) 「印」為

   jan3 wai6   (produced)

   'because'

Another problematic function word is 好似 *hou2ci5* which begins with the high rising tone. The L2 learner sometimes produced this word with a lower tone, which was perceived as T6:

(25)　好似睇嗰啲電視劇

　　　Hou2ci5 tai2 go2 di1 din6si6kek6　(target)

　　　'like watching those soap operas'

(26)　「號次」睇嗰啲電視劇

　　　Hou6ci3 tai2 go2 di1 din6si6kek6　(produced)

　　　'like watching those soap operas'

Because the target words here correspond to unstressed function words (*because* and *like,* functioning as conjunctions) in English, the learner may treat them as unstressed, preventing the realization of the target high tone of 因 *jan1* in 因為 *jan1 wai6* and the high rising tone of 好 *hou2* in 好似 *hou2ci5*.

Conclusions

This chapter has argued that apart from the intrinsic complexity of the Cantonese tone system, a major reason for non-target tone production is prosodic transfer from other languages, in this case English. Transfer takes place at points of overlap, in this case overlap between the high pitch of stressed syllables in English and the high-level tone 1 in Cantonese.

We have reviewed evidence for this point from case studies in bilingual child language acquisition as well as adult second language acquisition. Specifically, non-target high tones (T1) are produced corresponding to stressed syllables, resulting from either lexical or phrasal stress. Non-target low tones (perceived as T4 or T6) can result from two forms of prosodic transfer: they may result from superimposition of phrase-final intonation, or the target syllables may correspond to unstressed syllables, as in the case of function words.

The findings present here are from case studies of individual bilingual children and a fluent L2 speaker; whether these findings are representative of the acquisition of Cantonese will have to await further research. In second language learners, as in bilingual children, considerable individual variation is to be expected. Nevertheless, in the author's experience of using and observing Cantonese as a second language, the patterns described here, in particular the overuse of Tone 1, are found rather consistently. Research on a larger scale is required to establish these patterns and account for them more precisely.

Another question for further research involves how tone might be taught in such a way that these errors can be avoided or corrected before they can become fossilized. For example, it may be useful to raise students' awareness of common error patterns such as those identified in this study.

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