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Dynamic assessment of L2 learners' reading comprehension processes: A Vygotskian perspective

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Abstract

The focus of this study is to explore the feasibility of computerized dynamic assessment (C-DA) in the context of reading comprehension and, more precisely, the effects of electronically delivering textual and visual scaffolding on L2 readers' comprehension processes. The assessment procedure included a short reading text along with its manipulated version and visual prompts which were gradually offered upon the students' failure to provide the correct answer. The results demonstrated that C-DA could discriminate among low-achieving students with reference to their responsiveness to electronic mediation and diagnose quite vividly their underlying abilities in terms of both independent (ZAD) and assisted (ZPD) cognitive functioning.

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Keywords: Computerized dynamic assessment (C-DA); interventionist; cake format; reading; Vygotsky

1. Introduction

In second/foreign language programs, there has been a long tradition of standardized testing as the most dominant and user-friendly procedure to assess the students' language proficiency levels for such diverse goals as diagnostic, placement and selection. The wide popularity of standardized testing in the past related to its excessive interest in living up to its psychometric promises of validity, reliability and generalizability in its assessment procedures which were unfortunately kept even at the expense of disparaging testee's specific needs and underlying potentials. Dynamic assessment (DA) representing an assessment procedure originally developed in cognitive psychology has put forward concepts of mediation and interaction as indispensable components of assessment task and as valid procedures to probe more deeply into the learners' abilities.

DA experts have recently thought of replacing the labour-intensive human mediation during dynamic assessment with a more user-friendly electronically delivering mediation (Poehner, 2008) so as to include larger number of learners within one single DA session with the potential to provide automatically generated reports and profiles for each testee. Unfortunately, related C-DA studies undertaken so far are very rare and more particularly in reading context, almost no research has been reported in the literature (Kozulin & Garb, 2002; Poehner, 2008).

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The main focus of this study is to test the feasibility of a computerized format of dynamic assessment in L2 context. More particularly, we make an attempt to assess the discriminant validity of a computerized dynamic assessment for the assessment of reading comprehension through a systematic procedure with hopes to bring to surface the potential effects of textual and visual scaffolding on L2 learners' reading comprehension processes.

1.1. Theoretical origins of dynamic assessment

The term dynamic assessment originated in Vygotsky’s colleague Luria (1961) who coined it in his English writings on Vygotsky’s Socio-cultural Theory (SCT) of mind. Vygotsky argued that human’s abilities are in a constant state of flux and quite sensitive to two primary sources of mediation i.e., symbolic and physical tools that can feed the learning mechanisms. Dynamic assessment (DA) represents a procedure to tap such changing traits and abilities. For Vygotsky, learning was conceived as progression between two points i.e., the point of independent functioning and the point of dependent functioning. He christened this symbolic space the Zone of Proximal Development, a notion he offered as an alternative to the traditional IQ testing which became globally notorious for its presentation of merely a static measure of fully matured abilities. The idea of zone of proximal development came to Vygotsky when he understood that two children with the same IQ scores and chronologically at the same age benefited differently from the training sessions such that one could remarkably outperform the other. He concluded that although the two children had the same developmental age they were not mentally the same age. This difference between chronological age and mental age is what he technically named the zone of proximal development and defined it as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable others" (Vygotsky, 1978, p. 85, emphasis in the original). ZPD is conceived as a multistage progression and continuum rather than a single point in time.

Others have referred to these two points as 'independent performance' and 'assisted performance' respectively (Goos, 2005). The following figure depicts these two points clearly:

![Figure 1. ZPD representing a continuum (Bodrova & Leong, 1995)](image)

The bottom line here is that "what the child is able to do with some collaboration or assistance today he will be able to do independently tomorrow" (Vygotsky, 1934, p. 211). After moving from his present ability to his next (potential) ability with some assistance, the child will define a new potential ability by drawing on his genetic capacity and changes his previous potential ability as the springboard to reach a new potential ability. This cycle is repeated over and over again when the child learns different kinds of tasks, skills and behaviour. Thus, child's ability to perform more difficult tasks is gained as a result of several 'internalization' processes (Vygotsky, 1934) at different times progressively as is shown in figure 2 overleaf:
Figure 2. ZPD in progress (Bodrova and Leong, 1995)

Vygotsky (1994) criticized IQ test for its being confined to the estimation of individuals’ zone of actual development (ZAD) that approaches abilities ‘retrospectively’ and its shortcoming to uncover testees’ latent abilities or ZPD that defines abilities ‘prospectively’.

1.2. Procedures to operationalize dynamic assessment

A brief surfing on dynamic assessment literature can provide us with different models and approaches. Lantolf and Poehner (2004) identify interventionist and interactionist models to represent two general orientations of DA. Whereas interventionist DA is concerned with quantifying the amount of support required for a learner to reach a prespecified endpoint, Interactionist DA focuses on an individual learner or a group of learners without concern for predetermined endpoints (Poehner, 2008).

Researchers like Sternberg and Grigorenko (2002) classify the interventionist approaches to DA as being either in sandwich or cake format. The sandwich format reflects the traditional experimental research designs comprised of a pre-test and a post-test with a mediation phase which is 'sandwiched' between them and administered in a non-dynamic manner. Quite contrarily, the cake format embeds intervention (instruction) in the test administration itself and learners receive assessor's mediation for each test item or task that they find difficult. In this context, according to Sternberg and Grigorenko, mediation is usually very tightly scripted and often arranged as a menu of hints, prompts and cues that must be followed in a pre-determined sequence, from most implicit to most explicit.
Computerized dynamic assessment or C-DA as a recent development in DA research has tried to remedy many of the obsessions inflicting the interactionist format of dynamic assessment since any mediation during tester’s interaction with the testee has always been a source of unreliability. Moreover, C-DA is claimed to represent a compromise between clinical (interactionist) and psychometric (NDA) norms by sensitizing mediation to the learners’ needs while at the same time not sacrificing the test’s statistical properties (e.g. reliability) through its standardized forms of mediation (Poehner, 2008). A C-DA approach based on interventionist procedure holds the potential to be used for a large number of individuals with the capacity to generate a comprehensive profile including the test-taker’s current developmental status as well as his/her microgenetic developments and cognitive modifiability in the course of assessment.

**Research Question**

Quite precisely, the present study is going to explore the following main research question:

Q: What are the effects of computerized dynamic assessment on L2ers’ reading comprehension processes?

2. **Method**

2.1. **Study design**

Although researchers have elaborated on a number of models and approaches to DA (Brown & Ferrara, 1985; Carlson & Wiedle, 1992; Guthke, 1993; Poehner, 2005; Feuerstein, 1979), this study followed Aljaafreh and Lantolf (1994) and Brown’s Graduated Prompt Approach in providing mediatory feedbacks/prompts and an adapted version of Guthke and Beckmann’s (2000) recently developed computerized model of dynamic assessment with an interventionist cake format to measure the students' reading comprehension ability.

2.2. **Participants**

This project involved 100 undergraduate students of English major recruited from Allameh Mohades Non-profit College and Azad University of Chalus. The learners were at intermediate level which only reflected the number of semesters they have spent studying English at the college.

2.3. **Materials and instrument**

A reading text along with its manipulated version transformed by highlighting and visuals was used as the materials to assess the reading comprehension ability of the students. The researcher made use of computer to measure the students' reading comprehension ability. The software was programmed to present the mediatory
prompts starting from the textual towards the visual types as it was assumed that pictures normally provide more information than the text.

2.4. Procedure

The administration of our C-DA proceeded as follows. Once the students failed to provide correct responses to the questions, the software automatically offered pre-fabricated mediatory prompts. The software was programmed to present the mediatory prompts starting from the textual towards the visual types as it was assumed that pictures normally provide more information than the text. The different steps to provide textual and then visual cues altogether five stages formed a regulatory scale which is schematically displayed in table 1 below:

Table 1. Regulatory scale (implicit to explicit)

<table>
<thead>
<tr>
<th>Level</th>
<th>Prompts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implicit</td>
<td>1. Read the text again</td>
</tr>
<tr>
<td></td>
<td>2. Look at the first picture and read the text again</td>
</tr>
<tr>
<td></td>
<td>3. Look at the second picture and read the text again</td>
</tr>
<tr>
<td>Explicit</td>
<td>4. Look at the third picture and read the text again</td>
</tr>
</tbody>
</table>

The ZPD scores were calculated by counting the number of hints or prompts offered to help the students arrive at the answer. The assumption was that the more the student asked for prompts, the lower his/her ZPD score would be. For each prompt the computer offered 10% was subtracted from the maximum score. The scores gradually decreased with the presentation of more explicit prompts. Here is a snap shot of our C-DA procedure:

Figure 4. Schematic representation of C-DA M. T., manipulated text; V, visuals (pictures)
3. Results

The profiles collected through the computer provided information about each learner comprising a ZAD score and a ZPD score. The profiles also contained information about the number of mediation moves (prompts) offered to each learner. The following graph sum up the results of our computerized assessment procedures:

![Graph showing results of computerized DA and NDA](image)

Figure 5. Results of computerized DA and NDA

As can be understood from the foregoing graph, the two assessment procedures, DA and NDA, classified the students in strikingly different ways. Based on NDA results, only 21 out of 100 students could pass the test and the remaining 79 students did not understand the text at all. Quite interestingly, the results from the DA procedure proved the opposite; that is, 90 students answered the comprehension question correctly and only 12 students failed it. This minimal number of failed students (n = 12) based on DA results proves that they found the text far beyond their ZPDs because even scaffolding including textual and visual were of no service to them to promote their comprehension processes. The following table is more picturesque of the students’ performances in the course of dynamic assessment:

<table>
<thead>
<tr>
<th>Level</th>
<th>Prompts</th>
<th>scores %</th>
<th>task features</th>
<th>n = 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0</td>
<td>50</td>
<td>Text</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>40</td>
<td>Man. Text</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>30</td>
<td>Man. Text + V1</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>20</td>
<td>Man. Text + V2</td>
<td>12</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>10</td>
<td>Man. Text + V3</td>
<td>15</td>
</tr>
<tr>
<td>0</td>
<td>--</td>
<td>0</td>
<td>--</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 2. Results of computerized DA

Man. Text, text manipulated through highlighting; V, visuals (pictures)

This table encapsulates multiple information, including: a) classification of students based on their ZPD levels at 6 levels; b) number of prompts offered to each learner; c) scores assigned; d) task features presented at each level; and e) the number of students who finally did or did not tackle over the reading comprehension task. The specific finding from our computerized dynamic assessment was that out of 79 students who were given a score of zero based on NDA 67 (84%) students could successfully tackle over the task during DA procedure when scaffolding
was provided. This indicates that the students who failed on their first trial had different potentials or ZPDs which had remained inchoate in the course of NDA procedure. The examination of such ‘floor effects’ among low-achieving students surfaced only through dynamic assessment. Such precise identification of floor effects among students with the same ZAD score was the result of tracing students’ responsiveness to the mediatory prompts that were offered gradually from the most implicit to the most explicit.

4. Discussion and conclusion

The prime concern of this study was to test the feasibility of computerized version of dynamic assessment (C-DA) in the context of L2 reading comprehension. The results showed that electronically delivered mediatory scaffolding can enhance the students’ reading comprehension processes and computer can replace humans in raising readers’ consciousness by directing their attention to the key sections of the text and assisting them to understand the text better. One striking finding about the effect of C-DA was examination of the so-called ‘floor effects’ among low-achieving students who were falsely identified as non-gainers according to NDA results. Almost 84 percent of students who were classified as non-gainers by NDA procedure were found to have had different reading potentials or ZPDs. Differential performances among low-achieving students surfaced owing to the C-DA procedure which offered finely-grained contingent feedbacks and then traced learners’ responsiveness to the textual and visual scaffoldings. Such differences among non-gainers had remained inchoate during NDA testing. Therefore, quite evocative of Vygotsky’s epistemological perspective on the concept of assessment our study has operationalized an assessment procedure that tapped both learners’ level of independent performance (ZAD) and level of assisted performance (ZPD). Such a finding is the outcome of incorporating mediation into the assessment procedure, an epistemology grounded in Vygotsky’s socio-cultural understanding of mind and human’s cognitive functioning. Mediation in the course of assessment enhances the validity of the results and judgments. According to DA scholars, any assessment is valid when it is useful and beneficial to learners. They believe that the future is always emergent and can only be understood in an interaction between mediator and learner and validity of a DA procedure is best understood as the extent to which it promotes development through collaboration. In DA context, it’s the issues of measuring change, the issue of treatment validity (Messick, 1995) that becomes the ideal and due to its strong dyadic function mediation is essential in the course of assessment.

However, as a step towards making a compromise between NDA and DA norms, our C-DA procedure tried to control tester-testee interaction effect to some extent by offering a scripted menu of prompts in a consistent, standardized and computerized procedure which didn’t vary from one testee to another but at the same time it put into effect the interactionist DA value of mediation throughout assessment.

The results from our C-DA procedure proved helpful for our later decision-making processes like placement and selection as they provided valuable diagnostic information about learners’ abilities in terms of both independent and assisted performance functioning. The precise differentiation among the students helped smooth the process of planning the proportionate remedial tutorials for different individual learners.

Besides our specific findings, there still remained a few points which beg for further exploration. One issue concerns any relation between the time students spent on the test and the level of their ZPD since it is argued that learners with larger ZPDs need less processing time to perform language tasks. Another issue concerns the question of whether students’ computer literacy had any impact on the quality of their performances. I hope that next explorations will not be too long in the coming forward.

References


**Appendix A**

Read the following text and answer the question:

On Monday, I was driving along a main road toward a junction with a minor road on my left. Another car was travelling along the main road coming from the opposite direction, and a motorcycle was approaching the intersection along the minor road. I realized that the motorcycle was not going to stop. He turned left onto the main road directly in front of the other car. The car swerved to avoid the motorcycle and skidded off the road into a wall at the corner of the intersection. I braked, but it was too late. My car hit the motorcycle and the rider fell off. Fortunately, the motorcycle rider was not seriously injured, but his motorcycle and my car were both badly damaged (Heaton & Dunmore, 1994).

Q: Choose only one option that fully summarizes the story?

A) First car hit the second car
B) First car hit the motorcycle
C) First car hit the second car and also the motorcycle
D) Second car hit the motorcycle
E) There was no accident
F) First car hit a wall at the corner of the intersection
G) Second car hit a wall at the corner of the intersection
H) The motorcycle hit a wall at the corner of the intersection
I) First car hit the motorcycle and second car hit a wall
J) Second car hit the motorcycle and first car hit a wall