# All Children Reading–Asia

## Research Report: Investing in Early Grade Reading in Lower and Middle-income Countries in Asia

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# List of Acronyms and Abbreviations

| | |
|---|---|
| ACR | All Children Reading |
| ADB | Asian Development Bank |
| ASEAN | Association of Southeast Asian Nations |
| EGR | early grade reading |
| OECD | Organisation of Economic Co-operation and Development |
| PIAAC | Programme for the International Assessment of Adult Competencies |
| SDG | sustainable development goal |
| STEP | Skills towards Employability and Productivity |
| USAID | US Agency for International Development |
| WEF | World Economic Forum |

# 1 Executive Summary

Support for early grade reading in Asia has tangible benefits for foreign governments and markets. At the most fundamental level, support for early grade reading improves reading outcomes, as well as the future livelihoods of children and their families. It is prudent to emphasize that an equally important benefit is realized in parallel for the American economy – a thriving global market is in the National interest. National interests are served by helping other countries develop economically and socially. Investment in education (literacy in particular) engenders a more highly skilled, innovative workforce, fuller employment, and a developing economy. Fuller employment and shared economic development begets more stable, less violent societies. Such countries are better candidates (than unstable societies) for trade and cooperation agreements, which translates to growth opportunities for US businesses. Investment in education, even in the early grades, sets individuals on positive trajectories that impact their communities and (in aggregate) their countries. Therefore, based on the analysis presented in this report, we can answer a resounding "yes" in response to questions such as: Does aid for international educational development align with an "America First" policy approach? Does educational aid impact positively upon national security? Does continued investment in education systems in developing countries provide economic benefit for the United States?

This affirmative response is not because educational development programs are a silver bullet for all societal needs and wants, but rather because there is consensus that international aid (including educational aid) has net positive effects for recipients—and donors (e.g., Hansen & Tarp, 2001; Moreira, 2005; Clemens et al, 2011; Galiani et al, 2017).[1] Thus, investment in education – especially in the early grades when small ventures reap large returns – sets individuals on positive trajectories that impact their communities and (in aggregate) their countries. We argue that is an investment worth making.

USAID/Washington, via the All Children Reading (ACR)—Asia task order, commissioned RTI International to conduct research on whether lower and middle-income countries in Asia should invest in early grade reading. To do so, we consider the relationship between increased literacy and employment and social outcomes. We also investigate evolving job opportunities in developing Asian economies, their literacy requirements, and the relationship of Asian growth to the US economy. We then examine data on the current literacy levels among school-going and young-adult populations in Asian countries to see if they meet the needs revealed by job market trends in Asia.

Available data show strong, positive, and significant returns not just to years of schooling, but to the acquisition of specific skills, such as literacy. The relationship between education, skills, and economic benefits (individual and societal) is strongest in lower and middle income countries.

The data from projections of future job opportunities show job markets in Asia shifting in two important ways. Projected employment growth lies in categories of jobs that increasingly require more advanced literacy skills, such as reading comprehension—and jobs that do not require these skills today, will require them in the future. In general, predicted job growth in Asia is greater in higher-skill, higher-wage jobs that grow consumer purchasing power and facilitate international trade.

Analysis of available data on learning outcomes reveals that students are not acquiring strong applied literacy skills such as reading comprehension. Furthermore, those students

[1] See also: https://www.brookings.edu/blog/future-development/2017/05/08/once-more-into-the-breach-does-foreign-aid-work/?utm_campaign=Brookings%20Brief&utm_source=hs_email&utm_medium=email&utm_content=51671772.

who do acquire basic literacy skills early are significantly more likely to deepen those skills as they advance through their education, and thus are also more likely to complete higher levels of schooling.

Taken together, the analyses presented in this report show conclusively that it continues to be important for lower and middle income countries in Asia to invest in improving the teaching and learning of literacy skills in early grades. Emphasis should be placed not only on foundational skills, but also on applied skills, such as reading for comprehension across subject areas and applying information gleaned through reading various types of text to understand and solve increasingly complex problems. Education systems therefore must address the full continuum of reading skills development, beginning in the early years and throughout primary school.

# 2 Introduction

Education constitutes a significant and indivisible investment, on both the societal and individual levels (Banerjee, 2000; Nordstrum, 2011). At the individual level, education is valued as an investment (education is valued for future returns and income) and consumption good (education has intrinsic value) (Glewwe and Jacoby, 2004). In terms of societies, human capital is essential for economic and human development: such investment can engender both market returns, in the form of economic growth, innovation, and an expanded workforce, and non-market progress—low crime rates, good public health, political stability (Aghion and Bolton, 1992; Galor and Ziera, 1993; McMahon, 2002). A vast literature explores the interconnections between education, human capital, individual skills, the economy, and social progress. Traditionally, this literature has focused on years of schooling as a generic, though informative, proxy measure for skills. More recent efforts have provided direct measures of skills, including literacy achievement. This literature asserts that literacy is what lays the groundwork for overall academic success and other important life outcomes (Stormquist, 2009; United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2006).

It is for these reasons that USAID has invested heavily in raising the reading ability of millions of children across dozens of countries. Goal 1 of the 2011–2015 Education Strategy was to improve reading instruction; strengthen education delivery systems; and enhance engagement, accountability, and transparency by communities and the public. Between 2011 and 2015, USAID-sponsored early grade reading programs reached 37.7 million primary-aged students (USAID, 2016).

This rationale for investing in early grade reading—which, as stated previously, is backed up by a growing body of evidence—should not be cast aside when considering future budget allocations to education development. Rather, evidence and results should inform decision-making. The purpose of this report, then, is to present evidence of the impact of early grade reading on individuals' livelihoods and societal progress. To be most useful, we attempt to align this evidence with what we understand to be the policy priorities of the current administration, such as national security, international leadership and influence, and providing economic opportunities for American companies.

Given the varying definitions of literacy that exist, it is important to address the definition used in this report before delving into evidence and argument for investment in literacy. Literacy is frequently viewed as a simplistic dichotomous skill: either individuals are able to read and write or they are not. This view, however, is fallacious and misleading; rather, literacy is a skill that is gradually acquired and is instrumental. Literacy is useful, for individuals, for participating in higher levels of education and in the workplace. In other words, it is inherently functional. As the Organisation for Economic Co-operation and Development (OECD) states: literacy is the "ability to understand, use and reflect on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to

participate effectively in society" (OECD, 2002). Literacy is also a process learned over time (as shown in ***Table 1***): the results gained from learning to read can be viewed as cumulative in nature as they build upon one another (Roskos et al., 2009). As such, literacy can therefore be conceived as a functional ability as well as a foundational skill, allowing the literate reader to do something as a result of his/her ability.

**Table 1. Stages of Literacy**

| Stage | Name | The Learner |
|---|---|---|
| **Stage 0: Birth to Grade 1** | Emergent Literacy | Gains control of oral language; relies heavily on pictures in text; pretends to read; recognizes rhyme |
| **Stage 1: Beginning Grade 1** | Decoding | Grows aware of sound/symbol relationships; focuses on printed symbols; attempts to break code of print; uses decoding to figure out words |
| **Stage 2: End of Grade 1 to end of Grade 3** | Confirmation and Fluency | Develops fluency in reading; recognizes patterns in words; checks for meaning and sense; knows a stock of sight words |
| **Stage 3: Grade 4 to Grade 8** | Learning the New (Single Viewpoint) | Uses reading as a tool for learning; applies reading strategies; expands reading vocabulary; comprehends from a singular point of view |
| **Stage 4: Secondary and Early Higher Education** | Multiple Viewpoints | Analyzes what is read; reacts critically to texts; deals with layers of facts and concepts; comprehends from multiple points of view |
| **Stage 5: Later Higher Education and Graduate School** | A Worldview | Develops a well-rounded view of the world through reading |

Source: Roskos et al., 2009.

As mentioned in the Executive Summary, the overarching purpose of this report is to present evidence for investing in early grade reading programs in the context of lower- and middle-income countries in Asia. The next section (Section 3) explores the relationship between increased literacy and employment and other social outcomes. Section 4 investigates the job markets in developing Asian economies and discusses literacy requirements associated with trending jobs. Section 5 presents data on the current levels of literacy in Asian countries. Based on findings and linkages among these three important topics, we draw conclusions (presented in Section 6 and Section 7) regarding the importance of investing in early grade reading for low- and middle-income countries in Asia.

# 3 What is the relationship between increased literacy and the workforce and economy?

As noted above, literacy (and education, more generally) is inherently valued and is instrumental. We intend to show that literacy enhances livelihoods by expanding opportunities for individuals to participate in the economy and in civil society. These returns do not just accrue to individuals; rather, they also generate important collective effects on communities and societies.

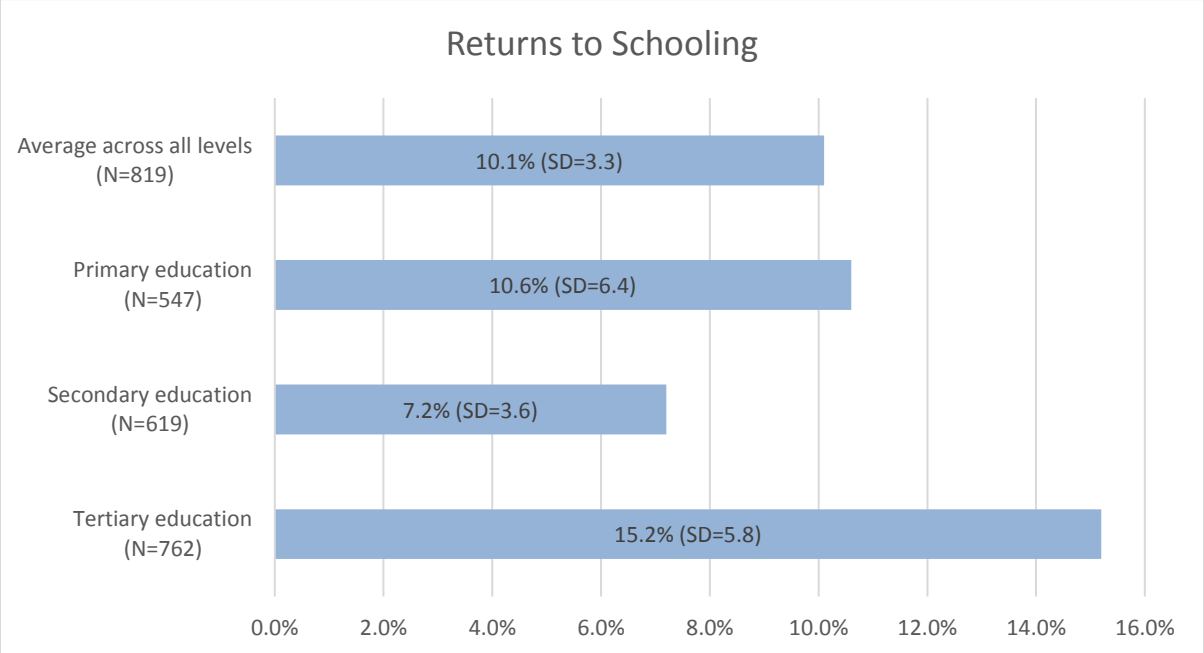
Education, skills, and literacy are not synonymous; however, there are considerable links between the three. The tendency to conflate education, in terms of years of schooling, with skills and literacy has been of recent debate (Pritchett, 2013). In other words, does simply being present at school ensure learning or the acquisition of skills? While school enrollment and attainment levels have increased significantly around the world over the past several decades (UNESCO, 2015), a shift in education to quality over quantity was recently made a global priority with the 2015 sustainable development goals (SDGs). This shift is due, in part,

to the fact that those with higher skills tend to stay in school longer, and the impact of skills on economic returns gained from education remain intertwined with continuation and completed years of schooling (Hanushek et al., 2013). In this section, we explore the relationship between increased literacy and the workforce and economy, first using data on returns to education and then looking at the impact of skills. Both methods show positive relationships. Lastly, we present the accrued effects that increased literacy can have on societies as a whole.

## 3.1 Returns to Education

Traditional methods of measuring skills returns have relied on the Mincerian framework. The Mincer formula posits that because schooling develops general skills, the number of years of schooling completed is a good indicator for measuring human capital. In 2014, the World Bank published a study, *Comparable Estimates to the Returns of Schooling around the World,* examining the relationship between education and earnings in an effort to compare returns to schooling (in terms of wage premiums) around the world. The study, led by Montenegro and Patrinos, found schooling to have a positive effect on individual returns. ***Figure 1*** below provides summary results of the returns to schooling, first across all levels of education then at the primary, secondary, and tertiary levels, individually. These results are based on 819 observations from across 139 economies between 1970 and 2013. This model reveals that an additional completed year of education yields about a 10% increase in wages, on average, across economies. Results from this study indicate that the returns are higher for girls and women than for boys and men, 11.7% and 9.6% respectively (Montenegro & Patrinos, 2014).

**Figure 1. Average Returns to Schooling (%) across 139 Economies**




Source: Adapted from Montenegro & Patrinos, 2014, p. 8.

While the data consistently show positive returns on the number of years of education at all levels (i.e., primary, secondary, and tertiary), Montenegro and Patrinos also noted an overall decrease to these returns in recent decades. Increases in school attainment levels within the world's economies has driven down the returns on wages. Over the last 30 years as the average years of schooling has increased around the world by 3 or more years, returns to schooling have decreased by 3.5 percentage points. This decrease is of less relevance for low- and middle-income economies where returns are highest. Sub-Saharan Africa (see

***Table 2***) has the highest average returns to schooling followed by East Asia and Pacific. Individuals in sub-Saharan Africa, on average, see a 12.4% increase in wages for each additional year of education completed; those from the East Asia and Pacific region, on average, see a 9.4% return to schooling. Overall, returns to schooling in Asian countries are similar to the average across all economies (Montenegro and Patrinos, 2014). There seems to be a great deal of variation in returns to education between economies (which may result from combination of factors including varying levels in quality of education systems and various economic dynamics), however, the impact of completing additional years of schooling is stronger (and remains strong in general) for developing countries where overall school attainment levels tend to also be lower.

The impact of completing additional years of schooling is stronger for developing countries where overall school attainment levels tend to be lower.

**Table 2. Average Returns (%) to Schooling by Region**

| Region | Average Returns to Schooling (%) | | | Average Years of Schooling | | | N |
|---|---|---|---|---|---|---|---|
| | Total | Male | Female | Total | Male | Female | |
| High Income Economies | 10.0 | 9.5 | 11.1 | 12.9 | 12.7 | 13.1 | 33 |
| East Asia and Pacific | 9.4 | 9.2 | 10.1 | 10.4 | 10.2 | 10.7 | 13 |
| Europe and Central Asia | 7.4 | 6.9 | 9.4 | 12.4 | 12.2 | 12.7 | 20 |
| Latin America and Caribbean | 9.2 | 8.8 | 10.7 | 10.1 | 9.5 | 10.9 | 23 |
| Middle East and North Africa | 7.3 | 6.5 | 11.1 | 9.4 | 9.2 | 11.0 | 10 |
| South Asia | 7.7 | 6.9 | 10.2 | 6.5 | 6.5 | 6.4 | 7 |
| Sub-Saharan Africa | 12.4 | 11.3 | 14.5 | 8.0 | 8.1 | 8.1 | 33 |
| All Economies | 9.7 | 9.1 | 11.4 | 10.4 | 10.2 | 10.8 | 139 |

Source: Montenegro & Patrinos, 2014, p. 11.

## 3.2 Payoffs of Cognitive Skills

While the wage returns to years of schooling are helpful in assessing education's impact on earnings generally, they also mask more specific relationships between skills, such as literacy, and employment outcomes. Recent studies argue that individuals' cognitive skills are more accurate for evaluating individual or economic returns. The use of direct assessment surveys to obtain data on adult skills has become more frequent and provides new information about how cognitive skills, and in many cases literacy in particular, impact returns.

Hanushek, Schwerdt, Wiederhold, and Woessmann explore a method that looks beyond the notion of completed years of schooling and uses skills for estimating returns. The results use data from the Programme for the International Assessment of Adult Competencies (PIAAC) collected in 2011–2012 across 22 OECD economies. PIAAC collects data on how adults develop and use skills through a Survey of Adult Skills that measures literacy, numeracy, and problem solving. The estimates and findings from Hanushek et al. again indicate there is a significant and positive effect of skills on earnings: "proficiency in literacy, numeracy and problem solving in technology-rich environments is positively and independently associated with the probability of participating in the labour market and being employed, and with higher wages" (Hanushek et al., 2013). While PIAAC collects data in OECD economies only, its finding regarding the significance of cognitive skills can be seen as relevant and important across all economy types.

A recent World Bank study, conducted by Valerio, Puerta, Tognatta, and Taborda (2016), investigates skills payoffs in low- and middle-income countries. Rather than only evaluating returns via years of schooling completed, Valerio et al. use data from the Skills towards Employability and Productivity (STEP) surveys. The STEP program measures cognitive skills through a direct literacy assessment that is designed to identify one's ability to access, integrate, and evaluate information.[2] Valerio et al. included eight sample countries: Armenia, Bolivia, Colombia, Georgia, Ghana, Kenya, Ukraine, and Vietnam. First looking at years of schooling, the study found positive returns. Similar to the study conducted by Montenegro and Patrinos that estimated an average of 10 percentage points worldwide on the returns of schooling, this study showed an increase of 5 to 7 percentage points in hourly earnings for each additional year of schooling completed in the countries studied (Valerio et al., 2016).

The main focus of the study conducted by Valerio and colleagues (2016), however, is to analyze the relationship between earnings and cognitive skills, as measured through reading proficiency. The results show "skills yield significant payoffs in the labor market, even after controlling for education and other relevant individual and family background factors." The association between reading proficiency and earnings is positive and significant for all the countries in the sample with the exception of Armenia. According to the data from the study, the estimated effects of reading proficiency on hourly earnings are highest in Ghana, Kenya, and Vietnam (see ***Table 3***). The effect of skills appears to be highest among the lowest income economies within the sample. In Table 3 below, looking at data from Vietnam specifically, an increase in reading skills by one standard deviation results in an increase of about 15% in hourly earnings. The effects of reading skills on wages are also high in Kenya and Ghana, increasing wages by nearly 15% and 19% respectively. While this study does not estimate the returns of skills but rather looks at the net effect of skills on earnings, the results found the relationship between wages and reading proficiency was more significant than that between wages and years of education in three of the eight sampled countries (Ghana, Ukraine, and Vietnam) (Valerio et al., 2016).

[2] The STEP surveys measure cognitive skills, socio-emotional skills, and job relevant skills; however, for the purposes of this report, we will explicitly focus only on cognitive skills related to literacy. For a full description of how the STEP survey measures literacy and reports results, see Gaëlle, P., Pierre, Sanchez Puerta, M.L., Valerio, A., & Rajadel, T., 2014.

**Table 3. Estimated Effect of Reading Proficiency on Hourly Earnings, Workers Aged 25 to 64**

| | Panel A | | Panel B (controlling for schooling) | | |
|---|---|---|---|---|---|
| | Reading | Standard Deviation | Reading | Standard Deviation | N |
| Armenia | -0.003 | (0.04) | -0.011 | (0.03) | 1557 |
| Bolivia | 0.120*** | (0.05) | 0.067 | (0.05) | 847 |
| Colombia | 0.085* | (0.05) | -0.022 | (0.05) | 1190 |
| Georgia | 0.085* | (0.04) | 0.065 | (0.05) | 1464 |
| Ghana | 0.188*** | (0.07) | 0.140*** | (0.07) | 1174 |
| Kenya | 0.158*** | (0.06) | 0.059 | (0.05) | 1454 |
| Ukraine | 0.086*** | (0.03) | 0.072*** | (0.03) | 1370 |
| Vietnam | 0.148*** | (0.03) | 0.061* | (0.04) | 1948 |

Note: Standard errors in parentheses. *p<0.1, **p<0.05, ***p<0.01. Reading proficiency scores are standardized. Schooling is measured as completed years of education. The wage model controls for potential experience, experience squared, and occupation. The Heckman method is used to correct for selection bias.

Source: Adapted from Valerio et al. 2016, p 23.

## 3.3 Societal Effects of Increased Literacy

We have seen that enhanced literacy ability begets opportunities for individuals to participate more fully in the economy, and that these opportunities lead to wage returns. In other words, literacy is valued as a workplace skill and individuals are rewarded for possessing and utilizing it therein. If literacy is, as an instrumental skill, conferred to a majority of individuals within a society, those individual wage returns inherently aggregate to higher household incomes and standards of living. Individuals and households inevitably have more money to spend on goods and services, which increases market demand and opportunities for others to provide those goods and services. Thus, the individual returns presented above should not be thought of as solely benefitting individuals.

In addition to the impact of literacy (and skills) on individual wages or economic growth (i.e., income or wealth), there are other significant effects that increased literacy can bring about in society. While the social benefits of literacy (or education in general) are harder to measure, they are undeniably present and an important factor to discuss. The correlations between education and societal development are argued to happen in parallel, meaning that one does not necessary cause the other but rather, they are mutually supportive (Morris and Sweeting, 1995).

Larger societal benefits from increased literacy may start out at the individual level (e.g., better health), but inevitably tend to accrue to families, communities, and society. For example, more literate societies tend also to have higher life expectancy rates, lower crime, less teen pregnancy, and lower infant mortality (e.g., Sen, 1997; McMahon, 2000; McMahon, 2002; Wolfe and Haverman, 2002; UNESCO, 2005). As an illustrative example, a longitudinal study conducted in 2002 in Nepal examined the effects that literacy and basic education have on women's ability to contribute to social and economic development within the country. The study found that improved literacy and participation in basic education impacted the participants' ability to contribute to other parts of society, including political affairs, increased knowledge around reproductive health, and school/community issues pertaining to their children's wellbeing (Burchfield, Hal, Baral, & Rocha, 2002).

Literate societies also tend to be less violent and more stable. A unique analysis of collective violence in the context of the Rwandan genocide (Yanagizawa-Drott, 2012) considered the role of mass media in fomenting violent behavior and the ability of education and literacy to mitigate it. Using a nationwide village-level dataset and measures of education and literacy, the author finds that enhanced literacy levels were associated with a lower likelihood of participating in violence in Rwanda. In this case, literacy ability enabled individuals to read national newspapers, which were the only alternative media sources to the radio transmissions. Access to and comprehension of such newspapers mitigated the effect of radio stations that incited violence.

Afghanistan represents a case example of the trade-off between State Department funding (including diplomacy and international aid for education) and military intervention. Conservative estimates indicate that the war in Afghanistan cost US taxpayers approximately $686 billion between 2001 and 2015 (Congressional Research Service, 2014). In contrast, educational assistance during that time has built 16,000 schools, recruited and trained 154,000 teachers, and increased enrollment rates to 60% (in 2001, fewer than 1 million students attended schools in Afghanistan; now more than 9 million do).[3] Though education alone cannot solve all the issues in Afghanistan, it is a crucial part of building towards future opportunities and a shared prosperity that are effective counterbalances to radical extremist groups.

## 3.4 Discussion

Gains from increased literacy are recognized far beyond the individual level and tend to have significant positive effects on multiple aspects of society.

USAID expresses a great desire to contribute to the SDGs with a holistic approach. Education and skills learned by individuals both can be seen as important and independent predictors of individual and greater societal outcomes, meaning the benefits span and can contribute directly to multiple development goals. Benefits starting at the individual level tend to expand outward and transfer to various aspects of human, political, social, cultural, and economic life. The literature and data presented in this section use various methods to make the claim that increased literacy has positive effects at individual, economic, and societal levels. Some research on this topic relies on measuring returns to education using the number of completed years of schooling. Other studies present evidence using data that measure cognitive skills. While it is important not to confound the differences between education, literacy, and skills (as these are all separate yet interrelated things), the findings are clear in most all cases that the effects are positive, strong, and significant.

Many of the data on this topic show that the relationship between education or skills and the economy vary widely amongst countries. This is not surprising given that countries vary greatly in their levels of development. What is of more interest, however, is the fact that the relationship tends to be strongest in lower- and middle-income countries. In other words, school attainment and the acquisition of foundational cognitive skills, such as literacy, are most important for those in less developed countries. These gains from increased literacy are recognized far beyond the individual level and tend to have significant positive effects on multiple aspects of society.

[3] See: https://www.brookings.edu/blog/future-development/2017/05/08/once-more-into-the-breach-does-foreign-aid-work/?utm_campaign=Brookings%20Brief&utm_source=hs_email&utm_medium=email&utm_content=51671772

# 4 How important is literacy to Asia's economic potential as the leading US trade partner?

USAID assistance to Asia helps develop the building blocks needed for sustainable economic growth. Primary among these building blocks is the promotion of education systems that create the skills needed for a productive workforce and increased individual incomes. Strong education and workforce development systems not only lift people out of poverty and support vibrant economies in Asia, they also benefit the US economy. The Asia region is a major US trading bloc, representing nearly 40% of the world's purchasing power, making it a prime market for US exports (World Economic Outlook, April 2017). Asia is also a major supplier of critical inputs for US led value chains—providing raw materials, agriculture products, and energy resources. With more than 20% of US jobs and $2.2 trillion in US GDP dependent on trade, the effective functioning of Asian markets is essential to American national interest (US Chamber of Commerce, 2013). This relationship makes the question of the importance of literacy levels to Asia's continued economic growth important to both the US and its Asian partners.

The preceding analysis (Section 3) points to a clear, positive relationship between educational attainment, skills acquisition, and economic and social gains. Importantly, the analysis is retrospective, with some of the data dating to the 1970s—well before the computing age and widespread globalization transformed the world economy, particularly in Asia. To capture current and forthcoming realities for the region, this section takes a prospective view, presenting data on Asia's economy of the future and analyzing the importance of literacy skills to growing sectors and professions. Overall, we find that literacy is of high importance to nearly all of the emerging and/or growing professions in Asia, especially those critical to higher-wage jobs and those linked to global commerce.

Overall, we find that literacy is of high importance to nearly all of the emerging and/or growing professions in Asia, with few exceptions. Rapidly expanding higher skill service sector jobs have particularly high literacy requirements.

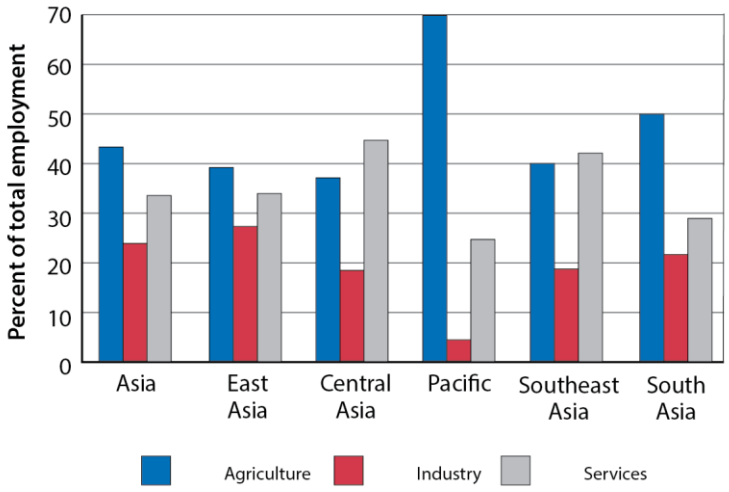
## 4.1 Asian Economic Change

The magnitude of ongoing and future global economic change is well documented, but nonetheless jarring. By one estimate, 65% of children entering primary school today will ultimately end up working in job types that do not yet exist (World Economic Forum, 2016a). The same World Economic Forum (WEF) analysis predicts that by 2020, more than a third of the skills that will be needed to perform in-demand jobs are not considered crucial to these jobs today. In part, these changes are driven by technological change, what some have called the 4$^{th}$ Industrial Revolution (Schwab, 2017), including automation, robotics, big data, and the internet of things. Equally important is the rise of a global "consuming class," predicted to grow to 1.8 billion people in the next 10–15 years, with 75% of it located in Asia—leading to changes in demand for certain foods, services, and products (Bove & Swartz, 2016).

These changes to production and consumption have challenged economic modernization theory. Conventional development theory has held that as countries develop they will see employment shares and output shift from the agricultural sector to the manufacturing sector and eventually the service sector, with at least 20% of employment in manufacturing being a benchmark of developed economies. While the shift away from agriculture-dominated economies is happening today—agriculture jobs have decreased from 46% of global employment in 1980 to 30% in 2010 (Dobbs, et. al., 2012)—the picture in Asia has been different in important ways.

Of the 800 million people in Asia currently employed, 43% of them work in agriculture (***Figure 2***). This employment share is down from a 65% share in the 1970s, but agriculture still represents the largest employment share in most Asian economies (Asian Development Bank, 2013).

**Figure 2. Share of Employment by Sector, Asia (% of total employment, latest year)**




Source: Asian Development Bank, Asia's Economic Transformation: Where to, How, and How Fast?, 2013, p. 8.

Asian Development Bank (ADB) projections for the next 25 years show further reductions in agriculture employment shares across Asia. The ADB predicts that some ASEAN economies will reach very low agriculture employment share levels, with Vietnam, India, and Bangladesh trending to below 40% and Indonesia, Thailand, and the Philippines to below 25% (Asian Development Bank, 2013).

With growth in non-farm labor, economic development theory would predict a rise in industrial production and manufacturing sector employment. This has not been the case in Asia, which has instead seen a large spike in service sector employment. In the mid-1970s, the industrial sector employed roughly 16% of the region's workers; 40 years later that share is now 23%. In other words, the 23% drop in farm labor over this time has only resulted in a 7% uptick in the industrial employment share. At the same time, the service sector's employment share has doubled from 17% to 34%—and in Central Asian and Association of Southeast Asian Nations (ASEAN) countries this figure is more than 40% (Asian Development Bank, 2013).

The creation of non-farm jobs and the rise of the middle "consuming" class—including large domestic and regional markets in Asia— has spurred the demand for the service sector.

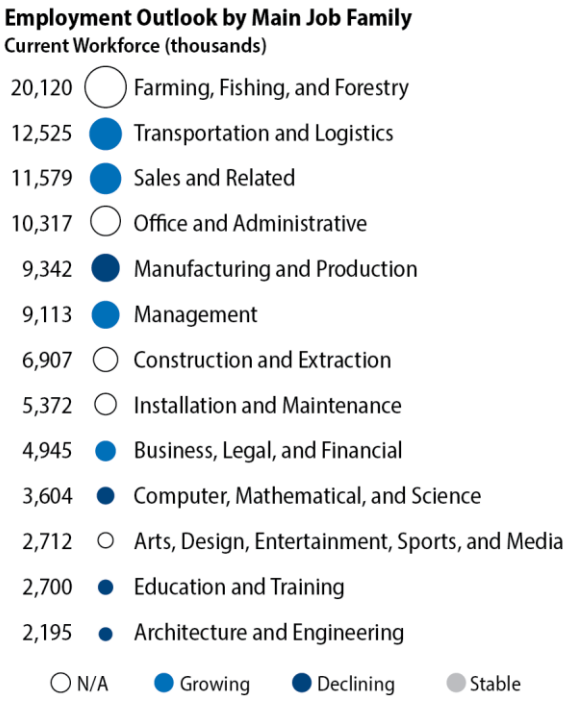
## 4.2 The Jobs of the Future

There are several ways to forecast changes to sectors and occupations over time. One way, employed by the WEF (2016b), is to survey employers across sectors and across countries about projected hiring demand. WEF interviewed nearly 400 chief human resource officials (or equivalent rank positions) at companies representing the 100 largest companies across nine broad sectors. The WEF data are global, but include data sets and breakouts for India and ASEAN. The second approach is economic modeling that projects economic change based on recent economic data and a set of assumptions about future trends. Such modeling has recently been done for select Asian countries (Petri, Plummer, and Zhai,

2013). We present both types of data below for ASEAN and India, which are largely representative of the countries USAID partners with in the region, and for which data were readily available.

***ASEAN:*** The WEF Future of Jobs (2016b) data for ASEAN predicts the highest job growth in the service sectors, particularly: management services, business services, legal services, financial services, transportation and logistics services, and sales and related services (see ***Figure 3***, from World Economic Forum, 2016b).

**Figure 3. ASEAN Employment Outlook**




Not shown: Social and Protective Services (7,226), Healthcare Practitioners (2,419), Hospitality and Food Related (7,046), Personal Care and Service (10,862)

Source: World Economic Forum, Future of Jobs, January 2016, p 92.

Similarly, economic modeling done by Petri, Plummer, and Zhai (2013) predicts that employment growth over the next 10 years will be greatest in services for each of the ASEAN countries they considered. Specifically, the model predicted high levels of growth in the same sectors designated by WEF: transport services, management services, business services, and food and hospital sales jobs. The model also projects growth in industrial employment shares for all ASEAN countries. Agricultural jobs are predicted to decrease in one country (Indonesia) and increase in all others, according to the model. The blue and grey shading in ***Table 4*** indicates the sector and subsector predicted to occupy the largest share of jobs by 2025.

**Table 4. Projected Job Growth for Select ASEAN Countries by 2025 (thousands of jobs)**

| Sector | Cambodia | Indonesia | Lao PDR | Philippines | Thailand | Vietnam |
|---|---|---|---|---|---|---|
| **Agriculture** | 998 | -1824 | 868 | 2520 | 1068 | -900 |
| **Industry** | 945 | 8373 | 189 | 3112 | 1326 | 3304 |
| **Mining** | 21 | 47 | 3 | 33 | -42 | -192 |
| **Manufacturing** | 359 | 2957 | 137 | 1348 | 621 | 1581 |
| **Utilities** | 16 | -3 | 7 | 62 | -52 | -132 |
| **Construction** | 550 | 5372 | 41 | 1668 | 800 | 2048 |
| **Services** | 1169 | 22,784 | 379 | 10,221 | 1034 | 8806 |
| **Trade & Transport** | 825 | 17,878 | 196 | 6772 | 1929 | 8354 |
| **Private Services** | 141 | 1977 | 92 | 2042 | -712 | 317 |
| **Public Services** | 203 | 2929 | 91 | 1407 | -183 | 136 |

Source: El Ackhar Hilal, 2014.

The WEF analysis—which relies on the perceptions and predictions of human resource officials from large companies—is complemented and confirmed by the economic modeling, itself subject to certain limitations, mainly the educated assumptions about future trends. Both predictions see ASEAN job growth in services as vital to trade and global commerce.

***India*:** The WEF data also allow us to look at projected job change in India—an economy with similarities to those of other South Asia countries, such as Bangladesh and Sri Lanka. For India, the WEF analysis suggests the following growing job areas: architecture and engineering; computer, mathematical; education and training; installation and maintenance; management; transportation and logistics (see ***Figure 4*** from World Economic Forum, 2016b). According to McKinsey & Co (Dobbs, et. al., 2012), India will create 160 million new jobs in manufacturing and services in the next 10–15 years. Services alone are projected to contribute 79% of the net new non-farm jobs in the next decade. Similar to the ASEAN forecasts, forecasts for India show that retail and wholesale trade, and higher-wage, skill-intensive service sectors (finance, real estate, health, and social services) are projected to significantly grow in the next decade (World Economic Forum, 2016b), with important implications for poverty reduction.

**Figure 4. India Employment Outlook**


Source: World Economic Forum, Future of Jobs, January 2016, p 106.

Taking these India and ASEAN projections together, and as a good overall representation for the countries of focus for USAID in Asia, we expect the highest job growth to be in semi-skilled services (transport and logistics, sales and related) and higher-skilled services (business and financial, management, legal) with more mixed results in the areas that typically get the greatest attention in the region (computer and mathematical, architecture and engineering, and manufacturing and production). Agriculture will continue to occupy a quarter to a third or more of employment shares in developing Asia, and thus agriculture productivity and upskilling in this sector is an ongoing priority, despite reductions in employment shares overtime.

What do these employment predictions mean for Asia's education and training systems? Specifically, what role does literacy play in these growing occupations?

## 4.3 Changing Skills Demand and the Importance of Literacy

Projections of skills gaps in Asia abound, with some claiming that if current education trends continue, India could have 27 million *too many* low-skill workers (Dobbs, et. al., 2012) and Indonesia could

Growing Jobs in Asia

- Semi-skilled services (transport, logistics, and sales)
- Higher skilled services (business, financial, management, legal)

have 9 million *too few* middle-skill workers by 2030 (Oberman, et. al, 2012). Such projections are made based on education attainment trajectories (i.e., what proportion of the population will have secondary degrees, vocational degrees, university degrees) and the predicted education requirements of occupations.

To drill down further and examine the skills requirements of particular sectors to answer the question of literacy's importance to emerging jobs, we analyzed occupation classification data from the O*Net system in the US—widely respected as the most comprehensive compilation of the skills needed for particular occupations.[4] The O*Net system surveys business managers and asks them to rank the importance of 35 different skills to the conduct of certain occupations; this is done for over 1,000 different occupations.[5] For each occupation, O*Net reports and ranks the skills that meet a minimum threshold of consensus across survey respondents. By analyzing the rank of the reading comprehension skill, - defined by O*Net as "Understanding written sentences and paragraphs in work related documents" (National Center for O*NET Development, 2017) we present findings for the importance of reading to growing employment areas in Asia.

***Table 5*** presents data for 19 sectors, each made up of dozens of occupations (see the Appendix for the full listing of occupations). The trajectories column shows whether that sector is predicted to grow in India and/or ASEAN in the coming 10 years, based on the analysis presented in section 4.2 above. We then present the O*Net reading comprehension rank (out of 35 skills ranked) in the final column. This ranking is the average rank for reading comprehension for all occupations in that sector, with sometimes significant variation within sectors.[6]

**Table 5. Importance of Literacy to Economic Sectors in Asia**

| Sector | Growth Trajectory Based on Data from Section 4.2 | Reading Comprehension Importance Rank of 35 Possible Skills |
|---|---|---|
| **Farming, Fishing, and Forestry** | India (-) ASEAN (-) | 14 |
| **Manufacturing and Production** | India (-) ASEAN (-) | 11 |
| **Services** | | 7 |
| Business and Financial Operations | India (=) ASEAN (+) | 3 |
| Architecture and Engineering | India (+) | 3 |
| Legal | ASEAN (+) | 3 |
| Life, Physical, and Social Sciences | | 3 |
| Computer and Mathematical | India (+) | 4 |
| Education and Training | India (+) | 4 |
| Office and Administrative | India (-) | 4 |
| Management | India (+) | 5 |

[4] We suggest that occupational classifications for basic occupations (services, manufacturing) are generally comparable across economies (i.e., the US to Asia). Comparable data do not exist in Asia, though the ILO is working on a similar database for the region.

[5] O*Net Skills: Reading Comprehension, Active Listening, Writing, Speaking, Mathematics, Science, Critical Thinking, Active Learning, Learning Strategies, Monitoring, Social Perceptiveness, Coordination, Persuasion, Negotiation, Instructing, Service Orientation, Complex Problem Solving, Operations Analysis, Technology Design, Equipment Selection, Installation, Programming, Quality Control Analysis, Operation Monitoring, Operations and Control, Equipment Maintenance, Troubleshooting, Repairing, Systems Analysis, Systems Evaluation, Judgment and Decision Making, Time Management, Management of Financial Resources, Management of Material Resources, Management of Personnel Resources.

[6] Methodological note: for occupations that did not list reading comprehension as a consensus skill, we gave it a score of 17 of 35 (the mid-point) to allow for comparability across occupations.

| Sector | Growth Trajectory Based on Data from Section 4.2 | Reading Comprehension Importance Rank of 35 Possible Skills |
|---|---|---|
| Healthcare | | 5 |
| Community, Social, and Protective Services | | 6 |
| Sales and Related | India (=) ASEAN (+) | 7 |
| Arts, Design, Entertainment, Sports, & Media | India (-) | 7 |
| Transportation and Logistics | India (+) ASEAN (+) | 12 |
| Installation and Maintenance | India (+) | 13 |
| Hospitality and Food | | 14 |
| Construction and Extraction | | 14 |

Source: www.onetonline.org

This analysis indicates the high importance of reading to almost every growing occupation in Asia, with a particularly high rank in the higher-skill service sectors. It is a top five skill in eight job families, with six of those job families projected to be high growth areas for Asia. For the consensus highest growth sector in Asia—Transportation and Logistics—reading comprehension ranks slightly lower, but still ranks 12th out of 35 possible skills. Of particular note is the productivity and wage differences among these job families and the relative importance of reading comprehension to the higher productivity and higher wage occupations—indicating that literacy is an important asset in the fight against poverty and to the promotion of decent work. If developing Asian economies are to grow and individuals are to prosper, reading skills are essential.

Reading comprehension is a highly demanded skill in six of the top seven growing sectors in developing Asia. These higher-skill, higher-wage jobs should lead to better resourced Asian consumers and better functioning global value chains.

The relationship of literacy skills and economic growth in Asia and the US economy is further elucidated here, with higher-skill jobs leading to better paid and better resourced consumers, and to better services along global value chains led by or benefiting US companies.

## 4.4 Discussion

The rapid changes brought by technology change and globalization can lead to a focus on high tech jobs and advanced manufacturing. However, this analysis shows that, for developing Asia, jobs are increasingly likely to be found in service sectors, most prominently transport and logistic services, financial and business management services, and retail, tourism, and sales, as well as the continued large-scale employment in agriculture across the region. A complementary analysis of skill requirements for the service sector jobs shows reading comprehension to be a top-rated skill for these professions—among other important qualifications. Further, increases to agricultural productivity—a sector that will continue to employ a quarter to a third of workers in developing parts of Asia—and the skill requirements of most manufacturing jobs, however limited, will increase the need for higher levels of education attainment, and a more literate population.

Understanding written material for work is a skill that is required across a growing number of job categories in Asia. These jobs also increasingly demand higher levels of education attainment, itself heavily dependent on literacy acquisition. For Asian economies that seek to grow, investments in early literacy are clearly related to future job success. This success is fundamental to global trade and US economic growth in turn.

# 5 Do children and youth in Asian countries have the literacy skills required for participation in further education and the workforce?

As mentioned earlier, early literacy is foundational to later academic success and other important life outcomes. This is inherently true because literacy, as defined in this report, is the ability to use reading for a given purpose, such as to understand a text or to learn something new. Lower- and middle-income countries in Asia need individuals with more advanced literacy abilities if they want to build a literate and educated workforce that can fill jobs of the future.

We have already discussed in this report that schooling and skills are consistently related to individual and collective outcomes later in life (see discussion under Section 3). Individuals with higher levels of schooling tend to earn more than individuals with fewer years of schooling, all other things being equal. Increases in the average years of schooling at the societal level are also associated with enhanced health, reduced infant mortality, and economic advancement. Though these findings do not directly associate literacy itself (as differentiated from other skills) with these outcomes, they do echo the notion of literacy (and schooling more generally) as a functional skill. However, as discussed previously, years of schooling do not inevitably translate to literacy. Indeed, there is a growing body of evidence that suggests many children cannot read—sometimes even a single word—despite spending years in school (e.g., Cao, 2010; Mithani et al, 2011).

We have also presented evidence of large shifts in Asian economies from agriculture to low productivity service sectors (Research Question 2), evolutions which have important implications for the level and types of literacies required of the future workforce. Following this, it is natural to question whether children in Asian countries are being adequately prepared for these tectonic changes in the most basic manner: whether they are acquiring literacy skills.

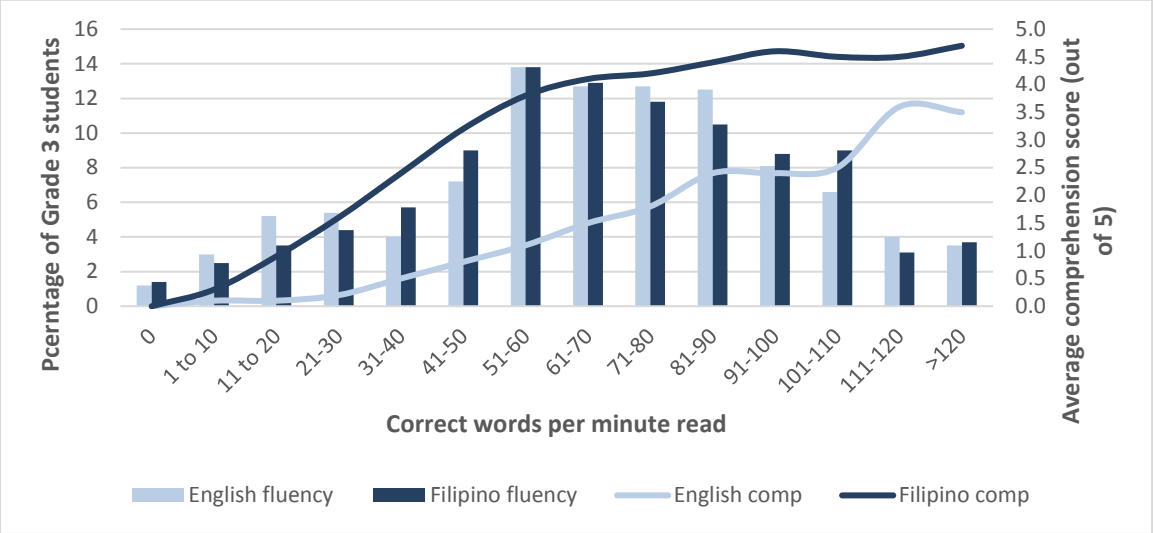
We respond to this question by exploring three distinct data sets, compiling evidence of early grade literacy, literacy in later schooling years, and longitudinal data that track children's literacy over time. Overall, we find that while students may be reading fluently in some cases, advanced literacy skills (reading for comprehension) are often lacking. Secondly, large segments of populations in some Asian countries may be unqualified for even a basic job, due to poor basic skills. Third, echoing other findings (e.g., Good et al, 1998; Gove and Cvelich, 2010), literacy is cumulative: learners who fall behind in early years tend to stay behind in later years.

## 5.1 What Trends in Early Grades Indicate about Early Literacy in Asian Countries

Despite recent gains in access to and enrollment in schooling in many Asian countries (UNESCO, 2015), a consistent and worrying pattern has been revealed: the level of literacy lags behind measures of reading fluency in primary school children. Here we present evidence from the Early Grade Reading (EGR) Barometer,[7] an interactive online tool that collates and summarizes literacy assessment results conducted in developing countries. Two of the countries represented in the Barometer results include the Philippines and Indonesia. Data—oral reading fluency and comprehension scores—from the Philippines are displayed below in ***Figure 5***.

[7] See www.earlygradereadingbarometer.org

**Figure 5. Oral Reading Fluency and Comprehension in Filipino and English (2013)**




Source: Early Grade Reading Barometer (accessed 2/11/2017)

In the figure, the bars represent the frequency of oral reading fluency scores and correspond to the primary (left-hand) axis. The lines represent the average reading comprehension score for a given student in each of the correct words per minute (cwpm) categories. For the reading fluency assessment, the child was asked to read a short story (up to 60 words in length) out loud. For the comprehension assessment, the child is asked to respond to five questions that the assessor asks about the short story just read. Generally speaking, a score of 3 out of 5 on comprehension indicates partial comprehension and 4 or better out of 5 indicates comprehension.

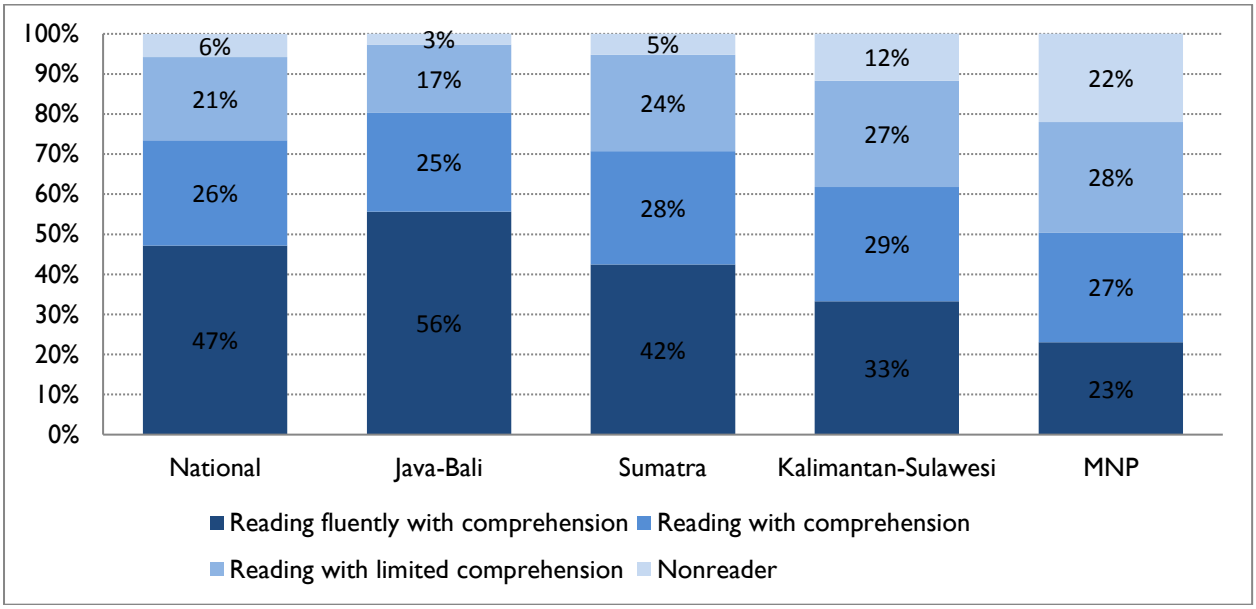
It is clear that the average student, reading in Filipino, does not reach comprehension until he or she is reading more than 70 cwpm, though partial comprehension is achieved above 40 cwpm. When reading in English, however, only a very small proportion of students (less than 10%) achieved even partial comprehension in the assessment.[8] Thus, while reading fluency appears to be rather strong (even in English), literacy—using reading for comprehension—is somewhat lacking. Indeed, 64% of students achieved partial comprehension in Filipino; only 18% achieved partial comprehension in English.

It is also true that more than 10% of students are reading fewer than 30 cwpm (in both languages assessed), a pace that is unconducive to comprehension (i.e., children are reading so slowly that comprehension is rendered very difficult).

A similar early grade reading assessment was conducted in Indonesia. Results are presented in ***Figure 6***, below.

[8] In the Philippines, classroom instruction is in learners' first language. Thereafter, Filipino and English are the primary languages of instruction.

**Figure 6. Proportion of Students Reading with Comprehension in Indonesia, by Region (2014)**




Source: Stern and Nordstrum, 2014

The figure shows that while most (73%) of students in Indonesia were reading with at least partial comprehension (i.e., 47% + 26%), these statistics vary widely by region. Indeed, most of the strong comprehension scores are driven by Java-Bali: all other assessed regions fall at or below the national average. Over half of the students in the Maluku-Nusa-Papua region were not able to comprehend a short passage, and one of every five students could not read a single word correctly.

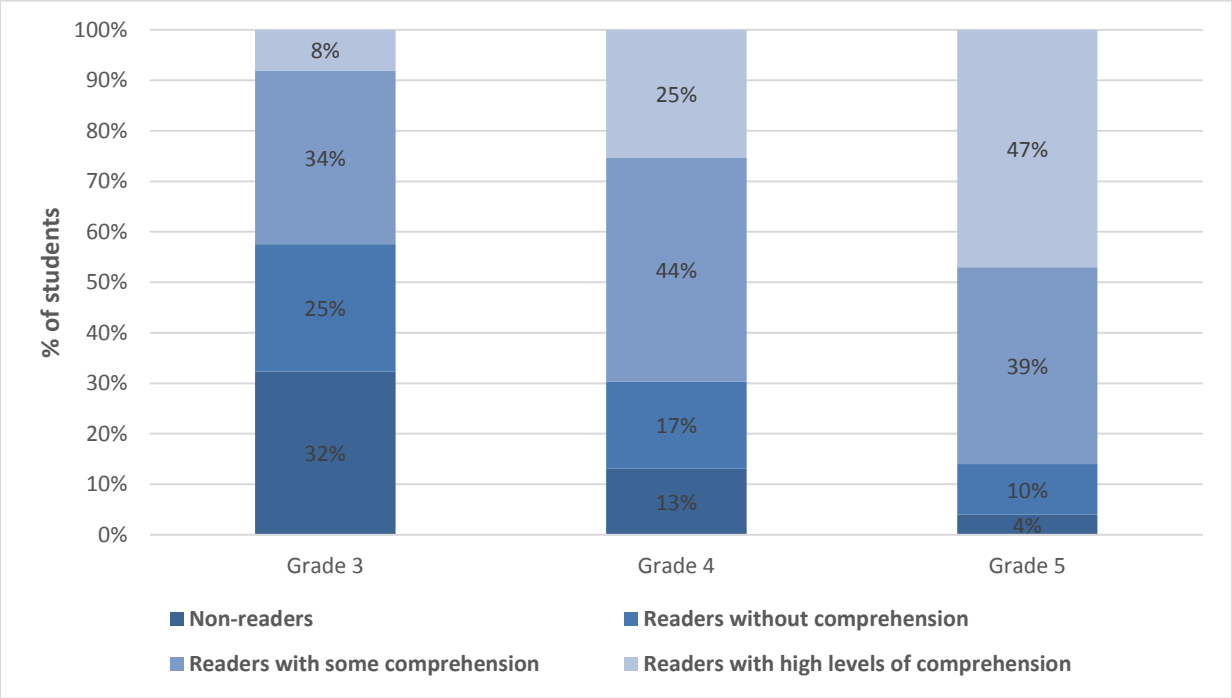
In Nepal, a 2014 early grade reading assessment found average reading fluency to be only 14 and 27 words per minute in Grades 2 and 3, respectively. More than one-third of Grade 2 learners and one-fifth of Grade 3 learners could not read a single word of text. Further, large proportions of students in both grades had substantial difficulty with more advanced literacy skills: 50% of Grade 2 and 27% of Grade 3 students, respectively, were unable to answer even one comprehension question.[9]

A 2012 early grade reading assessment of nearly 3,500 randomly selected students across 72 schools and 6 provinces in Lao People's Democratic Republic (PDR) showed similar results. While many students were able to read a simple 60-word text fluently, particularly by Grade 4, fewer students were able to infer meaning from that text. ***Figure 7*** clearly shows that students are making advances in comprehension from Grade 3 to Grade 5, but more than 50% of students are yet unable to read a simple text with a high degree of comprehension (i.e., reading most of the words correctly and answering at least four out of five comprehension questions).

Together, these results from the Philippines, Indonesia, Nepal, and Lao PDR suggest that literacy—using reading skills for comprehension—is not as advanced as reading fluency.

[9] Source: Early Grade Reading Barometer (http://www.earlygradereadingbarometer.org).

**Figure 7. Percent of Students Reading with Comprehension in Lao PDR**



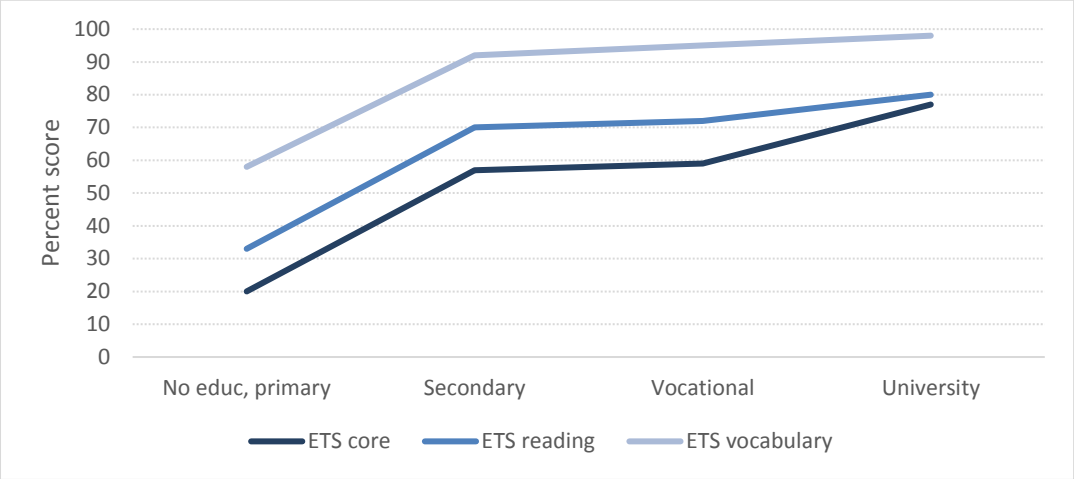

Source: Ministry of Education and Sports, 2012

## 5.2 What Trends Indicate about Literacy in Later Years in Asian Countries

The STEP Skills Measurement project, an initiative of the World Bank, was created to accurately measure skills supply and demand in developing countries. The project employs a set of core surveys and assessments that allow participating countries to build databases on skills that can be used for policy analysis and cross-country comparisons. For the purposes of this brief, the STEP initiative also includes a direct assessment of reading proficiency (core literacy, reading, and vocabulary) that is administered to a subset of the working age population scored on the same scale as the OECD PIAAC, a robust internationally recognized battery of assessments. Thirteen countries have participated in the STEP Skills initiative, among them are Lao PDR, Sri Lanka, and Vietnam.

A recent analysis of STEP Skills data from Lao PDR revealed that while most people in the country have basic vocabulary skills (83%), and 71% passed the sentence completion segment, most individuals assessed could not decipher text and approximately one-half could not pass the core literacy assessment (World Bank, 2013). Another interesting finding is displayed in ***Figure 8***, below, which shows the average score on the various literacy assessments administered in Lao PDR, disaggregated by the educational levels of the survey respondents.

**Figure 8. Scores on Direct Reading Assessments by Education Level in Lao PDR**




Source: World Bank, 2013

The figure shows a steep increase in average scores between those with primary school (or no school experience) and those with secondary schooling. This suggests that many individuals acquire foundational literacy skills (such as vocabulary development) in early grades and continue to learn words outside of formal schooling. Additionally, more complex literacy skills assessed by the core reading component (deciphering text, using memory to retain information, and answering questions based on that information) may be developed both during primary school as well as during later years. This has implications for the timing of imparting these skills: these findings are in line with other recommendations in terms of the early teaching of vocabulary and reading (e.g., National Reading Panel, 2000). Further, they suggest that the neglect of these skills in early grades cannot necessarily be made up for in subsequent years: individuals who are not literate in primary school are not likely to be later on in life (see also Gove and Cvelich, 2010).

## 5.3 What Longitudinal Data Tell Us about the Relationship between Early Literacy and Later Outcomes

Some of the previous discussion assumes that the acquisition of foundational literacy skills in the early grades is related to literacy outcomes—the strategic use of reading skills—later in life. However, the datasets used above are cross-sectional and do not conclusively show the long-term relationship between these two different points in time. Longitudinal data, however, provide conclusive evidence of how literacy patterns evolve over time. The Young Lives international longitudinal study follows approximately 12,000 children from India (Andhra Pradesh) and Vietnam[10] over the course of 15 years. The study follows two cohorts of children: the younger cohort (born in 2001–2002) and the older cohort (born in 1994–1995). It collects information about the family and the child, including direct reading assessments, from four rounds of surveys carried out in 2002, 2006, 2009, and 2013 (Singh & Mukherjee, 2016).

***Table 6***, below, displays average performance on the Peabody Picture Vocabulary Test (PPVT), administered at age 5, and average mathematics performance at age 12 among the younger cohort for both India and Vietnam.

[10] Ethiopia and Peru were also covered by the Young Lives study, but are not discussed here.

**Table 6. Performance in Vocabulary and Mathematics over Time, Younger Cohort (average scores)**

| | India | | Vietnam | |
|---|---|---|---|---|
| | PPVT – age 5 | Mathematics – age 12 | PPVT – age 5 | Mathematics – age 12 |
| **Average** | 22.1 | 65.3 | 18.0 | 50.0 |
| **Boys** | 22.3 | 66.5 | 18.4 | 49.1 |
| **Girls** | 21.9 | 64.1 | 17.6 | 50.9 |
| **Urban** | 29.7 | 71.3 | 25.9 | 54.8 |
| **Rural** | 19.9 | 63.4 | 16.0 | 44.6 |
| **Top wealth quintile** | 33.6 | 76.0 | 25.0 | 59.2 |
| **Bottom wealth quintile** | 18.4 | 60.2 | 12.8 | 38.7 |

Source: Singh & Mukherjee, 2016; Duc and Thi Thu Hang, 2016; PPVT=Peabody Picture Vocabulary Test

As seen in the table, there is a positive relationship between PPVT scores at age 5 and mathematics scores measured at age 12: individuals with higher reading ability tend to also have higher scores in mathematics. These data suggest that receptive vocabulary—an early literacy skill—is highly predictive of skills in mathematics, assessed 7 years later. The implication of this relationship is that children with higher reading abilities at an early age will tend to learn at higher rates than children with lower skills. This is further evidenced by PPVT scores achieved by the younger cohort in Vietnam over time and disaggregated by the least and most vulnerable youth populations. The least vulnerable population achieved scores of 25.0, 56.5, and 81.1 at ages 5, 8, and 12, respectively. The most vulnerable population achieved scores of 12.7, 36.6, and 69.3 at those same ages. While scores increase among both populations, disadvantage remains over time. This suggests that early childhood education (ECE) is an important step towards building an education system that can teach literacy skills and equip students to participate in the economy and society.

***Table 7***, below, highlights a similar relationship found among the older cohorts in India and Vietnam at a different point in time. The table displays average scores between reading ability at age 15 and several education outcomes at age 19 (reading, secondary completion, and tertiary participation rates). Again, the table makes clear that individuals with higher reading ability at age 15 also tend to have higher reading ability scores, as well as secondary completion and tertiary participation rates 4 years later.

Data suggest that children with higher reading abilities at an early age will tend to learn at higher rates than children with lower skills.

**Table 7. Reading Ability at Age 15 and Other Outcomes at Age 19, Older Cohort**

| | India | | | | Vietnam | | | |
|---|---|---|---|---|---|---|---|---|
| | Reading – Age 15 (score) | Reading – Age 19 (score) | Completed Secondary – Age 19 (%) | Tertiary Ed – Age 19 (%) | Reading – Age 15 (score) | Reading – Age 19 (score) | Completed Secondary – Age 19 (%) | Tertiary Ed – Age 19 (%) |
| **Average** | 18.3 | 59.8 | 71.5 | 39.7 | 79.1 | 57.9 | 57.7 | 35.0 |
| **Boys** | 17.8 | 62.2 | 76.2 | 43.9 | 76.6 | 55.5 | 50.6 | 32.0 |
| **Girls** | 18.8 | 57.5 | 67.0 | 35.5 | 81.4 | 60.1 | 64.1 | 37.9 |
| **Urban** | 28.1 | 64.5 | 81.4 | 52.5 | 84.2 | 61.8 | 70.8 | 45.4 |
| **Rural** | 14.6 | 58.3 | 68.4 | 35.6 | 74.6 | 54.0 | 46.0 | 23.8 |
| **Top Wealth** | 27.1 | 67.0 | 88.4 | 62.6 | 87.4 | 65.6 | 80.5 | 57.3 |
| **Bottom Wealth** | 16.9 | 52.9 | 56.5 | 22.0 | 66.7 | 47.2 | 25.1 | 12.9 |

Source: Singh & Mukherjee, 2016; Duc and Thi Thu Hang, 2016

This relationship was explicitly tested with data from both of the countries. Singh and Mukherjee (2015) found that 79% of students who were able to read words and sentences in Round 1 successfully progressed through secondary school (compared to 57% of those who were unable to read words or sentences. In addition, 83% of students who could write without errors in Round 1 graduated (compared to 46% of those who were unable to write without errors). The authors conducted a multivariate regression analysis that confirmed their findings: students who were able to read words and sentences in Round 1 were 1.7 times more likely to complete secondary school than were students unable to read words and sentences, and those who were able to write without errors were 3.3 times more likely to complete secondary schooling.[11] In Vietnam, Duc and Thi Thu Hang (2016) also found that older cohort students who scored well on the PPVT in Round 2 of data collection were less likely to drop out of school before age 19. In many lower- and middle-income countries in Asia, dropout is a significant issue that impacts individuals' future economic opportunities: students who drop out from school tend to have lower-paying and less secure jobs than graduates.

## 5.4 Discussion

Despite recent increases in access to schooling in many developing Asian countries, this section has provided and reviewed evidence that suggests literacy—the functional use of reading ability for other productive purposes—is not as ubiquitous as it may seem. While the common measure of literacy in a given society—the adult literacy rate—is often at or near 90% in many Asian countries, even developing countries such as the Philippines, Vietnam, and Thailand, the direct assessments of literacy discussed here bring to light several findings that contradict this conventional wisdom.

First, literacy is not synonymous with reading fluency. Evidence from Indonesia and the Philippines has shown that while there is a positive relationship between fluency and literacy (in fact, the former is a component of the latter), using fluency alone as a proxy measure for literacy can be misleading. Comprehension data indicate that many children may be reading fluently, but remain unable to comprehend (and therefore use) the information that they are reading.

[11] These findings hold even when controlling for sex, caste, birth order, paternal and maternal education, wealth, pre-school attendance, and nutrition.

Second, a significant proportion of the working age population does not meet the requisite skills for basic jobs in the region. Though most individuals assessed and interviewed through the STEP Skills initiative claimed that their jobs required them to read frequently, many respondents did not pass the core reading component of the assessment. Relatedly, passing rates were found to be predicted by the highest level of schooling respondents had attained, which suggests that most gains in core literacy skills occur during the primary years or do not occur at all. There may be, in other words, a window of opportunity in the early years during which to impart these skills.

Third, reading ability in early years is predictive of reading outcomes in later years. Evidence from the Young Lives longitudinal study in India and Vietnam suggest that young children with more advanced reading and writing skills are more likely to perform well on subsequent assessments (in multiple subjects), graduate from secondary school, and attend some form of tertiary education. That is, early readers are in a better position to use their reading ability to learn and prepare themselves for the world of work.

# 6 Conclusions and Recommendations

Literacy has been considered a right human right for many decades, and not just in Western countries. The rationale for positioning literacy as a right is represented by the benefits that accrue to individuals, households, and societies in which literacy flourishes. It has been definitively shown in the previous sections that literacy, even early literacy, is related to later individual success in school and in the workplace. Individual benefits are not merely academic or economic; literacy is also linked to positive health outcomes, engagement in schooling, and child well-being. However, it is also clear that these links between literacy and other outcomes that societies care about are both individual and social. The wage returns to literacy, explored under Section 3, certainly do accrue to individuals, but those skills garnered and wage premiums earned also have an impact upon the economy in the aggregate, through increased purchasing power and a reduced need for governmental assistance. Societies evidently benefit from a healthier, more politically engaged populous. This and other evidence presented in earlier sections of this report lead to at least eight recommendations for countries in Asia, and these are discussed in turn.

1. **Investment in early literacy aligns with national security aims.** It has been shown that more literate societies are more stable, less violent, and healthier. Such characteristics are inherently beneficial for countries that receive support for developing education systems to deliver literacy skills. They also happen to be good for the United States: increasing the number of stable countries and allies in a region reduces the likelihood of conflict and necessary intervention (either humanitarian or military). There is also substantial agreement, among academic, political, and diplomatic circles, on these points. Literacy enhances national security.
2. **Economic opportunities are enhanced through early reading investment**. It has been discussed that literacy begets wage returns for individuals and grows economies. It has also been noted that the majority of the world's consumers (approximately 95%) and 80% of the world's purchasing power reside outside the United States. Thus, future economic growth and jobs for Americans increasingly depend on expanding US trade and investment opportunities in the global marketplace. As such, investment in early literacy has the potential to set up a mutually beneficial system of economic growth and trade. As education systems in developing countries confer literacy skills to create a more productive workforce with support from USAID, there materializes a greater market for the exchange of goods and services between donor and recipient countries.
3. **Opportunity for US leadership through investment in early literacy.** Through prior investments in early literacy, the United States and USAID have displayed both

technical and policy leadership. The Early Grade Reading Assessment was developed in 2006 through USAID funding, and has been used extensively to determine literacy levels in young school-age children across dozens of developing countries. Many of the assessments conducted with EGRA have led to policy being adapted or adopted in developing countries. Millions of children have benefitted from these activities. The United States, again through USAID, has developed strategic and innovative partnerships with other donor governments, governments in recipient countries, international organizations, and local NGOs. Continued investment would enable the US to continue to support this type of leadership and innovation.

4. **Literacy has not been achieved** in many developing Asian countries. Reading fluency is not synonymous with purposeful literacy—the ability to put reading skills to use as essential for transition and success in the economy. We have presented and discussed evidence that levels of reading fluency may be adequate in developing Asian countries, even in the early grades, but that advanced literacy (such as the ability to comprehend what is read, or to use written information in the workplace) lags behind in direct assessments with young school-aged children. Direct assessments of working-age young adults revealed similar patterns: scores on basic literacy skills (such as vocabulary) tended to be high, but only about one-half of respondents were able to pass the more functional modules of the assessment. The recommendations are therefore rather straightforward: more attention to advanced literacy skills (comprehension) is needed. Teaching and learning materials, instructional practices, and assessment tools should be reviewed, critiqued, and revised (if necessary) with this in mind. Particularly given the importance of more advanced stages literacy in the emerging job families in developing Asian countries (discussed under Section 4), the trends seen in recent years should serve as a call to action and an orientation toward higher order literacy skills.
5. **Literacy skills are cumulative**. Evidence provided under Section 5 suggests that the acquisition of advanced literacy skills is a continuum of learning that begins in the early years and extends into later years. That is, literacy skills in the early years are predictive of literacy skills in secondary school and employment outcomes. As such, there is no inherent trade-off between an emphasis on post-primary education or workforce readiness, on one hand, and early grade reading, on the other. Rather, the emphases are complementary. USAID and Ministries of education in developing Asian countries, therefore, would do well to consider early literacy programs and literacy instruction an essential part of developing a cohort of educated and economically productive citizens. A related implication is that early literacy is not amenable to a declaration of accomplishment at a given point in time. It will have to be imparted to each learner in each cohort that enters the education system, regardless of whether or not it was imparted to their forebears. The literacy skills that will be required of the future workforce and their cumulative nature (acquisition of these skills begins early) imply that early literacy is currently and will continue to important for many years to come.
6. **The timing of imparting literacy skills is important**. We have presented evidence and arguments for the fact that literacy skills, even of the functional sort, are acquired predominantly during the primary years and solidified thereafter. While this is partially a product of design (literacy skills are consciously made a part of the primary school curriculum), it is equally a product of child development. As discussed during the previous point, literacy skills are cumulative and therefore poor readers in early grades tend to be poor readers in later years: those who fall behind (or those to whom skills are not imparted) tend to fall behind and stay behind (and not just in reading). Remedial literacy interventions, conducted later in life, tend to be more expensive and time-consuming than proactive approaches taken early in the primary school years (e.g., Torgeson, 2004). Moreover, they constitute an inefficient use of

educational resources, given that remediation is, at its base, rework that should have been conducted earlier but was not. All of this implies that the imparting of literacy skills is an activity that most often takes place during primary schooling, for both developmental and curricular reasons. It is less efficient to impart such skills later in life, when older children should be employing advanced stages of literacy skills for other purposes: for obtaining and analyzing information, or for using written information to inform job responsibilities. USAID should work with Ministries of education to expect and plan for the early acquisition of literacy skills, imparted during the primary years and further developed thereafter.

7. **Public investment in early literacy programs makes sense**. The above recommendations assume that it is logical for Asian countries to continue to make investments in early grade literacy instruction, and our discussion in this report reinforces this view. Though individuals certainly benefit from increasing levels of education (and literacy) through wage premiums conferred by the economy, the resultant benefits are not just economic and they do not just accrue singularly to individuals. If they did, then it would follow that the education system should be further subsidized by individual consumers through cost recovery and cost-sharing mechanisms (such as user fees). However, the discussion above makes clear that the benefits of enhanced literacy (e.g., lower crime, enhanced health, political engagement, economic participation) are shared by societies (to the extent that literacy skills are well distributed among citizens). Therefore, it is worthwhile for the public sector to invest in literacy acquisition. It is also worthwhile because individuals are likely to undervalue the benefits of literacy, and their willingness and ability to invest in it will be limited. Individuals' valuation of literacy is limited by: a lack of information about benefits (Colclough, 1996); the discounting of benefits because they are shared; subtle differences between instructional options (Nordstrum, 2011); and principal/agent investment problems[12] (Rolleston, 2009). It is also the case that the United States has a vested interest in continuing to invest in early literacy via foreign assistance programs. Again, literate societies tend to be less violent and more stable, and more likely to be economic partners.

8. **The time to invest is now**. We have demonstrated how job families in Asian economies are emerging and evolving. While agriculture currently is and will remain a significant sector of employment in many (though not all) Asian countries in the future, there is evidence of substantial growth in low- and semi-skilled service jobs (such as transportation, logistics, sales, management and business, legal and financial). Further, literacy is a highly important skill in these emergent job families. Combining these trends with evidence of lagging functional literacy in Asian countries, the time to invest in early grade literacy is now. Delay in this investment will yield a skills gap between what is needed by employers and the economy, on one hand, and what is provided by the educational system, on the other. Asian countries and their Ministries of education should immediately orient their educational systems toward imparting early literacy skills during the primary years that can be built upon during post-primary phases. This includes, as mentioned previously, the review and revision of teaching and learning materials, assessment tools, and instructional practices in order that they properly emphasize functional and higher-order literacy skills rather than fluency. The US Government also finds itself at a crossroads with a new administration and evolving investment priorities. Given the discussion points above, delay in investment in early grade reading may cede leadership to other country governments and would likely reduce the potential for mutually beneficial economic growth.

[12] Most returns accrue to direct beneficiaries of literacy skills, but parents make the decision whether or not to educate their children (and therefore make purchasing decisions).

# 7 Conclusion

Literacy is considered a fundamental human right because it offers discernable benefits to both individuals and societies. Many developing countries have in recent decades seen increases in access to and participation in schooling, particularly in primary grades. Reading fluency (the ability to correctly read words in a passage) has also increased. True literacy, the ability to use reading skills such as fluency to accomplish higher-order goals (such as answering comprehension questions, using text to learn about a topic, or comparing and contrasting), has lagged behind. While this is not surprising —reaching the stage of literacy where the reader has multiple viewpoints is inherently more complex than reading text fluently and correctly—it is unfortunate, as this stage of literacy is key determinant of success in school and participation in the workforce, as well as an important skill for emerging job families in Asian economies.

This report has examined the interrelationships between literacy, schooling, and the economy by addressing three questions:

1. *What is the relationship between increased literacy and the workforce (at the individual level) and the society?*
2. *What jobs (or job families) are emerging in Asian economies? What are the literacy requirements for these jobs?*
3. *Do young people in Asian countries have the literacy skills required for participation in further education and the workforce?*

With regard to the first question, we presented evidence that suggests increased levels of literacy yield returns in the form of increased wages for individuals, even when controlling for external factors. It is also the case that benefits accrue to societies: more literate societies also tend to have lower crime rates, better health outcomes, lower maternal mortality rates, more political participation, and higher levels of social cohesion. These benefits represent genuine reasons for which it is logical to continue public support of literacy programs.

In terms of the second question, we found an interesting phenomenon: while agriculture is decreasing within Asia as a whole (in terms of its share of employment), this is not leading directly to a rise in manufacturing jobs. Rather, substantial growth in low- and semi-skilled service jobs has been seen and is projected to continue. In the vast majority of these emerging job families, literacy is considered a top-five skill. For education to be relevant for workplace readiness in Asian economies, Ministries of education will have to focus on imparting functional literacy skills that accord with these emergent jobs.

As noted, we presented data that suggest functional literacy levels lag behind measures of reading fluency in several Asian countries, both in the early grades and among young adults. Moreover, there is evidence that literacy skills, in a functional sense, are predominantly acquired during primary school years, then strengthened during post-primary schooling. Data from both Indian (Andhra Pradesh) and Vietnam indicate that literacy skills are also cumulative: early acquisition of literacy engenders later gains in cognitive skills and participation in further education and the workforce.

Put together, these findings imply that public (rather than private) investment in literacy education is warranted in developing Asian countries: educational systems should emphasize reaching more advanced stages of literacy (e.g. the ability of have multiple viewpoints) more than measures of fluency. The importance of literacy is only likely to increase in Asian economies as service jobs requiring such skills expand their share of total employment.

Equally as important, the discussion section of this report highlights alignment between investment in early literacy development programs, national security, economic growth and opportunities (for the US and recipient countries), and leadership opportunities. Recent

debates around US budget allocations seem to assume that continued investment in foreign aid is not compatible with the priorities of the new administration (e.g., “America First,” national security, economic opportunities). The evidence and argument presented in this report shows that this trade-off is not the case; rather, investment in early literacy can be mutually beneficial for both donor and recipient countries.

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# Appendix: Reading Comprehension Skill Ranking by Occupation

| Farming, Fishing, and Forestry | |
|---|---|
| **Occupations (17)** | **Reading Comp Rank** |
| Agricultural Equipment Operators | 17 |
| Agricultural Inspectors | 4 |
| Animal Breeders | 8 |
| Fallers | 17 |
| Farmworkers and Laborers, Crop | 17 |
| Farmworkers, Farm, Ranch, and Aquacultural Animals | 17 |
| Supervisors of Agricultural Crop and Horticultural Workers | 15 |
| Supervisors of Animal Husbandry and Animal Care Workers | 12 |
| First-Line Supervisors of Aquacultural Workers | 11 |
| First-Line Supervisors of Logging Workers | 12 |
| Fishers and Related Fishing Workers | 17 |
| Forest and Conservation Workers | 17 |
| Graders and Sorters, Agricultural Products | 17 |
| Hunters and Trappers | 17 |
| Log Graders and Scalers | 8 |
| Logging Equipment Operators | 17 |
| Nursery Workers | 17 |
| **Avg.** | 14 |

| Manufacturing and Production | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Adhesive Bonding Machine Operators and Tenders | 8 |
| Aircraft Structure, Surfaces, Rigging, and Systems Assemblers | 8 |
| Bakers | 17 |
| Biofuels Processing Technicians | 3 |
| Biomass Plant Technicians | 9 |
| Butchers and Meat Cutters | 4 |
| Cabinetmakers and Bench Carpenters | 17 |
| Chemical Equipment Operators and Tenders | 7 |
| Chemical Plant and System Operators | 10 |
| Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders | 17 |
| Coating, Painting, and Spraying Machine Setters, Operators, and Tenders | 17 |
| Coil Winders, Tapers, and Finishers | 17 |
| Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic | 9 |
| Computer-Controlled Machine Tool Operators, Metal and Plastic | 7 |
| Cooling and Freezing Equipment Operators and Tenders | 9 |
| Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders | 9 |

| Manufacturing and Production | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Cutters and Trimmers, Hand | 17 |
| Cutting and Slicing Machine Setters, Operators, and Tenders | 5 |
| Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic | 17 |
| Dental Laboratory Technicians | 1 |
| Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 6 |
| Electrical and Electronic Equipment Assemblers | 1 |
| Electromechanical Equipment Assemblers | 3 |
| Engine and Other Machine Assemblers | 3 |
| Etchers and Engravers | 8 |
| Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic | 17 |
| Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers | 17 |
| Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders | 8 |
| Fabric and Apparel Patternmakers | 9 |
| Fiberglass Laminators and Fabricators | 17 |
| First-Line Supervisors of Production and Operating Workers | 6 |
| Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders | 7 |
| Food Batchmakers | 5 |
| Food Cooking Machine Operators and Tenders | 4 |
| Forging Machine Setters, Operators, and Tenders, Metal and Plastic | 5 |
| Foundry Mold and Coremakers | 17 |
| Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders | 6 |
| Furniture Finishers | 17 |
| Gas Plant Operators | 11 |
| Gem and Diamond Workers | 17 |
| Glass Blowers, Molders, Benders, and Finishers | 7 |
| Grinding and Polishing Workers, Hand | 17 |
| Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 5 |
| Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic | 17 |
| Helpers--Production Workers | 17 |
| Hydroelectric Plant Technicians | 11 |
| Inspectors, Testers, Sorters, Samplers, and Weighers | 5 |
| Jewelers | 17 |
| Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 6 |
| Laundry and Dry-Cleaning Workers | 17 |

| Manufacturing and Production | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Layout Workers, Metal and Plastic | 17 |
| Machinists | 7 |
| Meat, Poultry, and Fish Cutters and Trimmers | 17 |
| Medical Appliance Technicians | 4 |
| Metal-Refining Furnace Operators and Tenders | 17 |
| Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic | 6 |
| Mixing and Blending Machine Setters, Operators, and Tenders | 4 |
| Model Makers, Metal and Plastic | 17 |
| Model Makers, Wood | 3 |
| Molding and Casting Workers | 2 |
| Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic | 5 |
| Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 11 |
| Nuclear Power Reactor Operators | 3 |
| Ophthalmic Laboratory Technicians | 8 |
| Packaging and Filling Machine Operators and Tenders | 7 |
| Painters, Transportation Equipment | 17 |
| Painting, Coating, and Decorating Workers | 17 |
| Paper Goods Machine Setters, Operators, and Tenders | 17 |
| Patternmakers, Metal and Plastic | 6 |
| Patternmakers, Wood | 3 |
| Petroleum Pump System Operators, Refinery Operators, and Gaugers | 4 |
| Photographic Process Workers and Processing Machine Operators | 5 |
| Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic | 5 |
| Potters, Manufacturing | 17 |
| Pourers and Casters, Metal | 17 |
| Power Distributors and Dispatchers | 4 |
| Power Plant Operators | 11 |
| Precious Metal Workers | 17 |
| Prepress Technicians and Workers | 10 |
| Pressers, Textile, Garment, and Related Materials | 17 |
| Print Binding and Finishing Workers | 5 |
| Printing Press Operators | 5 |
| Recycling and Reclamation Workers | 17 |
| Rolling Machine Setters, Operators, and Tenders, Metal and Plastic | 11 |
| Sawing Machine Setters, Operators, and Tenders, Wood | 17 |
| Semiconductor Processors | 3 |
| Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders | 8 |
| Sewers, Hand | 17 |

| Manufacturing and Production | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Sewing Machine Operators | 17 |
| Shoe and Leather Workers and Repairers | 17 |
| Shoe Machine Operators and Tenders | 6 |
| Slaughterers and Meat Packers | 17 |
| Solderers and Brazers | 17 |
| Stationary Engineers and Boiler Operators | 9 |
| Stone Cutters and Carvers, Manufacturing | 17 |
| Structural Metal Fabricators and Fitters | 3 |
| Tailors, Dressmakers, and Custom Sewers | 17 |
| Team Assemblers | 17 |
| Textile Bleaching and Dyeing Machine Operators and Tenders | 17 |
| Textile Cutting Machine Setters, Operators, and Tenders | 17 |
| Textile Knitting and Weaving Machine Setters, Operators, and Tenders | 17 |
| Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders | 17 |
| Timing Device Assemblers and Adjusters | 17 |
| Tire Builders | 17 |
| Tool and Die Makers | 17 |
| Tool Grinders, Filers, and Sharpeners | 17 |
| Upholsterers | 2 |
| Water and Wastewater Treatment Plant and System Operators | 7 |
| Welders, Cutters, and Welder Fitters | 4 |
| Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders | 17 |
| Woodworking Machine Setters, Operators, and Tenders, Except Sawing | 17 |
| **Avg.** | **11** |

| Architecture and Engineering | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Aerospace Engineering and Operations Technicians | 7 |
| Aerospace Engineers | 2 |
| Agricultural Engineers | 3 |
| Architects, Except Landscape and Naval | 7 |
| Architectural Drafters | 4 |
| Automotive Engineering Technicians | 1 |
| Automotive Engineers | 4 |
| Biochemical Engineers | 4 |
| Biomedical Engineers | 5 |
| Cartographers and Photogrammetrists | 1 |
| Chemical Engineers | 8 |
| Civil Drafters | 2 |

| Architecture and Engineering | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Civil Engineering Technicians | 1 |
| Civil Engineers | 2 |
| Computer Hardware Engineers | 2 |
| Electrical Drafters | 1 |
| Electrical Engineering Technicians | 2 |
| Electrical Engineering Technologists | 4 |
| Electrical Engineers | 4 |
| Electro-Mechanical Technicians | 10 |
| Electromechanical Engineering Technologists | 3 |
| Electronic Drafters | 3 |
| Electronics Engineering Technicians | 1 |
| Electronics Engineering Technologists | 4 |
| Electronics Engineers, Except Computer | 3 |
| Energy Engineers | 1 |
| Environmental Engineering Technicians | 3 |
| Environmental Engineers | 1 |
| Fire-Prevention and Protection Engineers | 4 |
| Fuel Cell Engineers | 1 |
| Geodetic Surveyors | 3 |
| Human Factors Engineers and Ergonomists | 4 |
| Industrial Engineering Technicians | 1 |
| Industrial Engineering Technologists | 2 |
| Industrial Engineers | 1 |
| Industrial Safety and Health Engineers | 2 |
| Landscape Architects | 2 |
| Manufacturing Engineering Technologists | 10 |
| Manufacturing Engineers | 4 |
| Manufacturing Production Technicians | 3 |
| Mapping Technicians | 1 |
| Marine Architects | 1 |
| Marine Engineers | 3 |
| Materials Engineers | 2 |
| Mechanical Drafters | 10 |
| Mechanical Engineering Technicians | 2 |
| Mechanical Engineering Technologists | 5 |
| Mechanical Engineers | 4 |
| Mechatronics Engineers | 5 |
| Microsystems Engineers | 3 |
| Mining and Geological Engineers, Including Mining Safety Engineers | 4 |

| Architecture and Engineering | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Nanosystems Engineers | 3 |
| Nanotechnology Engineering Technicians | 4 |
| Non-Destructive Testing Specialists | 4 |
| Nuclear Engineers | 4 |
| Petroleum Engineers | 1 |
| Photonics Engineers | 3 |
| Photonics Technicians | 1 |
| Product Safety Engineers | 2 |
| Radio Frequency Identification Device Specialists | 4 |
| Robotics Engineers | 2 |
| Robotics Technicians | 4 |
| Solar Energy Systems Engineers | 1 |
| Surveying Technicians | 5 |
| Surveyors | 1 |
| Transportation Engineers | 5 |
| Validation Engineers | 2 |
| Water/Wastewater Engineers | 6 |
| Wind Energy Engineers | 2 |
| **Avg** | **3** |

| Arts, Design, Entertainment, Sports, and Media | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Actors | 3 |
| Art Directors | 7 |
| Athletes and Sports Competitors | 7 |
| Audio and Video Equipment Technicians | 4 |
| Broadcast News Analysts | 5 |
| Broadcast Technicians | 8 |
| Camera Operators, Television, Video, and Motion Picture | 12 |
| Choreographers | 10 |
| Coaches and Scouts | 17 |
| Commercial and Industrial Designers | 3 |
| Copy Writers | 1 |
| Craft Artists | 2 |
| Dancers | 17 |
| Directors- Stage, Motion Pictures, Television, and Radio | 3 |
| Editors | 1 |
| Fashion Designers | 10 |
| Film and Video Editors | 3 |
| Fine Artists, Including Painters, Sculptors, and Illustrators | 17 |

| Arts, Design, Entertainment, Sports, and Media | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Floral Designers | 17 |
| Graphic Designers | 4 |
| Interior Designers | 3 |
| Interpreters and Translators | 3 |
| Merchandise Displayers and Window Trimmers | 6 |
| Multimedia Artists and Animators | 2 |
| Music Composers and Arrangers | 1 |
| Music Directors | 17 |
| Musicians, Instrumental | 9 |
| Photographers | 12 |
| Poets, Lyricists and Creative Writers | 2 |
| Producers | 7 |
| Program Directors | 3 |
| Public Address System and Other Announcers | 3 |
| Public Relations Specialists | 8 |
| Radio and Television Announcers | 3 |
| Radio Operators | 3 |
| Reporters and Correspondents | 2 |
| Set and Exhibit Designers | 3 |
| Singers | 17 |
| Sound Engineering Technicians | 4 |
| Talent Directors | 2 |
| Technical Directors/Managers | 5 |
| Technical Writers | 2 |
| Umpires, Referees, and Other Sports Officials | 12 |
| **Avg.** | **7** |

| Business and Financial Operations | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Accountants | 3 |
| Agents and Business Managers of Artists, Performers, and Athletes | 7 |
| Appraisers, Real Estate | 1 |
| Assessors | 1 |
| Auditors | 2 |
| Budget Analysts | 2 |
| Business Continuity Planners | 8 |
| Buyers and Purchasing Agents, Farm Products | 7 |
| Claims Examiners, Property and Casualty Insurance | 1 |
| Compensation, Benefits, and Job Analysis Specialists | 3 |
| Coroners | 5 |

| Business and Financial Operations | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Cost Estimators | 3 |
| Credit Analysts | 5 |
| Credit Counselors | 5 |
| Customs Brokers | 2 |
| Energy Auditors | 2 |
| Environmental Compliance Inspectors | 3 |
| Equal Opportunity Representatives and Officers | 2 |
| Financial Analysts | 2 |
| Financial Examiners | 1 |
| Fraud Examiners, Investigators and Analysts | 4 |
| Fundraisers | 7 |
| Government Property Inspectors and Investigators | 4 |
| Human Resources Specialists | 3 |
| Insurance Adjusters, Examiners, and Investigators | 3 |
| Insurance Appraisers, Auto Damage | 4 |
| Insurance Underwriters | 3 |
| Labor Relations Specialists | 4 |
| Licensing Examiners and Inspectors | 2 |
| Loan Counselors | 3 |
| Loan Officers | 4 |
| Logisticians | 5 |
| Logistics Analysts | 1 |
| Logistics Engineers | 1 |
| Management Analysts | 3 |
| Market Research Analysts and Marketing Specialists | 1 |
| Meeting, Convention, and Event Planners | 2 |
| Online Merchants | 1 |
| Personal Financial Advisors | 4 |
| Purchasing Agents, Except Wholesale, Retail, and Farm Products | 2 |
| Regulatory Affairs Specialists | 1 |
| Risk Management Specialists | 1 |
| Security Management Specialists | 5 |
| Sustainability Specialists | 1 |
| Tax Examiners and Collectors, and Revenue Agents | 2 |
| Tax Preparers | 2 |
| Training and Development Specialists | 6 |
| Wholesale and Retail Buyers, Except Farm Products | 10 |
| **Avg.** | **3** |

| Community and Social Service | |
|---|---|
| **Occupations (14)** | **Reading Comp Rank** |
| Child, Family, and School Social Workers | 3 |
| Clergy | 5 |
| Community Health Workers | 5 |
| Directors, Religious Activities and Education | 4 |
| Educational, Guidance, School, and Vocational Counselors | 3 |
| Health Educators | 5 |
| Healthcare Social Workers | 6 |
| Marriage and Family Therapists | 8 |
| Mental Health and Substance Abuse Social Workers | 4 |
| Mental Health Counselors | 9 |
| Probation Officers and Correctional Treatment Specialists | 7 |
| Rehabilitation Counselors | 9 |
| Social and Human Service Assistants | 7 |
| Substance Abuse and Behavioral Disorder Counselors | 5 |
| **Avg** | **6** |

| Computer and Mathematical | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Actuaries | 5 |
| Biostatisticians | 3 |
| Business Intelligence Analysts | 3 |
| Clinical Data Managers | 3 |
| Computer and Information Research Scientists | 8 |
| Computer Network Architects | 9 |
| Computer Network Support Specialists | 4 |
| Computer Programmers | 2 |
| Computer Systems Analysts | 3 |
| Computer Systems Engineers/Architects | 4 |
| Computer User Support Specialists | 3 |
| Database Administrators | 6 |
| Database Architects | 3 |
| Document Management Specialists | 1 |
| Geographic Information Systems Technicians | 2 |
| Geospatial Information Scientists and Technologists | 1 |
| Informatics Nurse Specialists | 1 |
| Information Security Analysts | 2 |
| Information Technology Project Managers | 4 |
| Mathematical Technicians | 3 |
| Mathematicians | 4 |
| Network and Computer Systems Administrators | 2 |

| Computer and Mathematical | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Operations Research Analysts | 6 |
| Search Marketing Strategists | 2 |
| Software Developers, Applications | 10 |
| Software Developers, Systems Software | 1 |
| Software Quality Assurance Engineers and Testers | 2 |
| Statisticians | 3 |
| Telecommunications Engineering Specialists | 3 |
| Video Game Designers | 5 |
| Web Administrators | 3 |
| Web Developers | 6 |
| **Avg.** | **4** |

| Construction and Extraction | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Boilermakers | 10 |
| Brickmasons and Blockmasons | 17 |
| Carpet Installers | 17 |
| Cement Masons and Concrete Finishers | 17 |
| Construction and Building Inspectors | 2 |
| Construction Carpenters | 9 |
| Construction Laborers | 4 |
| Continuous Mining Machine Operators | 17 |
| Derrick Operators, Oil and Gas | 17 |
| Drywall and Ceiling Tile Installers | 17 |
| Earth Drillers, Except Oil and Gas | 17 |
| Electricians | 20 |
| Elevator Installers and Repairers | 15 |
| Explosives Workers, Ordnance Handling Experts | 12 |
| Fence Erectors | 17 |
| First-Line Supervisors of Construction Trades and Extraction Workers | 6 |
| Floor Layers, Except Carpet, Wood, and Hard Tiles | 17 |
| Floor Sanders and Finishers | 17 |
| Glaziers | 4 |
| Hazardous Materials Removal Workers | 6 |
| Helpers--Brickmasons, Stonemasons, and Tile Setters | 17 |
| Helpers--Carpenters | 17 |
| Helpers--Electricians | 17 |
| Helpers--Extraction Workers | 17 |
| Helpers--Painters, Plasterers, Stucco Masons | 17 |
| Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters | 17 |

| Construction and Extraction | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Helpers--Roofers | 17 |
| Highway Maintenance Workers | 17 |
| Insulation Workers, Floor, Ceiling, and Wall | 17 |
| Insulation Workers, Mechanical | 17 |
| Mine Cutting and Channeling Machine Operators | 17 |
| Operating Engineers, Construction Equipment Operators | 17 |
| Painters, Construction and Maintenance | 17 |
| Paperhangers | 17 |
| Paving, Surfacing, and Tamping Equipment Operators | 17 |
| Pile-Driver Operators | 17 |
| Pipe Fitters and Steamfitters | 17 |
| Pipelayers | 17 |
| Plasterers and Stucco Masons | 17 |
| Plumbers | 16 |
| Rail-Track Laying and Maintenance Equipment Operators | 17 |
| Reinforcing Iron and Rebar Workers | 17 |
| Rock Splitters, Quarry | 17 |
| Roof Bolters, Mining | 17 |
| Roofers | 17 |
| Rotary Drill Operators, Oil and Gas | 11 |
| Rough Carpenters | 6 |
| Roustabouts, Oil and Gas | 17 |
| Segmental Pavers | 17 |
| Septic Tank Servicers and Sewer Pipe Cleaners | 17 |
| Service Unit Operators, Oil, Gas, and Mining | 13 |
| Sheet Metal Workers | 6 |
| Solar Energy Installation Managers | 8 |
| Solar Photovoltaic Installers | 9 |
| Solar Thermal Installers and Technicians | 3 |
| Stonemasons | 17 |
| Structural Iron and Steel Workers | 17 |
| Tapers | 17 |
| Terrazzo Workers and Finishers | 17 |
| Tile and Marble Setters | 17 |
| Weatherization Installers and Technicians | 9 |
| **Avg** | **14** |

| Education, Training, and Library | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Adapted Physical Education Specialists | 4 |
| Adult Basic and Secondary Education and Literacy Teachers and Instructors | 4 |
| Agricultural Sciences Teachers, Postsecondary | 3 |
| Anthropology and Archeology Teachers, Postsecondary | 2 |
| Architecture Teachers, Postsecondary | 5 |
| Archivists | 1 |
| Area, Ethnic, and Cultural Studies Teachers, Postsecondary | 1 |
| Art, Drama, and Music Teachers, Postsecondary | 6 |
| Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary | 2 |
| Audio-Visual and Multimedia Collections Specialists | 16 |
| Biological Science Teachers, Postsecondary | 3 |
| Business Teachers, Postsecondary | 2 |
| Career/Technical Education Teachers, Middle School | 2 |
| Career/Technical Education Teachers, Secondary School | 3 |
| Chemistry Teachers, Postsecondary | 4 |
| Communications Teachers, Postsecondary | 6 |
| Computer Science Teachers, Postsecondary | 3 |
| Criminal Justice and Law Enforcement Teachers, Postsecondary | 7 |
| Curators | 2 |
| Economics Teachers, Postsecondary | 3 |
| Education Teachers, Postsecondary | 2 |
| Elementary School Teachers, Except Special Education | 10 |
| Engineering Teachers, Postsecondary | 1 |
| English Language and Literature Teachers, Postsecondary | 1 |
| Environmental Science Teachers, Postsecondary | 2 |
| Farm and Home Management Advisors | 3 |
| Foreign Language and Literature Teachers, Postsecondary | 3 |
| Forestry and Conservation Science Teachers, Postsecondary | 4 |
| Geography Teachers, Postsecondary | 5 |
| Graduate Teaching Assistants | 1 |
| Health Specialties Teachers, Postsecondary | 3 |
| History Teachers, Postsecondary | 2 |
| Home Economics Teachers, Postsecondary | 4 |
| Instructional Coordinators | 1 |
| Instructional Designers and Technologists | 1 |
| Kindergarten Teachers, Except Special Education | 9 |
| Law Teachers, Postsecondary | 2 |
| Librarians | 1 |

| Education, Training, and Library | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Library Science Teachers, Postsecondary | 2 |
| Library Technicians | 1 |
| Mathematical Science Teachers, Postsecondary | 4 |
| Middle School Teachers, Except Special and Career/Technical Education | 4 |
| Museum Technicians and Conservators | 2 |
| Nursing Instructors and Teachers, Postsecondary | 7 |
| Philosophy and Religion Teachers, Postsecondary | 4 |
| Physics Teachers, Postsecondary | 2 |
| Political Science Teachers, Postsecondary | 6 |
| Preschool Teachers, Except Special Education | 9 |
| Psychology Teachers, Postsecondary | 6 |
| Recreation and Fitness Studies Teachers, Postsecondary | 4 |
| Secondary School Teachers, Except Special and Career/Technical Education | 8 |
| Self-Enrichment Education Teachers | 7 |
| Social Work Teachers, Postsecondary | 3 |
| Sociology Teachers, Postsecondary | 2 |
| Special Education Teachers, Kindergarten, Elementary School | 7 |
| Special Education Teachers, Middle School | 4 |
| Special Education Teachers, Secondary School | 9 |
| Teacher Assistants | 10 |
| Tutors | 4 |
| Vocational Education Teachers, Postsecondary | 8 |
| **Avg.** | **4** |

| Healthcare Practitioners and Technical | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Acupuncturists | 8 |
| Acute Care Nurses | 4 |
| Advanced Practice Psychiatric Nurses | 4 |
| Allergists and Immunologists | 1 |
| Anesthesiologist Assistants | 3 |
| Anesthesiologists | 6 |
| Art Therapists | 6 |
| Athletic Trainers | 11 |
| Audiologists | 3 |
| Cardiovascular Technologists and Technicians | 6 |
| Chiropractors | 3 |
| Clinical Nurse Specialists | 6 |
| Critical Care Nurses | 5 |

| Healthcare Practitioners and Technical | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Cytogenetic Technologists | 3 |
| Cytotechnologists | 3 |
| Dental Hygienists | 13 |
| Dentists, General | 6 |
| Dermatologists | 3 |
| Diagnostic Medical Sonographers | 2 |
| Dietetic Technicians | 2 |
| Dietitians and Nutritionists | 1 |
| Emergency Medical Technicians and Paramedics | 9 |
| Exercise Physiologists | 3 |
| Family and General Practitioners | 4 |
| Genetic Counselors | 1 |
| Hearing Aid Specialists | 9 |
| Histotechnologists and Histologic Technicians | 3 |
| Hospitalists | 7 |
| Internists, General | 7 |
| Licensed Practical and Licensed Vocational Nurses | 5 |
| Low Vision Therapists, Orientation and Mobility Specialists, and Vision Rehabilitation Therapists | 9 |
| Magnetic Resonance Imaging Technologists | 3 |
| Medical and Clinical Laboratory Technicians | 2 |
| Medical and Clinical Laboratory Technologists | 3 |
| Medical Records and Health Information Technicians | 1 |
| Midwives | 7 |
| Music Therapists | 4 |
| Naturopathic Physicians | 3 |
| Neurodiagnostic Technologists | 5 |
| Neurologists | 4 |
| Nuclear Medicine Physicians | 1 |
| Nuclear Medicine Technologists | 5 |
| Nurse Anesthetists | 2 |
| Nurse Midwives | 7 |
| Nurse Practitioners | 4 |
| Obstetricians and Gynecologists | 3 |
| Occupational Health and Safety Specialists | 6 |
| Occupational Health and Safety Technicians | 3 |
| Occupational Therapists | 6 |
| Ophthalmic Medical Technicians | 6 |
| Ophthalmic Medical Technologists | 6 |

| Healthcare Practitioners and Technical | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Ophthalmologists | 3 |
| Opticians, Dispensing | 3 |
| Optometrists | 5 |
| Oral and Maxillofacial Surgeons | 4 |
| Orthodontists | 10 |
| Orthoptists | 7 |
| Orthotists and Prosthetists | 4 |
| Pathologists | 3 |
| Pediatricians, General | 5 |
| Pharmacists | 1 |
| Pharmacy Technicians | 2 |
| Physical Medicine and Rehabilitation Physicians | 3 |
| Physical Therapists | 1 |
| Physician Assistants | 3 |
| Podiatrists | 3 |
| Preventive Medicine Physicians | 1 |
| Prosthodontists | 7 |
| Psychiatric Technicians | 5 |
| Psychiatrists | 7 |
| Radiation Therapists | 2 |
| Radiologic Technicians | 3 |
| Radiologic Technologists | 3 |
| Radiologists | 4 |
| Recreational Therapists | 8 |
| Registered Nurses | 7 |
| Respiratory Therapists | 6 |
| Respiratory Therapy Technicians | 5 |
| Speech-Language Pathologists | 4 |
| Sports Medicine Physicians | 1 |
| Surgeons | 5 |
| Surgical Assistants | 5 |
| Surgical Technologists | 16 |
| Urologists | 3 |
| Veterinarians | 4 |
| Veterinary Technologists and Technicians | 3 |
| Dental Assistants | 2 |
| Endoscopy Technicians | 1 |
| Home Health Aides | 6 |
| Massage Therapists | 9 |

| Healthcare Practitioners and Technical | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Medical Assistants | 3 |
| Medical Equipment Preparers | 5 |
| Medical Transcriptionists | 2 |
| Nursing Assistants | 8 |
| Occupational Therapy Aides | 14 |
| Occupational Therapy Assistants | 3 |
| Orderlies | 17 |
| Pharmacy Aides | 4 |
| Phlebotomists | 6 |
| Physical Therapist Aides | 10 |
| Physical Therapist Assistants | 8 |
| Psychiatric Aides | 15 |
| Speech-Language Pathology Assistants | 2 |
| Veterinary Assistants and Laboratory Animal Caretakers | 8 |
| **Avg.** | **5** |

| Food Preparation and Serving Related | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Baristas | 7 |
| Bartenders | 17 |
| Chefs and Head Cooks | 21 |
| Combined Food Preparation/Servers, Including Fast Food | 17 |
| Cooks, Fast Food | 17 |
| Cooks, Institution and Cafeteria | 6 |
| Cooks, Private Household | 8 |
| Cooks, Restaurant | 17 |
| Cooks, Short Order | 17 |
| Counter Attendants, Cafeteria, Food Concession, and Coffee Shop | 6 |
| Dining Room, Cafeteria Attendants and Bartender Helpers | 17 |
| Dishwashers | 17 |
| First-Line Supervisors of Food Preparation and Servers | 10 |
| Food Preparation Workers | 17 |
| Food Servers, Nonrestaurant | 17 |
| Hosts/Hostesses, Restaurant, Lounge, and Coffee Shop | 17 |
| Waiters and Waitresses | 17 |
| **Avg.** | **14** |

| Installation, Maintenance, and Repair | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Aircraft Mechanics and Service Technicians | 8 |
| Automotive Body and Related Repairers | 17 |
| Automotive Glass Installers and Repairers | 17 |
| Automotive Master Mechanics | 13 |
| Automotive Specialty Technicians | 17 |
| Avionics Technicians | 11 |
| Bicycle Repairers | 12 |
| Bus and Truck Mechanics and Diesel Engine Specialists | 17 |
| Camera and Photographic Equipment Repairers | 9 |
| Coin, Vending, and Amusement Machine Servicers and Repairers | 17 |
| Commercial Divers | 12 |
| Computer, Automated Teller, and Office Machine Repairers | 12 |
| Control and Valve Installers and Repairers, Except Mechanical Door | 17 |
| Electric Motor, Power Tool, and Related Repairers | 12 |
| Electrical and Electronics Installers and Repairers, Transportation Equipment | 8 |
| Electrical and Electronics Repairers, Commercial and Industrial Equipment | 7 |
| Electrical and Electronics Repairers, Powerhouse, Substation, and Relay | 17 |
| Electrical Power-Line Installers and Repairers | 17 |
| Electronic Equipment Installers, Repairers, Motor Vehicles | 9 |
| Electronic Entertainment Equipment Installers, Repairers | 5 |
| Fabric Menders, Except Garment | 17 |
| Farm Equipment Mechanics and Service Technicians | 12 |
| First-Line Supervisors of Mechanics, Installers, Repairers | 10 |
| Geothermal Technicians | 5 |
| Heating and Air Conditioning Mechanics and Installers | 10 |
| Helpers--Installation, Maintenance, and Repair Workers | 17 |
| Home Appliance Repairers | 13 |
| Industrial Machinery Mechanics | 17 |
| Locksmiths and Safe Repairers | 12 |
| Maintenance and Repair Workers, General | 15 |
| Maintenance Workers, Machinery | 11 |
| Manufactured Building and Mobile Home Installers | 18 |
| Mechanical Door Repairers | 5 |
| Medical Equipment Repairers | 8 |
| Millwrights | 20 |
| Mobile Heavy Equipment Mechanics, Except Engines | 13 |
| Motorboat Mechanics and Service Technicians | 17 |
| Motorcycle Mechanics | 17 |
| Musical Instrument Repairers and Tuners | 16 |

| Installation, Maintenance, and Repair | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Outdoor Power Equipment and Small Engine Mechanics | 17 |
| Radio Mechanics | 14 |
| Radio, Cellular Tower Equipment Installers and Repairers | 8 |
| Rail Car Repairers | 17 |
| Recreational Vehicle Service Technicians | 16 |
| Refractory Materials Repairers, Except Brickmasons | 17 |
| Refrigeration Mechanics and Installers | 15 |
| Riggers | 17 |
| Security and Fire Alarm Systems Installers | 9 |
| Signal and Track Switch Repairers | 17 |
| Telecommunications Equipment Installers and Repairers | 14 |
| Telecommunications Line Installers and Repairers | 17 |
| Tire Repairers and Changers | 17 |
| Watch Repairers | 17 |
| Wind Turbine Service Technicians | 9 |
| **Avg.** | **13** |

| Life, Physical, and Social Science | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Agricultural Technicians | 1 |
| Animal Scientists | 3 |
| Anthropologists | 4 |
| Archeologists | 3 |
| Astronomers | 4 |
| Atmospheric and Space Scientists | 1 |
| Biochemists and Biophysicists | 3 |
| Bioinformatics Scientists | 2 |
| Biological Technicians | 1 |
| Biologists | 3 |
| Chemical Technicians | 3 |
| Chemists | 3 |
| City and Regional Planning Aides | 1 |
| Climate Change Analysts | 1 |
| Clinical Psychologists | 7 |
| Counseling Psychologists | 11 |
| Economists | 8 |
| Environmental Economists | 1 |
| Environmental Restoration Planners | 3 |
| Environmental Science and Protection Technicians, Including Health | 3 |
| Environmental Scientists and Specialists, Including Health | 3 |

| Life, Physical, and Social Science | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Epidemiologists | 3 |
| Food Science Technicians | 2 |
| Food Scientists and Technologists | 2 |
| Forensic Science Technicians | 3 |
| Forest and Conservation Technicians | 3 |
| Foresters | 2 |
| Geneticists | 1 |
| Geographers | 1 |
| Geological Sample Test Technicians | 2 |
| Geophysical Data Technicians | 1 |
| Geoscientists, Except Hydrologists and Geographers | 2 |
| Historians | 1 |
| Hydrologists | 2 |
| Industrial Ecologists | 1 |
| Industrial-Organizational Psychologists | 2 |
| Materials Scientists | 3 |
| Medical Scientists, Except Epidemiologists | 4 |
| Microbiologists | 5 |
| Molecular and Cellular Biologists | 2 |
| Neuropsychologists and Clinical Neuropsychologists | 1 |
| Nuclear Equipment Operation Technicians | 6 |
| Nuclear Monitoring Technicians | 5 |
| Park Naturalists | 2 |
| Physicists | 5 |
| Political Scientists | 1 |
| Precision Agriculture Technicians | 3 |
| Quality Control Analysts | 3 |
| Range Managers | 5 |
| Remote Sensing Scientists and Technologists | 2 |
| Remote Sensing Technicians | 3 |
| School Psychologists | 2 |
| Social Science Research Assistants | 2 |
| Sociologists | 1 |
| Soil and Plant Scientists | 1 |
| Soil and Water Conservationists | 2 |
| Survey Researchers | 2 |
| Transportation Planners | 1 |
| Urban and Regional Planners | 2 |
| Zoologists and Wildlife Biologists | 4 |

| Life, Physical, and Social Science | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| **Avg.** | **3** |

| Legal | |
|---|---|
| **Occupation (8)** | **Reading Comp Rank** |
| Administrative Law Judges, Adjudicators, and Hearing Officers | 2 |
| Arbitrators, Mediators, and Conciliators | 7 |
| Court Reporters | 3 |
| Judges, Magistrate Judges, and Magistrates | 5 |
| Judicial Law Clerks | 1 |
| Lawyers | 3 |
| Paralegals and Legal Assistants | 1 |
| Title Examiners, Abstractors, and Searchers | 4 |
| **Avg.** | **3** |

| Management | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Administrative Services Managers | 4 |
| Advertising and Promotions Managers | 7 |
| Aquacultural Managers | 6 |
| Architectural and Engineering Managers | 1 |
| Biofuels Production Managers | 3 |
| Biofuels Technology and Product Development Managers | 4 |
| Biomass Power Plant Managers | 7 |
| Brownfield Redevelopment Specialists and Site Managers | 5 |
| Chief Executives | 13 |
| Chief Sustainability Officers | 3 |
| Clinical Research Coordinators | 3 |
| Compensation and Benefits Managers | 2 |
| Compliance Managers | 2 |
| Computer and Information Systems Managers | 3 |
| Construction Managers | 7 |
| Distance Learning Coordinators | 6 |
| Education Administrators, Elementary and Secondary School | 2 |
| Education Administrators, Postsecondary | 3 |
| Education Administrators, Preschool and Childcare Program | 6 |
| Emergency Management Directors | 8 |
| Farm and Ranch Managers | 11 |
| Financial Managers, Branch or Department | 4 |
| Fitness and Wellness Coordinators | 6 |
| Food Service Managers | 12 |
| Funeral Service Managers | 6 |

| Management | |
|---|---|
| **Occupation** | **Reading Comp Rank** |
| Gaming Managers | 16 |
| General and Operations Managers | 7 |
| Geothermal Production Managers | 3 |
| Human Resources Managers | 7 |
| Hydroelectric Production Managers | 5 |
| Industrial Production Managers | 8 |
| Investment Fund Managers | 3 |
| Lodging Managers | 10 |
| Logistics Managers | 6 |
| Loss Prevention Managers | 4 |
| Marketing Managers | 4 |
| Medical and Health Services Managers | 6 |
| Natural Sciences Managers | 2 |
| Nursery and Greenhouse Managers | 15 |
| Postmasters and Mail Superintendents | 3 |
| Property, Real Estate, and Community Association Managers | 4 |
| Public Relations and Fundraising Managers | 3 |
| Purchasing Managers | 12 |
| Quality Control Systems Managers | 1 |
| Regulatory Affairs Managers | 1 |
| Sales Managers | 7 |
| Security Managers | 2 |
| Social and Community Service Managers | 10 |
| Storage and Distribution Managers | 8 |
| Supply Chain Managers | 2 |
| Training and Development Managers | 10 |
| Transportation Managers | 1 |
| Treasurers and Controllers | 5 |
| Water Resource Specialists | 1 |
| Wind Energy Operations Managers | 5 |
| Wind Energy Project Managers | 2 |
| **Avg.** | **5** |

| Office and Administrative | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Bill and Account Collectors | 7 |
| Billing, Cost, and Rate Clerks | 3 |
| Bioinformatics Technicians | 1 |
| Bookkeeping, Accounting, and Auditing Clerks | 2 |
| Brokerage Clerks | 3 |
| Cargo and Freight Agents | 7 |
| Computer Operators | 2 |
| Correspondence Clerks | 2 |
| Couriers and Messengers | 5 |
| Court Clerks | 3 |
| Credit Authorizers | 3 |
| Credit Checkers | 4 |
| Customer Service Representatives | 4 |
| Data Entry Keyers | 1 |
| Desktop Publishers | 2 |
| Dispatchers, Except Police, Fire, and Ambulance | 5 |
| Eligibility Interviewers, Government Programs | 3 |
| Executive Secretaries and Executive Administrative Assistants | 2 |
| File Clerks | 1 |
| First-Line Supervisors of Office, Administrative Support Workers | 4 |
| Freight Forwarders | 3 |
| Gaming Cage Workers | 9 |
| Hotel, Motel, and Resort Desk Clerks | 6 |
| Human Resources Assistants, Except Payroll and Timekeeping | 1 |
| Insurance Claims Clerks | 2 |
| Insurance Policy Processing Clerks | 3 |
| Interviewers, Except Eligibility and Loan | 3 |
| Legal Secretaries | 2 |
| Library Assistants, Clerical | 3 |
| License Clerks | 8 |
| Loan Interviewers and Clerks | 3 |
| Mail Clerks and Mail Machine Operators, Except Postal Service | 3 |
| Medical Secretaries | 4 |
| Meter Readers, Utilities | 3 |
| Municipal Clerks | 1 |
| New Accounts Clerks | 3 |
| Office Clerks, General | 2 |
| Office Machine Operators, Except Computer | 9 |

| Office and Administrative | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Order Clerks | 2 |
| Order Fillers, Wholesale and Retail Sales | 1 |
| Patient Representatives | 8 |
| Payroll and Timekeeping Clerks | 2 |
| Police, Fire, and Ambulance Dispatchers | 6 |
| Postal Service Clerks | 3 |
| Postal Service Mail Carriers | 17 |
| Postal Service Mail Sorters, Processors, and Processing Machine Operators | 4 |
| Procurement Clerks | 1 |
| Production, Planning, and Expediting Clerks | 2 |
| Proofreaders and Copy Markers | 1 |
| Receptionists and Information Clerks | 5 |
| Reservation and Transportation Ticket Agents and Travel Clerks | 5 |
| Secretaries and Administrative Assistants, Except Legal, Medical, and Executive | 3 |
| Shipping, Receiving, and Traffic Clerks | 4 |
| Statement Clerks | 2 |
| Statistical Assistants | 3 |
| Stock Clerks, Sales Floor | 17 |
| Stock Clerks- Stockroom, Warehouse, or Storage Yard | 17 |
| Switchboard Operators, Including Answering Service | 4 |
| Telephone Operators | 6 |
| Tellers | 5 |
| Weighers, Measurers, Checkers, and Samplers, Recordkeeping | 2 |
| Word Processors and Typists | 2 |
| **Avg.** | **4** |

| Sales and Related | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Advertising Sales Agents | 10 |
| Cashiers | 17 |
| Counter and Rental Clerks | 4 |
| Demonstrators and Product Promoters | 4 |
| Door-To-Door Sales Workers, News and Street Vendors | 9 |
| Energy Brokers | 2 |
| First-Line Supervisors of Non-Retail Sales Workers | 7 |
| First-Line Supervisors of Retail Sales Workers | 16 |
| Gaming Change Persons and Booth Cashiers | 7 |
| Insurance Sales Agents | 2 |
| Models | 17 |
| Parts Salespersons | 3 |

| Sales and Related | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Real Estate Brokers | 4 |
| Real Estate Sales Agents | 10 |
| Retail Salespersons | 7 |
| Sales Agents, Financial Services | 5 |
| Sales Agents, Securities and Commodities | 4 |
| Sales Engineers | 3 |
| Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 7 |
| Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products | 6 |
| Securities and Commodities Traders | 3 |
| Solar Sales Representatives and Assessors | 6 |
| Telemarketers | 6 |
| Travel Agents | 3 |
| **Avg.** | **7** |

| Transportation and Material Moving | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Air Traffic Controllers | 9 |
| Aircraft Cargo Handling Supervisors | 10 |
| Airfield Operations Specialists | 3 |
| Airline Pilots, Copilots, and Flight Engineers | 8 |
| Ambulance Drivers and Attendants | 17 |
| Automotive and Watercraft Service Attendants | 17 |
| Aviation Inspectors | 6 |
| Bridge and Lock Tenders | 17 |
| Bus Drivers, School or Special Client | 17 |
| Bus Drivers, Transit and Intercity | 17 |
| Cleaners of Vehicles and Equipment | 17 |
| Commercial Pilots | 8 |
| Conveyor Operators and Tenders | 7 |
| Crane and Tower Operators | 7 |
| Dredge Operators | 17 |
| Driver/Sales Workers | 8 |
| Excavating and Loading Machine and Dragline Operators | 13 |
| First-Line Supervisors of Laborers and Material Movers | 14 |
| First-Line Supervisors of Transportation Vehicle Operators | 8 |
| Flight Attendants | 10 |
| Freight and Cargo Inspectors | 1 |
| Gas Compressor and Gas Pumping Station Operators | 8 |
| Heavy and Tractor-Trailer Truck Drivers | 6 |

| Transportation and Material Moving | |
|---|---|
| **Occupations** | **Reading Comp Rank** |
| Hoist and Winch Operators | 17 |
| Industrial Truck and Tractor Operators | 17 |
| Laborers and Freight, Stock, and Material Movers, Hand | 17 |
| Light Truck or Delivery Services Drivers | 5 |
| Loading Machine Operators, Underground Mining | 17 |
| Locomotive Engineers | 8 |
| Locomotive Firers | 17 |
| Machine Feeders and Offbearers | 17 |
| Mates- Ship, Boat, and Barge | 13 |
| Mine Shuttle Car Operators | 17 |
| Motorboat Operators | 17 |
| Packers and Packagers, Hand | 17 |
| Parking Lot Attendants | 17 |
| Pilots, Ship | 11 |
| Pump Operators, Except Wellhead Pumpers | 6 |
| Rail Yard Engineers, Dinkey Operators, and Hostlers | 10 |
| Railroad Brake, Signal, and Switch Operators | 4 |
| Railroad Conductors and Yardmasters | 11 |
| Recycling Coordinators | 8 |
| Refuse and Recyclable Material Collectors | 17 |
| Sailors and Marine Oilers | 17 |
| Ship and Boat Captains | 15 |
| Ship Engineers | 11 |
| Subway and Streetcar Operators | 9 |
| Tank Car, Truck, and Ship Loaders | 7 |
| Taxi Drivers and Chauffeurs | 17 |
| Traffic Technicians | 5 |
| Transportation Attendants, Except Flight Attendants | 8 |
| Transportation Vehicle, Equipment and Systems Inspectors | 6 |
| Wellhead Pumpers | 17 |
| **Avg.** | **12** |

Source: https://www.onetonline.org/find/