Towards the Development of An Assessment of Employability Skills

September 30, 2014
Acknowledgements

This report was prepared by Lee E. Nordstrum of RTI International. The preparing author is grateful for and wishes to acknowledge the guidance and support of the following individuals while engaging in the activities outlined in this report: Luis Crouch, Seamus Hegarty, Scott Kipp, Amy Mulcahy-Dunn, Jana Scislowicz, Carmen Strigel, and Ami Thakkar.
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1 Introduction

1.1 Background

As access to schooling nears universality even in the poorest countries, attention is turning to the issue of whether children learn enough to become full citizens and productive workers. The next set of Millennium Development Goals is likely to include not only measure of access, but also of learning achievement. In early anticipation of those trends, leveraging a range of funding sources including significant resources from USAID, RTI had developed the Early Grade Reading Assessment (EGRA) and then its math equivalent, EGMA. That the international community needed this is signaled by the fact that EGRA or some equivalent has now been used in more than 50 countries and 100 languages and, just as importantly, has garnered technical attention for RTI. A relevant “extension” of EGRA was the development of Tangerine®, open source data collection and learning assessment software, made possible by RTI internal research and development funding, which can be used to gather EGRA-type information electronically, increasing the speed and accuracy of data compilation, and is now being used by over 20 organizations in 30 countries.

However, EGRA and EGMA are not enough. RTI has detected a growing need and demand for rapid assessment instruments (similar to EGRA/EGMA) that can assess students’ learning at higher grade levels. For example, RTI has observed EGRA/EGMA instruments being used to assess much higher grades than was intended. This is problematic not just because of the possibility of ceiling effects, but because assessment, in principle, ought to bear some relationship to the curricular demands of countries. In addition, as the world faces higher and higher unemployment rates among its youth, there is increasing interest in evaluating whether schools are adequately preparing their youth to enter the workforce. Do early school leavers (those leaving by Grade 9) possess the “foundational” and “employability” skills needed to effectively enter the workforce? Assessment instruments for literacy and mathematics appropriate to the end of the primary cycle do exist. However these tend to be in depth, large scale, regional or national assessments and not the rapid assessments that EGRA/EGMA are. In addition, these tools only measure some foundational skills, such as reading and math.

Previous investigation on employability skills identified three “clusters” of commonly cited skills in the international literature: cognitive, interpersonal, and intrapersonal skills.¹ These three clusters align favorably with the three domains specified by the Committee on Deeper Learning and 21st Century Skills, convened by the US-based National Research Council, as well as other prominent models.²

of the employability skills found by the authors could be classified under these three headings, as seen in Table 1, below. The authors concluded that a subset of these skills could be assessed, in combination with foundational skills such as literacy and mathematics, in order to ascertain whether or not youth of secondary school age (i.e. around 15–18 years of age) are finishing their tenure in formal schooling with at least a modicum of “work readiness” skills.

Table 1. Commonly cited employability skills

<table>
<thead>
<tr>
<th>Cognitive skills</th>
<th>Interpersonal skills</th>
<th>Intrapersonal skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical thinking</td>
<td>Teamwork</td>
<td>Enthusiasm</td>
</tr>
<tr>
<td>Problem-solving</td>
<td>Communication</td>
<td>Ethics</td>
</tr>
<tr>
<td>Decision-making</td>
<td>Leadership</td>
<td>Motivation</td>
</tr>
<tr>
<td>Creativity</td>
<td>Collaboration / cooperation$^3$</td>
<td>Self-esteem</td>
</tr>
<tr>
<td>Analytical skills</td>
<td>Respect for cultural diversity</td>
<td>Professionalism</td>
</tr>
<tr>
<td>Initiative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Pressley and Nimbalkar, 2013: 20

1.1.1 The need

Tools are needed that accomplish two more objectives: a) measure later and higher levels of cognitive skills; and b) measure so-called “soft” skills, such as persistence, punctuality, ability to engage in teamwork, and goal-orientation. The fact that there are serious technical challenges, and the call for scientists to work on these challenges and solve them, has been noted in one of the premier commissions working on this issue, the Brookings/UNESCO Learning Metrics Task Force, as well as Goal 2 of USAID’s Education Strategy.

1.1.2 The Proposed Solution

The proposed characteristics of such an assessment tool are provided below:

1. It is likely to be geared to students around 15 years of age.
2. The assessment will be rapid and similar to EGRA/EGMA in the following ways:
   a. The assessment will be brief;
   b. The assessment will not be designed as a diagnostic of an individual student;


Pressley and Nimbalkar group collaboration and cooperation together into one skill and therefore they are grouped together in this table. However, collaboration and cooperation are in reality different skills and should be differentiated. See, for example: The Conference Board. (2006). *Are they really ready to work? Employers’ perspectives on the basic knowledge and applied skills of new entrants to the 21st century US workforce*. The Conference Board, Inc.
3. A selection of key foundational and employability skills will be assessed.
4. The assessment is likely to be designed as a combination of serious games and simulations facilitated by mobile technologies, collaborative activities, pencil and paper tests, and questionnaires.

### 1.2 Rationale for an assessment of employability

This innovative work will raise awareness regarding workforce preparedness among youth and the limitations that current education systems face in preparing these individuals. As with EGRA/EGMA, we hope that this heightened awareness will result in new policies that will address these limitations and result in greater quality of learning.

### 1.3 The objectives of the present study

Research undertaken previously has stopped short of critically defining and evaluating the most commonly cited employability skills that comprise their categories of cognitive, interpersonal, and intrapersonal skills, as this was not the objective of the study. As such, a critical next step was, firstly, to define the skills identified by the authors to be important for work readiness and, secondly, to critically evaluate the importance of the skills via a rigorous comparative approach. To this end, the present study represents an attempt to accomplish these steps by building upon earlier work. It supports the development of a secondary assessment through the following objectives:

- Delineating a draft prioritized employability framework;
- Defining the skills that comprise a draft employability framework;
- Developing drafts of a framework and protocol for the assessment;
- Identifying the likely target population for such an assessment and describing further the characteristics (including foundational skills) of this population.

It is also important to note limitations to an assessment of employability. First, an assessment is not meant to be comprehensive (i.e. measuring all aspects of employability). Second, an emphasis is placed on innovative measurement. While other assessments of employability skills have relied on paper assessments or questionnaires, the assessment under development will also include “serious games” and team-based activities. Third, the theory of change underlying the assessment includes teaching these skills in some manner. While imparting these skills is not the current focus of this study, it does inform the skills that were selected as part of a draft employability framework. These self-imposed strictures should be carried in mind throughout the reading of this report.
2 Activities undertaken during this initiative

To address the aforementioned objectives, the research undertaken largely followed two lines of work: the development and specification of an employability skills framework, and development of a prototype game-based simulation to assess select sub-skills of the framework, the convening of a panel of external and internal (to RTI) experts, and a desk review of target population characteristics. The methods employed for each of these activities are briefly summarized below.

2.1 Development of an employability skills framework

To derive a framework for employability skills that builds upon the clustering of employability skills shown in Table 1, the research undertaken for this study sought to define and differentiate skills commonly cited as important for workforce readiness. The multitude and diversity of frameworks for work readiness or employability, while helping to raise awareness to essential skills beyond literacy and numeracy required in the world of work, have also begotten at least three substantive problems. First, individual entries of skills are often at differing levels of granularity in many frameworks. For example, two commonly cited employability skills include oral communication and teamwork. While it is true that oral communication can be broken down into more atomistic elements, teamwork is more rightly seen as a cluster of skills which, in fact, includes oral communication. As one of these “skills” is truly nested within the other, the two cannot be at the same level of granularity, which is likely to cause a problem for the purposes of definition and measurement. Second, the definitions of skills are not widely agreed upon; rather, they are contested. Returning to the teamwork example, only recently have scholars and researchers sought to delineate a consensus around the elements (or underlying skills) that constitute teamwork, despite a long history of conceptual study that has not yet been definitively merged together.4 Third, little empirical work has been done to link these constructs of skills to job performance or other life outcomes. For example, while numerous studies cite employer surveys and the skills mentioned therein as important to hiring managers, very few (if any) research studies have been done that rigorously quantifies the qualities that prompt managers and employers to either hire or promote workers through other means besides self-report.5

These three complications render it difficult to make quick and accurate generalizations of the skills that are commonly included in employability frameworks. As the skills differ in level of granularity (the first complication), it is difficult to judge whether all items on a given framework are indeed skills, or if they

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are more rightly conceived as clusters of more elemental skills. Since definitions of these skills are often contested (the second complication), simply counting the frequency with which skills are cited across frameworks can bias assessments of importance; teamwork may signify one set of skills in framework A and another set of skills in framework B.

In response to these complications, the current study attempted to identify or, in some cases, deconstruct the meaning of various skills cited in Table 1 and in other prominent frameworks in order to arrive at a set of skills that were reasonably distinct and well-specified. Subsequently, the list of skills was prioritized based on three inclusion criteria, which are discussed in a subsequent section (see “Inclusion criteria for skills”).

2.2 Development of a simulation to measure employability skills

Complementary to the development of a framework for employability skills, the technical team worked with a game developer to create a simulated game, leveraging a serious game methodology that could be used to assess and impart employability skills. The aim of this work was a scalable electronic game-based tool with an initial focus on assessment. In this vein, work was conducted in collaboration with an educational game developer specialized in multimedia and multiplayer entrepreneurship games to design a gaming platform that would be amenable to capturing and providing data about several employability skills in the framework. Several iterations of development, testing, and feedback were undertaken, as well as field testing the original game prototype with a number of internal staff members.

This game development is important as this initiative attempts to focus on innovation in measurement. Both the importance and presence of employability skills are often measured via self-report questionnaires, employer surveys, or third-party questionnaires. However, a review of literature germane to work readiness skills suggests that skills necessary for the workplace are best assessed in a context not unlike that of a workplace. In other words, an assessment should be authentic: it should approximate (to the extent possible) activities undertaken and interactions commonly found in the workplace; other forms of assessment represent more of an abstraction of actual job or task performance. As such, a decision was made to focus on the designing of simulated tasks and activities for the target population to participate in within a controlled assessment environment.

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2.3 **Expert panel meeting**

A panel of 10 experts, both external and internal to RTI, was convened from September 9–10, 2014 in Washington, DC. The panel was comprised of assessment and labor market specialists, as well as internal RTI staff.

The meeting objectives were as follows:

1. To present and obtain feedback on an assessment plan for work readiness skills.
2. To test and obtain feedback on a conceptual framework that describes the elements of work readiness.
3. To develop measures for elements of work readiness.
4. To present and obtain feedback on a virtual platform/instrument for assessing work readiness.

2.4 **Desk review of target population characteristics**

To design an assessment for the likely target population, some knowledge of demographics and characteristics are essential. In addition, an assessment that includes literacy and mathematics components is best if informed by actual literacy and mathematics achievement rates among the likely target population. To this end, the report presents a preliminary description of a likely target population, as well as some data on the literacy and mathematics achievement on several international and regional assessments.

3 **Skills in a framework of work readiness**

This section presents a draft framework for work readiness, inclusive of foundational and employability skills. This framework was researched and developed before the expert panel meeting and tested therein.

3.1 **Inclusion criteria for skills**

While a number of frameworks of “work readiness” exist from which could be pulled a great variety of employability skills, the research undertaken for this report utilized a specific set of criteria for the inclusion of skills that are discussed below. The criteria were as follows:

- Skills should be **important**: That is, they should be found to be predictive of work-related outcomes, or cited as important in employer surveys.
- Skills should be **teachable**: In other words, skills decided upon should be not only malleable (open to change), but amenable to teaching to young people in a school-like environment in a relatively short period of time (i.e. 9–12 months).
Skills should be **measurable**: As much of the focus of this initiative is on innovative measurement to discern employability levels of groups of youth, skills should be amenable to measurement, particularly in a simulation, game or observation (not just self-report questionnaires).

These three criteria were employed to test each potential employability skill. As these skills will eventually be assessed and measured in a simulation or set of simulations, the third criterion held slightly more weight than the other two.

### 3.2 A draft framework for employability

Table 2, below, presents a draft framework of employability skills, as identified via the literature review, interviews with experts, and during the expert panel meeting. Sub-skills denoted by an asterisk (*) are those that were identified by the panelists as warranting initial consideration and development.
### Table 2. Draft skills framework for employability

<table>
<thead>
<tr>
<th>Skill area</th>
<th>Definition</th>
<th>Sub-skills</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependability</strong></td>
<td>The ability to fit into the workplace and to perform tasks reliably and with adequate quality</td>
<td><em>Punctuality</em></td>
<td>Regularly on time to work and with responsibilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Completion of task</em></td>
<td>Tendency to complete assigned work in a timely fashion</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Time management</em></td>
<td>Ability to designate appropriate resources and importance to tasks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Understanding one’s place in business</td>
<td>Understanding one’s responsibilities and role in relation to the rest of the organization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staying on task</td>
<td>Remaining engaged with one’s responsibilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respect for property</td>
<td>Recognition of and acting upon the value of company property</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Keeping promises</td>
<td>Truthfulness, honesty</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fitting dress &amp; behavior</td>
<td>Professionalism in appearance and action</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Being organized</td>
<td>Preparedness, having one’s affairs in order, and resources ready to mobilize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attention to detail</td>
<td>Ability to focus on all aspects of a project or task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Customer orientation</td>
<td>Understanding of customer requirements and values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow-up</td>
<td>Ability to follow decisions with appropriate actions</td>
</tr>
<tr>
<td><strong>Learning skills</strong></td>
<td>Ability to absorb new information, organize it into flexible models of the world, and to question one’s thinking</td>
<td><em>Accepting instruction</em></td>
<td>Ability to accept authority and follow instructions, and ability to decide whether or not to accept advice</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Taking feedback</em></td>
<td>Willingness to receive constructive criticism, the ability to listen to it and apply it to enhance performance towards a goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Seeking help</em></td>
<td>Ability to recognize when one needs help and seek out resources</td>
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<tr>
<td></td>
<td></td>
<td>Self-reflection</td>
<td>The ability to plan, monitor, and evaluate performance against a standard, and to check for errors</td>
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<tr>
<td></td>
<td></td>
<td>Adaptability</td>
<td>Ability to change course based on information or evaluation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Taking on challenge</td>
<td>Willingness to accept challenging tasks at the zone of</td>
</tr>
<tr>
<td>Skill area</td>
<td>Definition</td>
<td>Sub-skills</td>
<td>Definitions</td>
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<td>----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
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<tr>
<td></td>
<td></td>
<td>proximal development</td>
<td></td>
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<tr>
<td>Open-mindedness</td>
<td>Accepting of others’ views, perspectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mindset</td>
<td>The beliefs that ability can be developed, and that intellectual challenge can be productive</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perseverance</strong></td>
<td>The ability to purposefully and strategically put effort towards long-term success, regardless of challenges or adversity</td>
<td>*Delayed gratification Ability to wait for greater goods or goals in the future</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>*Resilience The ability to persevere towards goals in the face of setbacks and difficulty</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>*Goal orientation (persistence) The ability to set and work (persist) towards goals</td>
<td></td>
</tr>
<tr>
<td>Passion</td>
<td>The degree of interest in obtaining a goal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future orientation</td>
<td>The ability to weigh long-term outcomes more favorably</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determination</td>
<td>Willingness to work hard and resist giving up</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Problem-solving</strong></td>
<td>The ability to activate prior knowledge (or to acquire new knowledge and apply it) to address a new problem through specific strategies</td>
<td>*Identifying and specifying the problem Ability to detect problems, and to understand and articulate the nature of the problem</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>*Testing solutions Trying out varied and appropriate actions, approaches and potential solutions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>*Identifying solutions Selection of techniques for addressing a problem</td>
<td></td>
</tr>
<tr>
<td>Planning solutions</td>
<td>Creating a detailed plan to solve the problem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engaging resources</td>
<td>Ability to identify the information or resources needed, where to find them, and utilizing them</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimension weighting</td>
<td>Assessing the importance and relevance of information in solving problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking initiative</td>
<td>Ability to identify action that needs to be taken and taking it, before being asked to do so</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creativity</td>
<td>Ability to create valuable knowledge or goods from pre-existing materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intrapersonal skills</strong></td>
<td>The ability to reflect on one’s performance, manage one’s emotions</td>
<td>Self-regulation* The ability to plan, monitor, and evaluate a course of action against a standard, as well as to control impulses that digress away from the course of action</td>
<td></td>
</tr>
<tr>
<td>Stress management</td>
<td>The ability to monitor and control one’s level of stress, and to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill area</td>
<td>Definition</td>
<td>Sub-skills</td>
<td>Definitions</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Interpersonal skills</td>
<td>The ability to interact positively and effectively with others</td>
<td>Collaboration*</td>
<td>Ability to work effectively with others towards a mutually held and defined goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clear speaking*</td>
<td>Ability to communicate orally in appropriate settings in a clear manner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Active listening*</td>
<td>Ability to take in new information, feed it back to others, and take appropriate action</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dealing with conflict &amp; prejudice</td>
<td>Ability to deal positively with workplace conflict</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open-mindedness</td>
<td>Accepting of others' views, perspectives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empathy</td>
<td>Consideration of others' feelings, to understand and share them</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respecting cultural diversity</td>
<td>Ability to recognize value in diversity and act inclusively</td>
</tr>
</tbody>
</table>

Note: Sub-skills denoted by an asterisk (*) were prioritized according to the three previously mentioned criteria. Items denoted in red have been amended subsequent to the expert panel meeting.
The sub-skills denoted by an asterisk in Table 2 are those which were prioritized by the expert panelists as warranting initial consideration for development into assessment items and measurement. These scored higher on the three criteria (i.e. importance, teachability, and measurability) than did the other sub-skills.

The skill areas themselves were selected based largely on the literature review and expert interviews conducted prior to the expert panel meeting. In Table 2, they are placed in order of priority, according to employer surveys, academic literature, and their connection with job performance and outcomes.

Dependability, or the ability to fit into the workplace and to perform tasks reliably with adequate quality, is consistently reported as an important consideration in employer surveys: employers claim to place great emphasis on punctuality, professionalism, time management, organization, one’s ability to reliably complete tasks, in addition to other skills. For example, Casner-Lotto and Barrington, in a survey of US employers, found that professionalism and work ethic ranked at the top of most important applied skills for new workforce entrants, regardless of education level.

The ability to be a “good learner,” or the ability to absorb new information, organize it into flexible models of the world, and to question one’s thinking, has also been shown to be important in terms of learning and mastering new tasks and responsibilities both in the classroom and in the workplace. A US National Research Council committee convened on 21st Century skills included cognitive processes and learning strategies as one of their clusters of 21st century competencies. The ability to organize new knowledge into meaningful patterns of information is a key ability in how individuals learn new tasks, routines, and responsibilities.

Perseverance, or the ability to purposefully and strategically put effort towards long-term success, regardless of challenges or adversity, features in the skills framework for employability for at least two reasons. First, some tasks require dedicated, long-term effort towards a goal or outcome and necessitate determination to complete it. Second, employers require workers who are able to overcome difficulties and challenges to accomplish their responsibilities. Much research asserts the importance of these skills, as well as the fact that they are teachable.

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The ability to solve problems, conceived as the ability to activate prior knowledge (or to acquire new knowledge and apply it) to address a new problem through specific strategies, is prominent in nearly every skills framework relevant to employability.\textsuperscript{13} Even in entry-level positions, employees need to be able to detect problems when they arise, follow routines to solve them, identify other solutions, and see them through.\textsuperscript{14} Particularly important here is the fact that most conceptualizations and assessments of problem-solving abilities presuppose a problem; that is, the problem to be solved is given to the pupil and does not require them to detect it in the first place.\textsuperscript{15} This skill is particularly germane to the workplace where both routine and new problems surface with regularity, but which may go undetected by the employee or manager.

Both intrapersonal skills, the ability to reflect on one’s performance and manage one’s emotions, and interpersonal skills, the ability to interact positively and effectively with others are ubiquitously cited as important for work readiness. Self-control and self-regulation have been shown to positively predict life and work outcomes,\textsuperscript{16} and the ability to work positively and effectively with others is self-evidently tied all work save the few jobs that are conducted in complete isolation. These positive interactions with others (e.g., communication, collaboration, empathy, dealing with conflict) will manifest in different way depending upon the social and cultural context of the workplace, as well as with the designated tasks which are to be achieved. Regardless, they are important for successful team performance.\textsuperscript{17}

Another grouping of skills related to employability that appeared often in literature reviewed for this report and which was discussed by the expert panel were those that fell under the mantle of “teamwork”. The concept of teamwork cuts across various skill areas discussed above and includes others, such as collaboration and the preference for mutual goals. The RTI research team attempted to unpack and synthesis various definitions and conceptualizations of teamwork in order to arrive at a similar framework for this set of skills. This represents a somewhat more specialized and specific take on skills that are

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\textsuperscript{15} R.E. Mayer, in dialogue with the author. J.W. Pellegrino, in dialogue with the author.


important for employability than is presented here. As a result, the teamwork framework devised by RTI research team is shown in Appendix A.

4 Development of a simulation to assess employability skills

In collaboration with the game developer, a prototype simulation was designed and developed between May and October 2014. The prototype was designed to be a platform to simulate tasks and interactions found in a workplace, and to measure a player’s responses to these. Specifically, this prototype is intended to measure and collect data on several of the sub-skills in the employability framework presented above.

The working prototype, which is still in development, uses an HTML interface than can be played on any device (e.g., phone, tablet, smartphone, computer). Instead of using plain SMS, the prototype simulates SMS messages, which saves SMS gateway and messaging fees during design and production. At the time of writing, the prototype is designed as a “serious game” with market competition and collaboration elements. The overall goal of the game is to grow and sell different types of fruit to interested buyers. In order to do so, however, a player must fill a single roll (i.e. farmer, distributor, seller) work together with the other roles to grow, distribute, and sell produce. While this approach simulates multiplayer gameplay, in reality each player is collaborating with simulated teammates (the computer) to accomplish the task or objective. Figure 1, below, displays a sample screenshot from the prototype.

18 The prototype development is being continued through the next fiscal year as outlined in the partnership agreement with MediaSpark. It is anticipated that by end of 2014, a playable prototype will have been completed.
As can be seen, the player dashboard is relatively simple, with messages and prompts received in the white dialogue box, and commands entered in the yellow dialogue box. Instructions for getting started appear in the green section on the right of the screen. In addition, there is an administrator dashboard that can be used by assessors or developers to create new or modify existing products to be sold and distributed, manage players, and advance gameplay.

In collaboration with the developer, it was decided to focus on a few select sub-skills from the draft skills framework for employability. These sub-skills were selected from the prioritized list of sub-skills identified by the expert panelist as those warranting initial consideration (i.e. those marked by an asterisk in Table 2). The selected sub-skills are shown in Table 3, below, and were chosen based on their relevance and face validity in the gameplay of the prototype assessment, as well as for their amenability to data collection via simple measurements.
### Table 3. Selected sub-skills for the prototype simulation

<table>
<thead>
<tr>
<th>Skill</th>
<th>Sub-skill</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependability</td>
<td>Completion of task</td>
<td>Tendency to complete assigned work in a timely fashion</td>
</tr>
<tr>
<td>Learning skills</td>
<td>Accepting instruction</td>
<td>Ability to accept authority and follow instructions</td>
</tr>
<tr>
<td>Perseverance</td>
<td>Goal orientation</td>
<td>The ability to set and work towards goals</td>
</tr>
</tbody>
</table>

It is important to note that these sub-skills represent a first attempt at incorporating employability skills into a game/simulation. In the coming months, RTI will work with the developer to incorporate these selected sub-skills within the gameplay, and refine how they are measured. Further versions will focus on the additional aspect of also imparting such skills. However, the current prototype is an example of what a future game/simulation might resemble.

### 5  Assessment framework

The act of assessing the skills within the employability framework will be conducted with measurement at the sub-skill level (see Table 2, above). In addition to working out a draft framework, assumptions of an employability assessment and a likely assessment protocol were outlined during the expert interviews and panel meeting working sessions.

#### 5.1 Assumptions of an assessment

1. At a single school, 20–30 children will be assessed at a time by 1 or 2 skilled assessors.
2. Employability skills will be assessed independently of foundational skills assessments (though the results of all assessments will be linked).
3. Employability skills will be assessed via a circuit of games and tasks (perhaps as many as 5 or 6, if they are short) that are connected by a common theme. Some of these tasks will be virtual (with individual devices) while others will be team-based (i.e. working with others and not on devices).
4. Data collected through the assessment will be collected through the individual devices and by assessors’ observations.
5. These results of the employability skills assessments (i.e. the observations and digitally captured data) will, at least in the first instance, be triangulated with survey-type questions of students and/or teachers.
6. The entire assessment timeframe will be approximately 3 hours for both employability and foundational skills. The assessment of these two skill areas (foundational and employability) may be divided over two days.

5.2 Assessment protocol

The assessment and data collection will follow a pre-defined protocol similar to that followed for the EGRA/EGMA data collection. The protocol is likely to be similar to the following:

1. Assessors come to school with devices and instructions, and other assessment tools.
2. Assessors select students and brief them on the game.
3. Assessors assess students’ reading and math skills to validate their ability to participate effectively in the game.
4. Students get devices, practice their use, then start playing the 5-6 simulation games. Assessors collect the devices.
5. Once the device-based simulations are done, assessors assign a task to pre-defined groups of 5 students each. Students will have 20 minutes to complete the task. Assessor observes group interaction and collects data\(^{19}\) (driven by a series of closed-ended questions).
6. Assessors also interview teachers, and collect other relevant information (to be determined).
7. Data from the game, plus uploaded data from other assessments, are exported as a csv or similar file from the server(s).
8. Data are then analyzed and reported for policy and/or programmatic purposes.

6 Characteristics of the likely target population

Time was also spent determining the likely characteristics of the target population, such as geographic and demographic characteristics. In addition, a desk review of international assessment results (i.e. SACMEQ, TIMSS, PIRLS, and PISA) was undertaken in order to determine approximate levels of competence in reading and mathematics in countries similar to those in which the proposed assessment would be administered. In most cases, low-income countries are not well-represented by international assessments (with the exception of regional assessments in Africa, such as SACMEQ and PASEC); therefore an attempt was made to present data on countries in which RTI has worked previously or countries that are illustrative of the types of countries RTI is likely to work.

\(^{19}\) All data collected by assessors will be put into Tangerine.
6.1 General characteristics

Through interviews conducted for this study and discussions that took place during the expert panel meeting, some initial descriptions of a likely target population were articulated. The following list describes briefly the first thinking around the likely target population of students and is subject to revision as this initiative goes forward.

- **“School-leaving” age**: Initially, the target student will likely be between lower and upper secondary age, or around 15 years old. While a case could be made for assessing youth at the end of upper secondary (i.e. around 18 years of age), a lower age was decided upon for three reasons. First, this approximates the end of free and compulsory education in a number of countries, and secondary and upper secondary often requires the subsidy of out of pocket fees. Thereafter, a significant proportion of students opt to discontinue formal schooling, which means that the target population available within schools is lower at older ages. Second, assessing students earlier facilitates school-based interventions which would be inaccessible to out-of-school youth. Third, as will be seen in the discussion of foundational skills below, a sufficient proportion of 15 year-old students in likely target countries are reading at an adequate level to participate in assessment tasks.

- **Peri-urban locale**: In an assessment will, at least in part, utilize cell phones and their networks to collect data, peri-urban areas are much less likely to experience connectivity and network issues (though these will vary by context).

- **Small and medium enterprises**: An assessment could be tailored to the employability skills necessary to obtain and hold positions in small and medium-sized enterprises (SMEs). SMEs are important as they create the majority of existing and new job openings worldwide. This implies, however, that the eventual instruments would not assess any and all skills necessary for all jobs. For example, subsistence farmers and informal workers in single-worker enterprises, who also make up a significant proportion of the labor market, would not be targeted with the instrument, and neither would individuals working for large multinational corporations.

- **Lower-middle and middle-income households**: Partially as a consequence of the choices already outlined with regard to the targeted population, youth assessed via the proposed instrument are likely to originate from lower-middle or middle-income households. That is, they would neither

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20 Given the significant proportion of overage pupils in lower and upper secondary, it makes sense to target an age (i.e. 15 years) rather than a school year (e.g., Grade 9).
be the poorest nor the wealthiest within a given society; the targeted population would likely fall between the 30th and 70th wealth percentiles.

- **Technologically able**: As part of an assessment is likely to be conducted with a hand-held device (i.e. a cell phone or tablet), assessed youth would need to have some sort of familiarity with cell phones, or possibly smart phones. While the assessment model allows for a significant amount of facilitation through trained facilitator, youth with absolutely no prior exposure to similar hand-held devices would necessarily be at a disadvantage compared to others.

These general assumptions surrounding the target population would need to be revisited and revised as an assessment is developed.

### 6.2 Reading and mathematics proficiency

The desk review of international learning outcomes and assessment results concentrated on youth literacy rates as well as results from the Programme for International Student Assessment (PISA, 2012), SACMEQ III (2007), the Trends in International Mathematics and Science Study (TIMSS, 2011), and the Progress in International Reading Literacy Study (PIRLS, 2011). These outcomes and assessments were chosen because they are well known and data were available for a number of countries. While the typical profile of countries that take these assessments varies substantially from those countries RTI might work in, an attempt was made to gather data on countries that were “similar enough” so as to be illustrative for the purposes of this report.

The objective of this section is not to be definitive in describing the foundational skills (i.e. reading and mathematics sections covered by the assessments) in likely pilot countries, but rather to give the reader a sense of the level of proficiency in a number of countries. Furthermore, this section is important as pupil participation in simulation exercises and group tasks in an employability assessment will require a certain proficiency in reading and, to a lesser extent, in math. As such, this section attempts to answer the questions:

- Are the assumptions of a likely target population expressed above (e.g., age, location, etc.) valid?
- Are 15-year old pupils likely to have the requisite levels of proficiency in reading and, to a lesser extent, in math to participate in a series of assessments and tasks?

At base, being functionally literate will be a pre-requisite for any assessment that requires the participant to read or write. As such, literacy levels were obtained from UNESCO Institute for Statistics (UIS) databases for low- or lower middle-income countries for which recent data (i.e. 2010 or later) were available. Fourteen countries, two regions, and one income classification group (low-income countries –
LICs) were found that met these criteria; youth literacy rates\(^{23}\) for these countries are shown below in Figure 2.

**Figure 2. Youth literacy rate in 14 countries, 2 regions, and 1 income grouping, 2010–2012**

<table>
<thead>
<tr>
<th>Country</th>
<th>Literacy Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea</td>
<td>31.4</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>47.0</td>
</tr>
<tr>
<td>Mali</td>
<td>47.1</td>
</tr>
<tr>
<td>Senegal</td>
<td>66.0</td>
</tr>
<tr>
<td>SSA</td>
<td>68.8</td>
</tr>
<tr>
<td>Pakistan</td>
<td>70.8</td>
</tr>
<tr>
<td>LICs</td>
<td>71.9</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>79.5</td>
</tr>
<tr>
<td>Togo</td>
<td>79.9</td>
</tr>
<tr>
<td>South &amp; West Asia</td>
<td>80.2</td>
</tr>
<tr>
<td>Cameroon</td>
<td>80.6</td>
</tr>
<tr>
<td>Morocco</td>
<td>81.5</td>
</tr>
<tr>
<td>Ghana</td>
<td>85.7</td>
</tr>
<tr>
<td>Uganda</td>
<td>87.4</td>
</tr>
<tr>
<td>Egypt</td>
<td>89.3</td>
</tr>
<tr>
<td>Indonesia</td>
<td>98.8</td>
</tr>
<tr>
<td>Jordan</td>
<td>99.1</td>
</tr>
</tbody>
</table>

Note: Data are most recent available, between 2010 and 2012.

As seen in these data, there is significant variation in the extent to which youth between the ages of 15 and 24 years can read or write a short simple statement: rates range from just over 30% in Guinea to nearly 100% in Jordan. In a majority of countries for which data were available (9 of 14), four of every five youth were literate, according to this definition of the term. Nevertheless, a number of countries in which RTI has worked or is currently working have quite low levels of literacy (i.e. below 70%). This is compounded

\(^{23}\) In these data, literacy is defined as the ability to both read and write, with understanding, a short simple statement on one’s everyday life.
by the fact that this definition of literacy (reading and writing a simple statement) is quite basic. With regard to the assumptions stated above about the target population for an employability assessment, these literacy data suggest that a significant percentage of youth (i.e. approximately 20% in South and West Asia, and 30% in Sub-Saharan Africa) may be ineligible to participate in an assessment process that requires even a small amount of reading proficiency. As such, additional investigation as to the functional literacy levels of youth is warranted in countries that are likely candidates for pre-pilot programs.

Turning attention to results of regional and international assessments, the Programme for International Student Assessment (PISA) administered by the Organisation for Economic Cooperation and Development (OECD) is a well-known assessment that is conducted every three years to determine the abilities of 15-year olds in (mostly) OECD partner countries in reading, mathematics.\textsuperscript{24} OECD countries by definition tend to be more developed, economically speaking, a subset of countries are illustrative of those in which RTI has worked previously. Further, the assessment is administered to 15 year-olds, which represents the target population for an employability assessment. Figure 3, below, tabulates the proportion of students performing at each of six proficiency levels in mathematics on PISA 2012.

\textbf{Figure 3. Proportion of students performing at six mathematics proficiency levels on PISA, 2012}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{pisa_2012_proportion.png}
\caption{Proportion of students performing at six mathematics proficiency levels on PISA, 2012}
\end{figure}

Source: OECD 2014: 62 (Figure I.2.22)

\textsuperscript{24} PISA also includes other assessment components, such as financial literacy and science, on a rotating basis.
Figure 3 shows that approximately 50% or more of pupils assessed in 2012 performed at the first mathematics proficiency level or below in the 12 countries chose to be illustrative of those in which RTI works. Table 4, below, describes in detail the requirements of each of the six benchmark proficiency levels in PISA mathematics. Performing at the first proficiency level suggests that students can answer questions of familiar contexts for which all relevant information is present involving routine procedures that are obvious and explicit. Specifically, two countries in which RTI has worked in the past and which are represented in Figure 3 are Indonesia and Jordan. In these two countries, approximately 70% of assessed pupils performed at or below level one. For the purposes of an employability assessment and this report, these findings suggest that a less advanced assessment would be necessary to accurately ascertain students’ mathematics proficiency is likely target countries (i.e. low- and lower middle-income countries), and the workforce readiness assessment itself would have to demand only rather low-level numeracy skills. For the simulation exercises and team-based tasks, however, these results are less troublesome, as these components of the assessment are likely to require minimal mathematics proficiency.

Table 4. Descriptions of PISA 2012 international benchmark levels in mathematics

<table>
<thead>
<tr>
<th>Level</th>
<th>Lower score limit</th>
<th>Students able to perform tasks at this level (OECD avg)</th>
<th>What students can typically do</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>669</td>
<td>3.3%</td>
<td>Students can conceptualize, generalize and utilize information based on their investigations and modelling of complex problem situations, and can use their knowledge in relatively non-standard contexts. They can link different information sources and representations and flexibly translate among them. Students at this level are capable of advanced mathematical thinking and reasoning. These students can apply this insight and understanding, along with a mastery of symbolic and formal mathematical operations and relationships, to develop new approaches and strategies for attacking novel situations. Students at this level can reflect on their actions, and can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, and the appropriateness of these to the original situation.</td>
</tr>
<tr>
<td>5</td>
<td>607</td>
<td>12.6%</td>
<td>Students can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare, and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models. Students at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriate linked representations, symbolic and formal characterizations, and insight pertaining to these situations. They begin to reflect on their work and can formulate and communicate their interpretations and reasoning.</td>
</tr>
<tr>
<td>4</td>
<td>545</td>
<td>30.8%</td>
<td>Students can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic, linking them directly to aspects of real-world situations. Students at this level can utilize their limited range of skills and can reason with some insight, in straightforward contexts. They can construct and communicate explanations and arguments based on their interpretations, arguments, and actions.</td>
</tr>
<tr>
<td>3</td>
<td>482</td>
<td>54.5%</td>
<td>Students can execute clearly described procedures, including those that require sequential decisions. Their interpretations are sufficiently sound to be a base for building a simple model or for selecting and applying simple problem-solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They typically show some ability to handle percentages, fractions, and decimal numbers, and to work with proportional relationships. Their solutions reflect that they have engaged in basic interpretation and reasoning.</td>
</tr>
<tr>
<td>Level</td>
<td>Lower score limit</td>
<td>Students able to perform tasks at this level (OECD avg)</td>
<td>What students can typically do</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------</td>
<td>--------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>2</td>
<td>420</td>
<td>77.0%</td>
<td>Students can interpret and recognize situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures, or conventions to solve problems involving whole numbers. They are capable of making literal interpretations of the results.</td>
</tr>
<tr>
<td>1</td>
<td>358</td>
<td>92.0%</td>
<td>Students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are almost always obvious and follow immediately from the given stimuli.</td>
</tr>
</tbody>
</table>

Source: OECD 2014: 61 (Table I.2.21)

Figure 4 presents the proportion of students performing at each of seven reading proficiency levels in PISA 2012. While the 15 countries which comprise Figure 4 are, again, for the most part illustrative, both Indonesia and Jordan are countries in which RTI has worked in the recent past. From the figure, it can be seen that approximately 50% of assessed pupils in a majority of “similar” countries to those in which RTI works perform at or below the first reading performance benchmark (i.e. level 1a, 1b or below). Table 5, also below, describes in detail the abilities required to achieve level 1b (the lowest benchmark) or 1a. In general, students performing at either 1b or 1a can locate a single piece (1b) or multiple independent pieces (1a) of information in a text with little competing information and a significant amount of textual support. Figure 4 also shows that, of the students that perform at levels higher than 1a or 1b, most pupils in “similar” countries perform at the next performance level, 2. The difference between this performance level and those below it is that pupils performing at level 2 are able to begin to infer meaning and the purpose of a text, as well as to compare and contrast different texts based on a single element. Again, it is clear that reading proficiency in “similar” contexts to countries that may be likely to pilot an employability assessment is relatively low. As such, a reading assessment for students of “school-leaving” age in low- and lower middle-income countries would require rather more basic items. With regard to the simulation exercises and group tasks, some level of reading proficiency is likely to be required, probably at or above proficiency level two, at which pupils are beginning to infer conclusions, understand relationships, and construe meaning. At least 40% of assessed 15-year old pupils in the countries presented in Figure 3 were reading at this level, which bolsters the description of the target population above.
Figure 4. Proportion of students performing at seven reading proficiency levels on PISA, 2012

Table 5. Descriptions of PISA 2012 international benchmark levels in literacy

<table>
<thead>
<tr>
<th>Level</th>
<th>Lower score limit</th>
<th>Students able to perform tasks at this level (OECD avg)</th>
<th>Characteristics of tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>698</td>
<td>1.1%</td>
<td>Tasks at this level typically require the reader to make multiple inferences, comparisons and contrasts that are both detailed and precise. They require demonstration of a full and detailed understanding of one or more texts and may involve integrating information from more than one text. Tasks may require the reader to deal with unfamiliar ideas, in the presence of prominent competing information, and to generate abstract categories for interpretations. Reflect and evaluate tasks may require the reader to hypothesize about or critically evaluate a complex text on an unfamiliar topic, taking into account multiple criteria or perspectives, and applying sophisticated understandings from beyond the text. A salient condition for access and retrieve tasks at this level is precision of analysis and fine attention to detail that is inconspicuous in the texts.</td>
</tr>
</tbody>
</table>
Table 6 and 7, overleaf, display the proportion of students performing at SACMEQ III reading and mathematics benchmarks, respectively. SACMEQ III, which assesses pupils in Grade 6, commenced in 2006 and encompassed 15 Sub-Saharan African countries. The assessment examines the conditions in
approximately 2,800 schools and relates these to the achievement levels of 61,000 learners and their 8,000 teachers in both reading and mathematics. Results are divided into eight achievement levels in both disciplines (see Box 1, below, for full descriptions) which range from the most basic (i.e. pre-reading and pre-numeracy for reading and mathematics, respectively) to the most advanced (i.e. critical reading and abstract problem-solving for reading and mathematics, respectively). Table 6 shows that of 11 countries with disaggregated data, the median child in Grade 6 is reading at the inferential reading benchmark in two countries (Seychelles and Tanzania), at the interpretive reading benchmark in three countries (Botswana, Kenya, and Swaziland), at the reading for meaning benchmark in four countries (Mozambique, Namibia, South Africa, and Zimbabwe), and at the basic reading benchmark in two countries (Lesotho and Malawi). At the higher benchmark, students are able to combine information from various parts of the text so as to infer the writer’s purpose; while at the lower basic benchmark students can match words and phrases, complete sentences, and read to link and interpret information located in various parts of the text. At this very general level of analysis, it is clear that in approximately one-half the countries with disaggregated data, a majority of Grade 6 pupils is reading at the highest four reading benchmarks and, by this measure, have moved beyond reading for meaning. Such levels of proficiency, which include combining textual information with external information and making inferences, would be likely adequate for participation in an employability assessment that incorporates simulations and group tasks.

In contrast, Table 7 shows that Grade 6 achievement in mathematics tends to be lower. Indeed, most assessed children achieved at the beginning numeracy benchmark or below (i.e. in the bottom four benchmarks) across all ten countries for which there are data. At the beginning numeracy benchmark, students can translate verbal or graphic information into simple arithmetic problems, though many students can only translate verbal information into arithmetic problems (i.e. basic numeracy), conduct two- or one-step calculations (i.e. emergent or pre-numeracy, respectively). In sum, the majority of students can relatively simple mathematic computations while only a small minority could be categorized as “mathematically competent” or solve concrete or abstract problems.

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### Table 6. Proportion of students performing at SACMEQ III reading benchmarks, 2007

<table>
<thead>
<tr>
<th>Description</th>
<th>Botswana</th>
<th>Kenya</th>
<th>Lesotho</th>
<th>Malawi</th>
<th>Mozambique</th>
<th>Namibia</th>
<th>Seychelles</th>
<th>South Africa</th>
<th>Swaziland</th>
<th>Tanzania</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-reading</td>
<td>2.9</td>
<td>2.3</td>
<td>4.0</td>
<td>9.7</td>
<td>6.7</td>
<td>3.0</td>
<td>4.0</td>
<td>9.9</td>
<td>0.2</td>
<td>1.4</td>
<td>6.0</td>
</tr>
<tr>
<td>Emergent reading</td>
<td>7.7</td>
<td>5.7</td>
<td>17.0</td>
<td>26.9</td>
<td>14.8</td>
<td>11.0</td>
<td>7.0</td>
<td>17.3</td>
<td>1.2</td>
<td>2.1</td>
<td>12.5</td>
</tr>
<tr>
<td>Basic reading</td>
<td>13.6</td>
<td>11.8</td>
<td>31.0</td>
<td>36.7</td>
<td>22.0</td>
<td>25.0</td>
<td>10.0</td>
<td>21.1</td>
<td>5.6</td>
<td>6.6</td>
<td>18.7</td>
</tr>
<tr>
<td>Reading for meaning</td>
<td>19.2</td>
<td>19.6</td>
<td>25.0</td>
<td>19.9</td>
<td>25.0</td>
<td>26.0</td>
<td>10.0</td>
<td>14.7</td>
<td>20.7</td>
<td>12.0</td>
<td>20.7</td>
</tr>
<tr>
<td>Interpretive reading</td>
<td>20.7</td>
<td>21.8</td>
<td>12.0</td>
<td>4.8</td>
<td>17.9</td>
<td>16.0</td>
<td>12.0</td>
<td>10.6</td>
<td>34.5</td>
<td>16.9</td>
<td>15.0</td>
</tr>
<tr>
<td>Inferential reading</td>
<td>16.5</td>
<td>18.7</td>
<td>6.0</td>
<td>1.4</td>
<td>10.7</td>
<td>10.0</td>
<td>18.0</td>
<td>9.6</td>
<td>25.7</td>
<td>28.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Analytical reading</td>
<td>13.7</td>
<td>13.7</td>
<td>4.0</td>
<td>0.6</td>
<td>2.7</td>
<td>7.0</td>
<td>22.0</td>
<td>10.2</td>
<td>10.1</td>
<td>26.8</td>
<td>11.7</td>
</tr>
<tr>
<td>Critical reading</td>
<td>5.8</td>
<td>6.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>3.0</td>
<td>16.0</td>
<td>6.6</td>
<td>1.8</td>
<td>6.2</td>
<td>4.5</td>
</tr>
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</table>

Source: [www.sacmeq.org](http://www.sacmeq.org) [Accessed 9/20/2014]

Note: Columns may not total 100 due to rounding.

### Table 7. Proportion of students performing at SACMEQ III mathematics benchmarks, 2007

<table>
<thead>
<tr>
<th>Description</th>
<th>Botswana</th>
<th>Kenya</th>
<th>Lesotho</th>
<th>Malawi</th>
<th>Mozambique</th>
<th>Namibia</th>
<th>Seychelles</th>
<th>South Africa</th>
<th>Swaziland</th>
<th>Tanzania</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-numeracy</td>
<td>1.5</td>
<td>0.6</td>
<td>4.0</td>
<td>86.0</td>
<td>5.1</td>
<td>5.0</td>
<td>2.0</td>
<td>5.5</td>
<td>0.2</td>
<td>0.7</td>
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</tr>
<tr>
<td>Emergent numeracy</td>
<td>20.9</td>
<td>10.6</td>
<td>38.0</td>
<td>51.3</td>
<td>27.7</td>
<td>42.0</td>
<td>16.0</td>
<td>34.7</td>
<td>8.4</td>
<td>12.6</td>
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<tr>
<td>Basic numeracy</td>
<td>34.0</td>
<td>27.1</td>
<td>39.0</td>
<td>32.8</td>
<td>41.1</td>
<td>34.0</td>
<td>24.0</td>
<td>29.0</td>
<td>35.7</td>
<td>29.8</td>
<td></td>
</tr>
<tr>
<td>Beginning numeracy</td>
<td>27.2</td>
<td>32.1</td>
<td>14.0</td>
<td>6.6</td>
<td>20.9</td>
<td>12.0</td>
<td>26.0</td>
<td>15.4</td>
<td>37.0</td>
<td>25.5</td>
<td></td>
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<tr>
<td>Competent numeracy</td>
<td>9.2</td>
<td>15.5</td>
<td>3.0</td>
<td>1.3</td>
<td>3.9</td>
<td>3.0</td>
<td>14.0</td>
<td>7.1</td>
<td>12.9</td>
<td>19.3</td>
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</tr>
<tr>
<td>Mathematically skilled</td>
<td>6.0</td>
<td>10.1</td>
<td>2.0</td>
<td>0.4</td>
<td>0.8</td>
<td>2.0</td>
<td>13.0</td>
<td>5.9</td>
<td>5.4</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>Concrete problem-solving</td>
<td>0.9</td>
<td>2.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.3</td>
<td>0.0</td>
<td>2.0</td>
<td>1.9</td>
<td>0.3</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Abstract problem-solving</td>
<td>0.4</td>
<td>1.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
<td>0.6</td>
<td>0.0</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: [www.sacmeq.org](http://www.sacmeq.org) [Accessed 9/20/2014]

Note: Columns may not total 100 due to rounding.
**Box 1.**

Descriptions of SACMEQ III reading and mathematics benchmarks

**Literacy benchmark levels**

1. **Pre-reading**: Matches words, pictures involving concrete concepts and everyday objects
2. **Emergent reading**: Matches words, pictures involving prepositions and abstract concepts
3. **Basic reading**: Interprets meaning (matching words and phrases, completing sentences). Reads to link and interpret information located in various parts of the text.
4. **Reading for meaning**: Reads to link and interpret information located in various parts of the text.
5. **Interpretive reading**: Interprets information from various parts of text in association with external information.
6. **Inferential reading**: Reads to combine information from various parts of text so as to infer the writer's purpose.
7. **Analytical reading**: Located information in longer texts (narrative, document, expository) to combine information from various parts of text to infer the writer's personal beliefs (value systems, prejudices, biases).
8. **Critical reading**: Reads from various parts of texts to infer and evaluate what the writer has assumed about both the topic and the characteristics of the reader.

**Mathematics benchmark levels**

1. **Pre-numeracy**: Applies single-step addition and subtraction
2. **Emergency numeracy**: Applies a two-step addition and subtraction involving carrying.
3. **Basic numeracy**: Translated verbal information into arithmetic operations.
4. **Beginning numeracy**: Translates verbal or graphic information into simple arithmetic problems.
5. **Competent numeracy**: Translates verbal, graphic, or tabular information into an arithmetic form in order to solve a given problem.
6. **Mathematically skilled**: Solves multiple-operation problems (using the correct order) involving fractions, ratios, and decimals.
7. **Concrete problem-solving**: Extracts and converts information from tables, charts, and other symbolic presentations in order to identify, then solve multi-step problems.
8. **Abstract problem-solving**: Identifies the nature of an unstated mathematical problem embedded within verbal or graphic information and then translate this into symbolic, algebraic or equation form in order to solve a problem.

Source: [www.sacmeq.org](http://www.sacmeq.org) [Accessed 9/20/2014]
Figure 5. Average performance on SACMEQ III in 12 countries, 2007

Figure 5, above, displays the average achievement on SACMEQ III reading and mathematics components for 12 countries for which there is data, disaggregated by location (rural or urban) and socio-economic status (low or high). This figure highlights that in many sub-Saharan African countries, there is a large gap between urban and rural achievement as well as between students of low and high SES households. In general, Figure 5 shows that countries with higher average levels of achievement also tend to have higher urban–rural and SES achievement gaps. It is also evident that reading and mathematics achievement varies widely by country and, in some cases, within countries. For the purposes of this report, these findings suggest that context is important and will determine the level of mathematics and reading assessed as part of foundational skills. With regard to the target population for an employability assessment comprised of simulation exercises and groups tasks which require a certain level of proficiency in reading and, to a lesser extent, mathematics, the figure suggests that targeting urban and peri-urban locations is warranted (i.e. Grade 6 pupils in these locations tended to perform better on SACMEQ III). In some cases, however, the rural–urban performance differential is not substantial (e.g., Seychelles, Swaziland, Mozambique, Malawi) and therefore limiting the target population to peri-urban areas in these contexts might not be warranted, based on academic performance alone.26

Another international assessment which sheds some light on the mathematics achievement among young people in countries “similar enough” to those in which RTI works or has worked is the TIMSS assessment. This instrument is administered every four years to both fourth and eighth grade students in participating countries. The latest administration was in 2011 in 63 countries and 14 benchmarking entities (i.e. regional jurisdictions of countries, such as states).27 While the typical country participating in TIMSS tends to be middle or upper-middle or high-income, there were a few countries in 2011 that are similar to those in which RTI has worked in the past. Indeed, Jordan, South Africa, and Ghana are all countries in which RTI has worked previously. Moreover, this assessment is germane to this report as the Grade 8 pupils assessed are close to the target age for an employability assessment (i.e. around 15 years of age). Figure 6 displays the proportion of Grade 8 students who meet each of the four achievement cut points in the 2011 TIMSS assessment.

26 Though average reading and mathematics performance might be similar in rural and urban areas in these contexts, a peri-urban focus might be warranted for other reasons (e.g., technology familiarity).
From Figure 6, at least 50% of Grade 8 pupils in approximately one-half of the “similar enough” countries met the “low” performance benchmark, while in the rest of the countries less than 50% of pupils met the low benchmark. Box 2, below, gives a fuller description of the mathematic requirements for each of the assessment performance levels. To meet the low performance level, students must have some knowledge of whole numbers and decimals, operations, and basic graphs. According to the data presented by Mullis and colleagues (2012), few Grade 8 pupils achieved at performance levels higher than the low benchmark; only approximately one in every three pupils achieved the intermediate benchmark in Lebanon and one in every four pupils in Thailand. Very few pupils (i.e. less than 10%) achieved the high or advanced performance levels. This suggests that, according to this assessment, the vast majority of students in countries similar to those in which RTI works have only basic knowledge of whole numbers and decimals, operations, and graphs. These findings are in line with those of SACMEQ III, which showed low average achievement in mathematics among Grade 6 pupils. For the purposes of this report, this serves to reinforce the notion that an assessment of foundational mathematical ability will have to be aimed at lower levels of knowledge, and that the assessment of work readiness skills, if it has to use numerical examples or skills, must assume that it can use only fairly low-level skills, so as not to prevent
identification of the work readiness skills because the students simply cannot carry out the mathematics needed to answer the questions or play the assessment “items” that test the work readiness skills. With regard to the simulation and group task components in the employability assessment, this level of mathematics proficiency (even TIMSS level 1) is likely to be sufficient for participation. Thus, countries such as those represented in the figure above are likely to have an adequate population of youth who are able to participate in such an assessment.

### Box 2.

**Descriptions of TIMSS performance levels**

**Advanced (625)**
- Students can reason with information, draw conclusions, make generalizations and solve linear equations.
- Students can solve a variety of fraction, proportion, and percent problems and justify their conclusions.
- Students can express generalizations algebraically and model situations.
- They can solve a variety of problems involving equations, formulas, and functions.
- Students can reason with geometric figures to solve problems.
- Students can reason with data from several sources or unfamiliar representations to solve multi-step problems.

**High (550)**
- Students can apply their understanding and knowledge in a variety of relatively complex situations.
- Students can use information from several sources to solve problems involving different types of numbers and operations.
- Students can relate fractions, decimals, and percentages to each other.
- Students at this level show basic procedural knowledge related to algebraic expressions.
- They can use problems of lines, angles, triangles, rectangles, and rectangular prisms to solve problems.
- They can analyze data in a variety of graphs.

**Intermediate (475)**
- Students can apply basic mathematical knowledge in a variety of situations.
- Students can solve problems involving decimals, fractions, proportions, and percentages.
- They understand simple algebraic relationships.
- Students can relate a two-dimensional drawing to a three-dimensional object.
- They can read, interpret, and construct graphs and tables.
- They recognize basic notions of likelihood.

**Low (400)**
- Students have some knowledge of whole numbers and decimals, operations, and basic graphs.

Source: Mullis, Martin, Foy & Arora, 2012
The PIRLS assessment of reading is also administered by the IEA every four years. Unlike TIMSS, however, PIRLS assessed only Grade 4 pupils and therefore is slightly less relevant for this study, but nevertheless can provide some insight into the reading achievement of younger children in several countries similar to those in which RTI works. Figure 7 shows the proportion of Grade 4 pupils that performed at each of four PIRLS 2011 reading benchmarks: low, intermediate, high, and advanced. According to the results displayed below and reported by Mullis and colleagues, higher proportions of assessed pupils seem to be reading at the PIRLS performance levels than was the case with TIMSS.28 Nevertheless, most Grade 4 children are only reading at the low performance level or below; that is, they can locate and reproduce explicitly stated detail in an informational or literary text. Between one in five and one in three pupils assessed in the countries reported in Figure 5 were found to be reading at the intermediate performance level. While these findings are not as relevant for an employability assessment focus on 15-year olds (pupils assessed by PIRLS are in Grade 4), they do indicate that a significant minority of pupils may have requisite reading skills to participate in any simulation exercises and group tasks that require reading. Box 3, below, describes in detail students’ abilities at this performance level, but it will suffice to state here that reading abilities are relatively low in these countries, though perhaps more competent in this area than in mathematics.

![Figure 7. Proportion of 4th grade students meeting performance levels in PIRLS, 2011](source)

Source: Mullis, Martin, Foy & Drucker, 2012
Note: Values do not add up to 100 as: 1) not all students reach any of the attainment levels and 2) the attainment of higher performance levels is cumulative (i.e. all students who meet performance level 3 by definition also meet performance levels 2 and 1).

---

Box 3.  
Descriptions of PIRLS performance levels

Advanced (625)

When reading literary texts, students can:
- Integrate ideas and evidence across a text to appreciate overall themes
- Interpret story events and character actions to provide reasons, motivations, feelings, and character traits with full text-based support

When reading informational texts, students can:
- Distinguish and interpret complex information from different parts of text, and provide full text-based support
- Integrate information across a text to provide explanations, interpret significance, and sequence activities
- Evaluate visual and textual features to explain their function

High (550)

When reading literary texts, students can:
- Locate and distinguish significant actions and details embedded across the text
- Make inferences to explain relationships between intentions, actions, events, and feelings, and give text-based support
- Interpret and integrate story events and character actions and traits from different parts of the text
- Evaluate the significance of events and actions across the entire story
- Recognize the use of some language features (e.g., metaphor, tone, imagery)

When reading informational texts, students can:
- Locate and distinguish relevant information within a dense text or a complex table
- Make inferences about logical connections to provide explanations and reasons
- Integrate textual and visual information to interpret the relationship between ideas
- Evaluate content and textual elements to make a generalization

Intermediate (475)

When reading literary texts, students can:
- Retrieve and reproduce explicitly stated actions, events, feelings
- Make straightforward inferences about the attributes, feelings, and motivations
- Interpret obvious reasons and causes and give simple explanations
- Begin to recognize language features and style

When reading informational texts, students can:
- Locate and reproduce two or three pieces of information from within the text
- Use subheadings, text boxes, and illustrations to locate parts of the text

Low (400)

When reading literary texts, students can:
- Locate and retrieve an explicitly state detail

When reading informational texts, students can:
- Locate and reproduce explicitly stated information that is at the beginning of the text

Source: Mullis, Martin, Foy & Drucker, 2012
This section has begun to elaborate both the general characteristics and demographics of a likely target population of an employability assessment, as well as to describe the performance of foundational skills such as reading mathematics in countries that are “similar enough” so as to be illustrative of likely target countries. In summary, the target population is likely to be of “school-leaving” age (i.e. around 15 years), in a peri-urban location, likely to find employment in small or medium enterprises, from lower- or lower-middle income households, and at least somewhat technologically savvy. This brief analysis of international assessment data suggests that there are sufficient numbers of pupils with adequate reading and, to a lesser extent, math, proficiency in likely target countries to participate in an assessment of employability skills that requires both of these foundational skills. In particular, peri-urban areas appear to be a good context in which to conduct at least initial assessments.

With regard to foundational skills such as mathematics and reading, this study found evidence to the effect that reading achievement levels tend to be slightly higher than mathematics achievement levels in countries similar to a likely target country. Regardless, achievement in these foundational skills is on the low end of international benchmarks. As a consequence, any assessment of foundational skills done in parallel (or as a part of) an employability assessment would need to target lower levels of proficiency.

7 Conclusions and recommended next steps

The research and activities undertaken for this report were intended to advance the development of an assessment of employability skills. This report has outlined research conducted through literature reviews, expert interviews, panel meetings, and desk reviews of international assessments in order to advance understanding of the skills that comprise employability and how they could be measured. These efforts advanced the development of an employability assessment in a number of ways.

First, this report presented a skills framework for employability that was developed and tested with input from a number of experts in the field and subsequently tested against other experts. This framework is comprised of six skill areas (i.e. dependability, learning skills, perseverance, problem-solving, intrapersonal skills, and interpersonal skills) and 17 prioritized sub-skills, all of which are important, teachable, and measurable such that they warrant initial consideration in the development of an assessment instrument.

Second, this report outlines assumptions behind an assessment of employability skills and describes the assessment protocol in brief.
Third, the desk review of international assessments and expert interviews yielded an initial description of the target population for an assessment of employability. This report presented the general characteristics and demographics of a likely target population for such an assessment. In addition, the report attempted to go into some detail in describing the foundational skills (i.e. reading and mathematics) a likely target population have. Findings in this regard suggest that reading and mathematics performance in low-income countries is low in comparison to international benchmark levels, and considerable variation exists between and within countries. In turn, this suggests that context is important when designing an assessment of employability skills that is conducted in parallel with, but which may also presuppose, foundational skills.
Appendix A: An illustrative framework for teamwork

A distinctive feature of the research conducted for this report was that attention was paid to one specific skill area of employability: teamwork. This was done in order to understand the skills inherent in team performance and to focus on depth of understanding rather than breadth across an entire employability framework. To this end, significant time was spent researching and outlining skills associated with teamwork and team performance. These skills are presented in a framework below as illustrative of how to dive deeply into one skill area (or cluster) and to define well the skills that comprise it.
<table>
<thead>
<tr>
<th>Skill</th>
<th>Definition</th>
<th>Sub-skills</th>
<th>Measurement source(s)</th>
<th>Academic source(s)</th>
</tr>
</thead>
</table>
| Preference for mutual goals | The preference for, propensity to work towards, and sense of responsibility for collective goals rather than individual/selfish ones. | • Team orientation  
• Mutual performance monitoring  
• Humility  | • ACT Workkeys  
| Agreeableness         | A tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others. | • Trust  
• Straightforwardness  
• Altruism  
• Compliance  
• Modesty  
• Tender-mindedness | • HEXACO Personality Inventory – Revised  
• NEO-PI-R  
• Cattel 16 Personality Factors  
<table>
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<tr>
<th>Skill</th>
<th>Definition</th>
<th>Sub-skills</th>
<th>Measurement source(s)</th>
<th>Academic source(s)</th>
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<td></td>
<td></td>
<td>• Performance-oriented</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>• Professionalism</td>
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<tr>
<td></td>
<td></td>
<td>• Sense of responsibility</td>
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<tr>
<td></td>
<td></td>
<td>• Self-reflection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Patience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td>Working together in distinctive, specific roles</td>
<td>• Shared goals</td>
<td>• Cisco Collaboration</td>
<td>Axelrod, R. &amp; Hamilton, W.D. 1981. The evolution of cooperation. Science, 211, 1390-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Flexibility</td>
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Towards the Development of an Assessment of Employability Skills
<table>
<thead>
<tr>
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<th>Definition</th>
<th>Sub-skills</th>
<th>Measurement source(s)</th>
<th>Academic source(s)</th>
</tr>
</thead>
</table>
|       | to accomplish a task or goal collectively, pooling individual resources. | • Reflectiveness  
• Knowledge of team roles | Analytics  
| Communication | Actively engaging in conversation with team members, listening, responding, and being open to new information or ideas. | • Oral communication  
• Written communication  
• Listening  