**PIAAC IDE Training Video Transcript**

Link to Training Video: https://youtu.be/r__3hhjgtcU

**Training Video Outline (Video Time 0:00-2:02)**

**Slide 1**

This video is designed to provide comprehensive, step-by step instructions on how to use PIAAC international data explorer (IDE). It contains a detailed information about PIAAC-IDE content and capabilities as well as how PIAAC data are organized in this tool. The scenarios presented in this video are structured from easy to more complex in order to provide instructions for all levels of expertise. The training is intended to be used by, researchers, policymakers, news media, and practitioners who are interested to learn more about PIAAC data.

The training video was prepared by the PIAAC team at American Institutes for Research (AIR), through a contract with the National Center for Education Statistics (NCES) of the U.S. Department of Education. Special thanks to Emily Pawlowski for her work on this video.

**Slide 2**

Before starting the training portion, we first cover a short introduction to PIAAC and then introduce the IDE, including computer requirements and an overview of what you can and cannot do with the IDE. Next, we will cover the content and organization of the IDE. We will then go over nine research question scenarios to show you the IDE's functions. We start with easy scenarios to show the basic functions, and then move to more complex scenarios. There will be some practice scenarios at the end of each section so that you can practice your own.

Please note that the slides and full text transcript of this video, plus a detailed outline of the content and topics covered in each section with timing for each section can be found on the PIAAC Gateway website as well as in the video description.

Links to reports, resources, and tools referenced throughout can also be found in the same location.

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**Part 1: Introduction to PIAAC (Video Time: 2:03-6:22)**

**Slide 3**

Introduction to PIAAC

**Slide 4**

First, the short overview of PIAAC.

PIAAC is an international large–scale assessment of adult skills, organized internationally by the Organization for Economic Cooperation and Development, or OECD.

It is conducted in households with a nationally representative sample of a minimum of 5,000 adults ages 16 to 65, in 24 OECD and partner countries in 2011 to 2012.

In the U.S., PIAAC was conducted by the National Center for Education Statistics, or NCES.

The initial results were released in 2013.

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The U.S. conducted a PIAAC National Supplement in 2013 to 2014, adding 3,660 adults to its original sample resulting in a combined 2012/2014 sample of over 8,600 U.S. adults.

In this second round, the U.S. oversampled unemployed adults ages 16 to 65, young adults ages 16 to 34, and extended the sample to older adults ages 66 to 74.

The second round also included the U.S. PIAAC Prison Study, which administered the assessment to a sample of 1,300 inmates in federal and state prisons.

Internationally, **9** additional countries joined the second round of PIAAC data collection in 2014.

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PIAAC direct assessment includes three cognitive domains: literacy, numeracy, and problem solving in technology-rich environments, or PS-TRE, often referred to as digital problem solving.

Literacy and numeracy are assessed either on a computer or in a paper-and-pencil format, while only those who took the assessment on the computer were assessed in digital problem solving.

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In addition to the cognitive assessment, PIAAC includes an extensive background questionnaire survey, or BQ, that collects information on a wide range of topics including work, education, and training experiences as well as skill use at work and in everyday life.

Countries had the option to add up to 5 minutes of country-specific items to the international BQ. The additional U.S. national variables include, for example, race/ethnicity and health practices.

In the U.S., the cognitive assessment is only given in English while the BQ is given in either English or Spanish.

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Now let’s see how PIAAC results are reported.

Results from the cognitive domains are reported **as average scores** and as proficiency levels.

**Average scores** are reported on a scale of 0 to 500 for all three cognitive domains.

**Proficiency levels** are reported as the percentage of adults scoring at each performance level anchored by a specific set of concrete skills.

The literacy and numeracy proficiency levels are reported as six levels, from below level 1 to level 5, and digital problem solving is reported as four levels, from below level 1 to level 3.

Tasks vary in difficulty. For example, tasks at below level 1 in literacy may involve locating a single piece of specific information while tasks at level 5 may require searching for and integrating information across multiple, dense texts.

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For more information about PIAAC check out the links on this slide.

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**Part 2: Introduction to the International Data Explorer (Video Time: 6:23-11:33)**

**Slide 10**

Introduction to the International Data Explorer

**Slide 11**

Now let's have a short overview of the PIAAC IDE.

The PIAAC IDE is a web-based tool for conducting analyses using a simple point-and-click interface without any special software or advanced statistical knowledge.

There are two versions of the PIAAC IDE. One, which we will refer to as the U.S. PIAAC IDE, is supported by NCES, and the other by the OECD, which can be accessed at the web addresses on the slide.

While both IDEs are similar, there are some differences between the two, primarily in terms of **data availability** and **analytical functions**.

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In terms of data availability, the U.S. IDE **contains** the U.S. combined 2012/14 main study and national supplement household data as well as U.S. prison data, while the OECD IDE contains only the U.S. 2012 or main study data. Additionally, the U.S. version contains U.S.-specific variables, and prison-specific variables that are not available in the OECD version.

Other differences are: the U.S. IDE includes data for Cyprus, which is not in the OECD version while the OECD IDE includes Australia and Russian Federation data that are not available in the U.S. version.

The U.S. IDE also has some **additional analytical functions** and capabilities that are not available in the OECD version: it allows for **gap analysis** and **regression analysis**, **groups subjects together** so they can be displayed simultaneously, and **has proficiency levels/benchmarks as "variables**" instead of "statistics options", which provides more flexibility for your analyses.

Please note, for the rest of this presentation, **we will focus on the U.S. PIAAC IDE only,** and all references to the IDE or PIAAC IDE throughout will be referring to this U.S. version.

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Here are the computer requirements for use of the U.S. PIAAC IDE.

**Slide 14**

We will now go over the specific types of analyses the U.S. PIAAC IDE can be used for.

The IDE can produce statistically valid results accounting for PIAAC's complex sampling and assessment design, including for example weights and plausible values, to answer a variety of research questions.

These questions can range in complexity from simple descriptive results using one or a few variables, such as average score by gender, to those that require using multiple variables, such as a linear regression of literacy scores on age, gender, and education.

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Some types of analyses cannot be done in the IDE. It cannot provide more complex linear regressions, or logistic regressions; results that look at the correlation between variables or scale scores on multiple domains; or analysis that involves more complex recoding of variables, such as creating new variables from multiple existing ones.

If you are interested in conducting these more advanced analyses, or using variables only available on the U.S. restricted use file, you would need to use the micro-data files and other tools such as the IDB Analyzer.

Information about these files and tools can be found in the PIAAC Distance Learning Dataset Training, or DLDT, a free online training module provided by NCES, as well as in the other PIAAC resources shown earlier.

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Now let's see the types of results the U.S. PIAAC IDE provides.

It can be used to **generate various types** of statistical results including averages, percentages (including proficiency level distributions), standard deviations, and percentiles.

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The IDE can also be used to collapse categories within a variable.

Results can be displayed in a variety of formats including tables, maps, and charts. The types of charts include bar charts, column charts, line charts, and percentiles charts.

The IDE can also be used to run **statistical significance** testing and, as mentioned before, the U.S. PIAAC IDE can be used to run **regression and gap analysis.** Later, we will go over specific examples of each type of result and how to produce it within the IDE.

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**Part 3: Content and Organization of the IDE (Video Time: 11:34-28:33)**

**Slide 18**

First, let's find out about the content stored in the IDE.

There are four major types of data available in the U.S. PIAAC IDE:

1. First is direct assessment data or data on the three cognitive domains of literacy, numeracy and digital problem solving.

2. Second is the data from three types of background questionnaire, or BQ, variables, including:
    a. International BQ variables that are common across all countries;
    b. U.S.-specific BQ variables such as those only asked of the U.S. household population; and
    c. U.S. prison-specific BQ variables that are based on questions only asked of the prison population.

    In addition, there are derived variables that have been recoded or categorized from direct responses to the BQ.

3. The third set of data are comparable trend variables from the two prior international adult literacy assessments, including literacy data from the International Adult Literacy Survey (IALS), conducted in 1994 to 1998 and literacy and numeracy data from the Adult Literacy and Life skills Survey (ALL), conducted in 2003-2008.

4. The fourth group of data is information on jurisdictions.

This includes **OECD Entities,** or countries that participated in PIAAC at the national level, such as the U.S. Also included are the **OECD Sub-National Entities,** or OECD members that participated in PIAAC at the sub-national level, and the **Partners** group, which includes participating countries that are not OECD members.

In addition, there is U.S.-specific data including the U.S. household population and the U.S. incarcerated population.

In order to be able to effectively use the U.S. PIAAC IDE, you'll need to know how the content and data we talked about are organized. So, let's now go to the NCES IDE site:

*(Go to IDE)*

The PIAAC sample or target population is organized in three groups under the display link. These displays, or populations of interest, are: Adults ages 16 to 65, Young adults ages 16 to 34; and U.S. Adults residing in households and prisons ages 16 to 74. Use the 16-65 display when you plan to conduct an international comparison of the full 16-65-year-old population of all or a selected number of participating countries, or if you want to look at just the 16 to 65-year-old population within the U.S.

The Young adults 16-34 target group or display is useful for easier sub-setting of the young adult population that was oversampled in the U.S., and also allows for international comparison of peers.

The third target group or display is focused on U.S. Adults only, ages 16 to 74 who reside in households or prison.

Note that only one target population or display can be selected at a time.

After a population is selected, the second part of the page appears.

Before showing you how the other content areas are organized, we need to mention that as you move from one page to another, like moving from the **1. Select Criteria** page to the **2. Select Variables** page that are indicated in the tabs at the top of the page, category and subcategory options may change. Note that the highlighted white tab at the top of the page indicates the current step or location in the analysis process. Throughout this training we may refer to these different steps as pages in the IDE. Additionally, the categories here are mutually exclusive so each measure or variable is only available on one page and under one subcategory.

In the top portion of the first page or **1. Select Criteria page**, there are variables that you can use as dependent measures in your analysis. All of the variables included in this page are **continuous variables** that are organized by category and sub category. These continuous variables include the actual values of responses rather than the range or group in which they fit. So, for example, one would find the specific earnings variable on this page. The variables on this page can be used as dependent measures in analysis and one can produce averages, standard deviations, and percentiles of these measures.

The first category in here is skills, which includes overall **scale scores** for the three literacy, numeracy, and digital problem-solving domains.

The next in the skills category is **indices** of skill use in everyday life and at work for ICT, numeracy, reading, and writing **skill use**.

**Still in the skills section**. Here you also find **scores** on the three sections **of reading components** skills (passage comprehension, print vocabulary, and sentence processing) and related timing for each section.

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**The next major category** on this page is the **population** category which is used when you want to look at percentages across the full sample without looking at any specific **continuous measures**.

Next is the **International Background Questionnaire** category, where you can find various subcategories from each section of the international BQ that was common across countries; such as Formal education, Current work, and Background. You can expand each of these subcategories to look more specifically at the various continuous variables available in the IDE on that particular topic or area.

**Trend variables category**, includes comparable trend variables that are available from IALS, ALL, and PIAAC and they can be used to do analysis over time.

**The Interview routing determining group category** and subcategory shows variables that are derived by and used in the BQ's computer-based routing system.

When selecting the U.S. Adults, 16-74-year old **(**Household and Prison) display, you will also see a category for National variables for Prison, with prison-specific variables and topics such as Prison jobs.

Going back to Adults, 16-65 display, you can see **the right half of this page** has column headers in both the upper and lower portions to select the years/studies for your analysis, like if you want to use data from ALL 2003-2008 or IALS 1994-1998.

Although there are many categories and subcategories on this page, you need to select at least one measure in order to proceed with analysis. In fact, only one measure can be included in a particular results table and if more than one measure is selected here, separate results tables would be produced for each measure.

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Now let's look at **how** the **lower portion of the 1. Select Criteria** page, that is dedicated to the data from **the jurisdictions**, is organized. If you have selected Adults 16-65 or Young Adults 16-34, and plan to conduct an international comparison, the first group listed here is the International group, and the first jurisdiction listed is the **Average of All Jurisdictions.** When selected, this provides the **average of all OECD national and sub-national entities**, and **Partners** that are included in the NCES IDE. This **average stays the same regardless** of the other specific jurisdictions selected.

The other listed in this group is the **Average of the Selected Jurisdictions that provides** the average of all the specific jurisdictions you have selected in your analysis. So, this average will **vary depending on your selections**. For example, if you have selected Canada, Japan, and the United States in addition to the Average of the Selected Jurisdictions, this would provide the average of those three selected countries.

The OECD National and Subnational entities, as well as Partners are also available here.

When you select US. 16-74 as your target population, then you will only see the U.S. Household **(**16-74 years old) and U.S. Prison (16-74 years old) in the jurisdiction section.

Again, similar to the measures, you only need to select one jurisdiction in order to continue to the next step in the analysis.

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Now let's look at the content of the step 2 or "**2. Select Variables**" page. Here, similar to the previous page, you see variables are organized by category and sub-category. However, the variables here are not **continuous variables.** They are all **categorical variables**. For example, on this second page you would find variables categorizing income into deciles, which is different from the continuous income variables on the first page. The variables here can be used differently in your analysis than the variables on the first page. They can be used to produce percentage distributions or crosstabs, and can also be used to cross or subset the results for the measures on the first page.

**Major reporting groups** is the first category on this page and provides easy access to commonly used variables. This category begins with the **All adults** option that allows you to look the **full population results**, without breaking it down by additional categories or variables. It also includes **common demographic variables** such as gender, age, education level, or employment status.

**Proficiency levels** is another major subcategory, which allows access to the six proficiency levels for literacy and numeracy and four levels for digital problem solving.

**The PIAAC Assessment status subcategory** is a category that may be useful for more advanced analysis of assessment routing and participation, especially when you want to know whether the **participants had scores** for each domain and to see what percentage of the population **had literacy-related non-response,** meaning those who were not able to complete the background questionnaire, or BQ, due to language difficulties or learning and mental disabilities. It can also be used to find out what portion of the population took the **computer-based assessment or paper-and-pencil version**, and the **reasons why** they were routed to the paper-and-pencil version.

The **Interview routing determining group category and subcategory** in here indicates variables that are derived and used by the CAPI, or Computer-Assisted Personal Interview, which is the computer software that is used in the administration of the BQ. This means that these variables are used in routing respondents to relevant questions in the BQ. All of the variables in this category are derived, meaning that they are not direct responses from the BQ, but have been recoded or categorized in some way from responses to one or more questions. The specific coding for these derivations can be found in the Background Questionnaire. For example, in here the variable **Current status/work history - Work experience** was recoded from responses to several work-related questions in order to create a clearer indicator of current and recent work experiences. So, in addition to **understanding** how respondents were routed in the BQ, these variables can be useful for their efficient, clear, and **more simplified derivations.**

Similar to the previous page, the **Trend and the International BQ variables** are listed on this page. Note that although these trend variables appear for the Adults 16-74-year-old display, they cannot be used for analysis over time for this population. There are also U.S. prison variables (when you select 16-74

display) and U.S. national variables that are based on U.S.-specific questions, derivations, or modifications, so cannot be used in international comparison.

This was a basic overview of the two pages or tabs on the top indicating the data that is stored in the IDE and how these data are organized. The functions of the remaining pages in the IDE will be demonstrated throughout upcoming example scenarios.

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There are four groups of scenarios starting from simple scenarios in Group A and then moving to more complex scenarios. The purpose of these scenarios is to show you the U.S. PIAAC IDE's capabilities, through familiarizing you with the functions, the types of analyses and the multiple formats that you can use to present your results.

The first group of scenarios, Group A, will provide an overview of the basic functions and steps in the IDE and will cover topics including analysis of average scores, proficiency levels, and percentiles as well as significance testing between jurisdictions and creating charts.

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**Research Question Scenarios: Group A**

**Slide 21: Research Question 1 (Video Time: 29:22-34:37)**

The first research question we will look at is:

> **Research Question 1**: ***What are the average literacy skills of adults 16-65 in the U.S. and internationally?***

This question involves a simple analysis comparing the US literacy average with the average of all participating countries included in the NCES IDE.

The **goals of the scenario** are to introduce how to set up basic criteria for this question, how to select appropriate variables and the simplest way of reporting the results.

We will demonstrate the different steps in the IDE analysis process and show you how to do an average scores analysis.

*(Go to IDE)*

The first step is to select the target population of your analysis. So, from the first page on the IDE website select Adults, 16-65 from the Display drop down menu that will allow you to produce results on U.S. adults and also conduct an international comparison.

After selecting your display, several **blue bars** appear with a few other selection options. For this question, we want to look at **literacy skills** so we will only need to focus on the first box under the scale scores category and then select **PIAAC Literacy: Overall scale** under Measure. As shown in the

introduction, there are a variety of other continuous measures available on this page which we don't need for this question.

Next, we need to select **our Jurisdiction** under the blue bar in the lower half of the page. Options in this area allow you to compare all countries or only a few of them. Because we want to compare the international average of all jurisdictions to the U.S., under the international group, we will select the **Average of All Jurisdictions**. In order to compare the international literacy average with the U.S. average, we will then click on the blue arrow next to **the OECD National Entities** group so the full listing of OECD countries appears and then scroll down to select the United States.

Now that we have determined the scope of our research and selected literacy as our measure and selected our jurisdictions – **the U.S. and the international average**, we can move on the next page by clicking on the **2. Select Variables** button on the bottom right of the page.

Since we want to compare the full populations, regardless of any specific demographic differences, we will select the **"All adults"** variable at the top of the variable listing. We do not need any other categorical variables for this question and can then move to the next step and select **the 3. Edit Reports** button at the bottom right of the page.

The **3. Edit Reports** page is designed to give you an overview of your selections and allow you to edit your reports or change your statistic type. General details are found on the top left corner of the page. Within the report listing, details of selections for specific tables are listed.

Here for Report 1, the measure is the PIAAC Literacy Overall Scale, the variable is **All Adults**, the **Year/Study is PIAAC 2012/14**, the jurisdiction is **Average of all Jurisdictions and United States,** and the statistic is set to report **Averages**. Since we do not want to change our selections, we can continue to the next page by selecting the **4. Build Reports** button at the bottom right of the page.

This page will show you the results of the first query.

As you can see in this table, the International average for literacy **is 267** and the U.S. average for literacy **is 272**. It appears that the U.S. adults have a higher average literacy score than adults internationally. However, you would have to **conduct a significance test** to know whether this difference is statistically significant, which we will **show you later in this training**.

**Slide 22: Research Question 2 (Video Time: 34:38-43:51)**

Now that you have seen the basic steps for conducting analysis in the U.S. PIAAC IDE, we will look at another research scenario which is more complex than the first scenario. This next question is focused on finding**:**

> **Research Question 2**: ***How does the distribution of proficiency levels of numeracy skills among U.S. young adults ages 16-34 compare to the distribution among their peers internationally?***

Our **goals for this question** are to introduce how to present different types of results that involve percentage distribution of proficiency levels, and also how to find out if the differences in the results are meaningful through showing you how to conduct significance testing.

If you are continuing from a previous analysis, you will first need to go back to the **"1. Select Criteria"** page. You can use the **"Reset"** button to clear any previous selections you have made. A pop-up message indicating "This action will delete all variable selections on this page. **Choose OK** to continue or Cancel to stop" will appear and you will need to click OK.

For this analysis, since we are going to conduct an international comparison for young adults, we'll have to select Young adults, 16-34 from the display drop down menu. We need a score, a continuous variable, so we have to select **PIAAC Numeracy: Overall scale** as our measure or subject of the study.

By default, only PIAAC is selected in the Years/Studies row. Because we just want to use the data from the latest available study, we do not need to change anything here.

Moving down to the jurisdictions, since we are doing an international comparison similar to the first scenario, we will select the **Average of All Jurisdictions** under the International group and under the **OECD National Entities** group we can select the United States.

We are now ready to go to the next step to the **"2. Select Variables"** page, where we find categorical variables for analysis. Since we want to find the distributions of numeracy skills, we scroll down to the **Proficiency levels** sub category and select **PIAAC Numeracy proficiency levels**.

We have completed selection of the variables and we can go to the **"3. Edit Reports"** page**.**

On this page, the statistic is set to **Averages.** This is the default statistic type, but for finding the distribution of proficiency levels, we need to change the statistic type to **percentages**. To do so, we can click on the **Statistics Option** above **Year/Study**. A pop-up window will appear with a listing of the various statistics types options. Select the **check box next to Percentages**, and then click the **Done** button. You should see that the listing under Statistic has now changed to percentages. Now we are ready to move to **"4. Build Reports"** page**.**

On this page the table shows you, for example, that **6%** of young adults in the U.S. performed below level 1 in numeracy compared to 5% internationally. At the higher levels, you can see that only 9% of U.S. young adults performed at level 4, while **12%** of their peers did internationally.

In order to find out whether these percentages are significantly different, we conduct a significance test by selecting the **Significance Test** button above the table.

There are five selection options on this page. In the first selection item, we want to leave **Between Jurisdictions** selected as we are comparing percentages between the U.S. and the international average rather than within variables, which would compare percentages within each jurisdiction for the categories of the proficiency levels variable.

We will leave the **name (Sig test 1)** of our significance test as is in the second item. In the third item, we will leave the **output type as table.** We will show the map output type in a later scenario. In the fourth item, we will leave **Show table details** selected, to include additional information in our output tables. In the fifth selection option we will select **All Jurisdictions** in the first column of the table below, since we want to compare the two jurisdictions included in our analysis, and **Under Variables**, we will select **all proficiency levels** by selecting the box next to **PIAAC Numeracy proficiency levels**. The category listing for the jurisdictions and variables should expand, showing all categories selected. Notice that you cannot change the year and statistic. Since we only selected one year and one statistic previously, they

are greyed out. You may notice other areas in the IDE where items are greyed out when they are not available for use. We can then select **Done**.

Let's scroll down on this **significance testing** page which include significance testing for **all levels**. Let's examine the significance testing information for **Level 4**. The table title provides details and information that this significance test is for our group of interest, level 4. In this legend the **less than arrow <** with lighter blue shading indicates "**significantly lower**", the **greater than arrow >** with darker blue shading indicates "**significantly higher**" and **the x** with white shading indicates "**no significant difference".**

To interpret the table, you can read across the row and see, for example, that the **Average of All Jurisdictions** (or international average) percentage at level 4 is significantly higher than the percentages for the United States. The percentage values being compared for each jurisdiction is in **parentheses after each jurisdiction label** (for example, for the United States it was 9%).

Within the table, under the **symbol indicating the results** of the testing, you can see the differences in percentage points between the two jurisdictions or groups being compared, for which the difference is **2 percentage points** for the international average and the U.S. The difference is estimated based on the unrounded numbers, so even though it may seem that it should be 3, for the difference between 9 and 12, **the difference based on unrounded estimates is 2**. The value in parentheses is the **standard error** of this difference.

The **p-value** for that testing is indicated under the difference. As indicated in the note, an alpha level of 0.05 is being used for these comparisons, so testing with a p-value lower than this indicates a significant difference.

Under the significance testing table, you will also see a table showing similar information to the original table produced, for easier reference. This additional table and some of the details within the significance testing table will not be included if the **Show table details** option was not selected.

One way to **save these results** for later reference is to use the **"Export Reports"** button**.** In the Export Reports window that opens you can select the reports you want to save. When selecting the checkbox next to Report 1, you can see that other related items that were produced, in this case significance testing, is available for export with the original results table.

After selecting the report to save, we can select the format we want to save it in. **The available formats are HTML, Excel, Word, and PDF.** We will select the radio button for Excel as this will allow for easier manipulation of the results later. When you press **Done**, the excel export will download and when you open it you can see the table presenting the same information as on the webpage.

**Slide 23: Research Question 3 (Video Time: 43:52-50:27)**

You have now seen two statistics types in the U.S. PIAAC IDE. This next scenario will introduce you to another available statistic type. We will look at the research question:

> **Research Question 3**: ***How do percentiles on the literacy scale vary among incarcerated adults between those who do and those who do not have a prison job?***

The goal here is to show you how to do percentiles analysis in the IDE and use a chart format to display your results. This will also introduce you to the prison data and using prison-specific variables.

*(Go to IDE)*

We again reset the analysis by going back to the **1. Select Criteria** page and using the **Reset** button to clear any previous selections. In upcoming scenarios, we will start from a reset page and will not show this step unless otherwise specified.

This question deals with the prison population so we need to choose **U.S. Adults 16-74 (Household and Prison)** as our Display. We want results for literacy, so we will select **PIAAC Literacy: Overall scale** as our measure or continuous variable. Note that at this stage, in addition to literacy, this screen allows you to select multiple subjects or scales, such as the numeracy or problem solving in technology-rich environments scales, where reports would be produced **separately** for each subject or scale selected.

In the Jurisdictions section, we will select only **U.S. Prison**, as we will not be comparing to the household population. We will move to the next page to select our categorical variables.

Our question deals with prison jobs, a prison-specific topic, so we will scroll down to the **National variables - United States - Prison** category, to select the first variable from the **Prison job** subcategory**.** Clicking on the **"details"** button next to the variable label provides additional information about the variable, including the full question, variable id name, and the categories for the variable. We can then see the variable name is P_Q390, and the response options or categories, which indicate that it is a basic Yes or No response to whether they currently have a prison job, so we will select it. We can then continue to the **3. Edit Reports** page.

We want to find the **percentiles**, so we need to select **Statistics Options** to change our statistic type. In the popup window, the **plus symbol +** next to Percentiles expands the available options of the $10^{th}$, $25^{th}$, $50^{th}$, $75^{th}$, and $90^{th}$ percentile. To look at the full range, we can select the check box next to percentiles and then click on the **Done** button. Now in the Statistic column of the report listing, all of the percentiles are listed so we can go to **4. Build Reports** page.

Results listed in the first part of the table show the percentiles for those who responded "Yes" to having a prison job, while the second set of results are for those who did not. For example, as you can see the $50^{th}$ percentile on the literacy scale for those that had a prison job was **254**, meaning that 50% of those who had a prison job scored at or above 254 in literacy, while it was **246** for those who did not.

The IDE also provides **chart options** as another way to display your results. To create a chart, you first need to select the **Chart** button, which is the first item in the light blue bar. The **Data Options** page appears that will allow you to select options for the way you want to display your chart. We cannot change any selections, as we only have one statistic type, one year/study, and one jurisdiction. So, click on the **Chart Options** button to move to the next page.

On this page, we will click on the **Percentiles Chart** image to select it as our chart type. We want to see the percentiles distribution for both categories of our variable, so we will leave the **Bar Values** section as **Prison - Jobs - Current incarceration**. We do not have multiple jurisdictions or years, so we can leave **None** as our **"Values Grouped by"** selection. Now we can click the **Preview** button to generate the chart.

If you want to **save your chart** to image, make sure to select the **Done** button in the upper right corner. This will allow you to export or save your chart later. As the legend indicates, the black line in the **middle** of the figure is the 50th percentile, the light blue bar indicates the 25th and 75th percentiles, and the dark blue bar indicates the 10th and 90th percentiles. For example, you can see that the 90th percentile for those with a prison job is **307**, so only 10 percent of those with a prison job scored at or above 307 in literacy. You can use this chart to visually compare the percentiles for those with and without a prison job.

**Slide 24: Research Question 4 (Video Time: 50:28-1:00:52)**

Now that you have seen a few examples of basic analyses and how to display results in the IDE, we will begin to show you some more complex analysis and additional features of the IDE. This next question is focused on finding:

> **Research Question 4**: ***How does the distribution of proficiency levels of numeracy skills among U.S. adults ages 16-65 who did not participate in non-formal education compare to the distribution among Canadian and German adults who did not?***

This question involves percentage distribution of proficiency levels, like the second example, but in this question, we will introduce to you how to do analysis with multiple variables and how to display significance testing in a map format.

We will select **Adults, 16-65** from the display drop down menu, to conduct an international comparison of the selected countries. Here on this page we select **PIAAC Numeracy: Overall scale** as the subject of the study. Since we will be using percentages as our statistic type in order to conduct proficiency levels analysis, the variable selected here is not used as a dependent variable, meaning that we will not see results using the continuous numeracy score measure. So instead the measure selected here is used to **limit our population only to those with numeracy scores**.

Now go down to **Jurisdiction** part of the page to select our target countries in the **OECD National Entities** section. We then select **Canada, Germany, and the United States.** Next, we move on the **2. Select Variables** page to select the categorical variables.

On the **2. Select Variables** page, we will scroll down to select the **PIAAC Numeracy proficiency levels** to find the distributions of numeracy skills.

Next, based on our research question, we have to look for an **indicator of participation in non-formal education**. Since we are looking for a variable that we can compare across countries, we need to look for it in the **International Background Questionnaire** listing and expand that category. We want an indicator of participation in non-formal education, so we need to select the **Informal education and training** subcategory. The first variable listed in here is **"Participated in non-formal education in 12 months preceding survey (derived)"**, which is the variable we are interested in, so we will select it.

We have selected all the variables we need for our research question and we can now continue to the **3. Edit Reports** selection page.

Here, similar to scenario 2, since we need the percentage distribution of proficiency levels, first we have to change **our statistic type**. To do this we will click on the **Statistics Option** and select **percentages** in

the pop-up window that appears. We can then click the **Done** button and, as you can see, the statistic has now changed on the last column from averages to percentages.

As you notice, three reports are listed on this page. Reports 1 and 2 each use a selected variable individually. Report 3 is a cross-tabulated report, and includes both of the selected variables. Because we want to look at proficiency levels by participation in non-formal education, we need to use **the cross-tabulated report**. Therefore, we will **unselect the first two reports listed**, so the cross-tabulated report will be the only analysis produced and will be the first table available on the **4. Build Reports** page. Now we are ready to continue to the next step by selecting the **4. Build Reports** button at the bottom right of the page.

The report appears in a table format. The description of the table is indicated in the title on the top. As you can see, this table shows you that **13% of U.S. adults who did not participate in non-formal education** performed at **Below Level 1**, the lowest numeracy proficiency level, compared to **10% of Canadians** and **8% of Germans**

You may notice the **Literacy related non-response** column here. As mentioned before, because we selected the numeracy overall scale as our measure, our population is limited to those with numeracy scores. This means that the population without scores due to literacy-related non-response—those who were not able to complete the BQ due to language difficulties or learning and mental disabilities—was excluded from our analysis and proficiency distribution. Therefore, we do not see any reportable results in this literacy related non-response column.

We also had the option to select **Percentage across full sample** as our measure in the first step, where the distribution would then include the full 16-65 population, including those who have no proficiency scores due to literacy-related non-response. In this case, we would see some results in the literacy-related non-response column as this population would be part of our proficiency distribution.

In order to find out whether these percentages we have here are significantly different, you can select the **Significance Test** button above the table. A new **Significance Test** window will pop up.

In the first selection item, we want to leave **Between Jurisdictions** selected as we are comparing percentages across three countries. We will leave the name **(Sig test 1)** of our significance test as is in the second item. In the third item, we will select to display our results as a **Map** rather than a table like the one shown in a previous example. As you can see, the fourth selection option is now **greyed out** because we have selected a map output type. In the fifth selection option we will select **All Jurisdictions** in the first column of the table below, since we want to compare all three countries. In this table, under **Variables,** we will select all proficiency levels by selecting the box next to **PIAAC Numeracy proficiency levels**. We will select the **plus sign +** next to the "**Participated in non-formal education"** variable to display all of the variable categories and then only select the checkbox next to **"Did not participate in NFE"** since our question concerns those who did not participate. We will then select the **Done** button at the bottom of the table to continue to the map showing significance testing results.

At the top of the significance testing map you will see a **dropdown menu** that will allow you to select your categories of interest to compare within the map. In this case, the **categories are the different numeracy proficiency levels.** Below that you will see a title describing the current selections for the comparison shown in the map. In the global map under that, you will see that all PIAAC participating

countries are shaded according to **the legend in the bottom left**, indicating whether they are, for example, the **focal jurisdiction** or **significantly higher or lower from the focal jurisdiction**. The other countries that did not participate are white. The map display for significance testing focuses on comparing a **single proficiency level group or category across countries**. Therefore, you may need to adjust your selections within the map to look at your comparison of interest.

By looking at the **map title** and the information in the **dropdown menu** above the map title, we can see that this initial map shown is comparing those with **literacy related non-response who did not participate in non-formal education** across countries. We want to look at a different group, to look at those who performed below level 1 in numeracy, we will select the item beginning with **"Percentages for PIAAC Numeracy proficiency levels [BMNUM] = Below Level 1"** from the dropdown menu at the top of the map. Looking at the legend, we can see that the map has a **focal jurisdiction** that is indicated by the **blue color** in the map, and we can see that **Canada** is currently the focal jurisdiction, meaning that the significance testing indicated by the various colors on the map is done in comparison with Canada.

For our question, we want to see how the U.S. compares with the other countries, so we will change our **focal jurisdiction to the U.S**. by clicking on the **U.S.** on the map. You can see that the U.S. is now blue, meaning that it is now the focal jurisdiction for comparison, and Canada and Germany are both orange, indicating that they both have a lower percentage than the focal jurisdiction, the U.S. This means that compared to their peers in those other countries, a **larger percentage of adults in the U.S.** who have not participated in non-formal training perform at the lowest level, **Below Level 1**, in numeracy. You can perform the same significance testing for other numeracy proficiency levels using the dropdown menu.

If you want to be able to save your map for later reference, make sure to select the **Done** button in the upper right corner.

**Slide 25**

*(Shows table from previous example before sharing the slide)*

In the table from our last example, you may have noticed that sometimes data is not available, applicable, or reportable for certain groups or analyses. The statistical notations outlined on this slide are found at the end of a data table, as applicable, and indicate why the particular result is not reported.

The **dash —** shows that the data is not available, indicating, for example, that the data was not collected for that group. You would see this if you were conducting analysis using U.S.-specific variables in other countries.

The **dagger †** indicates that the result is "not applicable." You would see this symbol, for example, for the standard error of an estimate that is not available.

The **pound sign #** indicates that the statistic rounds to zero.

The **double dagger ‡** indicates that reporting standards are not met, for example, if the sample size is too small.

Additional information about the data in the table are included in the "**Note and Source"** sections.

**Practice Scenario A (Video Time: 1:02:10-1:03:22)**

**Slide 26**

Now it is time for a practice scenario to test what you have learned in the previous examples. On your own, you can work on answering the question:

> **Practice Scenario A:** ***What are the average problem solving in technology-rich environments scores of U.S. young adults ages 16-34 by race/ethnicity (RACETHN4CAT)?***

You can then create a bar chart to display the results. We will show you the expected results in the next few slides. You may want to pause to conduct your own practice analysis.

**Slide 27**

Shown on this slide are the expected average score results for this research question.

**Slide 28**

This slide shows the results in chart format.

**Slide 29**

The next part, **Group B**, of the **PIAAC IDE Training Research Question Scenarios**, covers topics such as trend analysis, significance testing across years, editing table layouts, and creating profiles within proficiency levels.

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**Research Question Scenarios: Group B**

**Slide 31: Research Question 5a (Video Time: 1:03:41-1:13:08)**

The goals of this scenario are to introduce trend analysis in the IDE and conduct significance testing across years. The specific research question is:

> **Research Question 5a:** ***How has the educational attainment of native and non-native born adults in the U.S. changed over time?***

For this analysis we'll have to use data from the **two previous international assessments before PIAAC** that the U.S. participated in. The first one is **IALS** conducted from 1994 to 1998, and the other one is **ALL** conducted from 2003 to 2008. Here we need to select **Adults, 16-65** as our display, since that was the population **common between all three assessments**.

We are doing analysis of trends over time, so to get results from ALL and IALS, we'll check the related boxes in the top blue bar on the page or check the box the for **All Years/Studies** to include the trend analysis for all three studies.

Since our question is not specific to any skill domain and we want to look at distributions of background variables without relating them to scale scores, rather than selecting an overall scale in the skills subcategory, we'll have to select the **Population** category and subcategory in the top portion of the page. We can then select the **Percentage across full sample** as our measure, which will allow us to look at the full population without sub-setting our sample to those with scores.

Our analysis is about trend among the U.S. population and therefore in the **Jurisdiction** section, we will select the **United States** and continue to the next page to select our categorial variables.

As we scroll down and locate the trend variables category on this page, we notice that although many variables from both previous studies are included in the PIAAC study, there are many differences as well. Therefore, to conduct this analysis we will need to use specific trend variables that are common across all three studies.

In the **Trend variables** category, we find the list of variables, including variables for educational attainment and nativity that are included both in IALS and ALL, as well as PIAAC. Looking at **details** from the first trend variable, **Education - Highest qualification – Level (Trend-IALS/ALL)**, we find this is the variable that we want to answer our question about educational attainment, so we will select it.

Further down, we find **Background - Born in country (Trend-IALS/ALL)** in the background section and select it, since this trend variable can be used to identify nativity status. We have selected all of our variables and are ready to move to the **3. Edit Reports** page.

We want to use the **Cross-Tabulated Report**, since our question involves crossing educational attainment and nativity status, so we will **deselect the first two reports**.

We will then select the **Statistics Option** button and change the statistic type to **Percentages**. We want to check that our cross-tab is set up to look at educational attainment within each nativity status. So to do this, in the row for the cross-tabulated report, under the **Action** column, we will click on the **Edit** option. The **Edit Report** window that pops up provides **three options** to change various aspects of that specific report: first the **name** and **measure**, next other options such as **variables** included, **statistic**, or other items.

We will focus on the **3rd** option. This option allows you to edit the table layout by changing how the variables are located in the rows and columns. Particularly for percentages analysis, changing the rows and columns of table will change how the distributions are analyzed and reported.

Here we see that the **Born in country** variable is the row variable, and the **education level** variable is in the column section. This is what we want, because when the statistic is set to percentages, the IDE will provide the percentage distribution of the column variable within each category for the row variable. In the IDE, the categories of the column variable will add up to 100% for each category of the row variable. So here, for example, this means that the percentage at each education level will add up to 100% for native born adults and 100% for non-native born adults. We can then exit out of this window since no

changes are needed. After reviewing the information in the report listing we will go to the **4. Build Reports** page.

The table in here includes information over time on the educational attainment of both those **who were born** and **not born in the U.S.** Trend results for adults **not born in the country** show that **25%** of adults reported having **less than a high school education in PIAAC (2012/2014) and ALL (2003-2008)**, compared to **35% in IALS (1994-1998)**.

In order to find out whether this change or other changes we see in this output is significant, we conduct a significant test by selecting the **Significance Test** button on the top.

From this page, since we want to compare the differences over time we will select the **"Across Years"** radio button for the first option. We will leave the significance test name as is, leave the output type as **Table**, and leave **Show table** details selected.

For the fifth item, under the **Variable** column, we will select **all education level** categories and **all nativity status** categories. The category listing for both variables should expand, showing all categories selected. Similarly, under the **Year** column, we will select the box next to **"All Years/Studies"** to select all three studies. We can then click the **Done** button.

Let's scroll down on this significance testing page to examine the significance testing information for **non-native born with less than high school education**. This second chart and table provide details of the significance testing for our groups of interest. The subgroups for this testing is indicated in the title, in this case, those with education level less than high school and not born in the country. As we have seen with the other types of testing, the **less than arrow <** with lighter blue shading indicates **"significantly lower,"** the **greater than arrow >** with darker blue shading indicates **"significantly higher,"** and **the x** with white shading indicates **"no significant difference."**

To interpret the table, you can read across the row and see, for example, looking at the last row, the **IALS percentage of non-native born** with less than high school education is **significantly higher than the percentages for PIAAC and ALL**. The percentage values being compared for each study are in parentheses after each study label (for example, for IALS, it was **35%**). Within the table, under the symbol indicating the results of the testing, you can see the differences in percentages between the two years being compared, for which the difference is **10.5 percent** for PIAAC and IALS. Similar to the significance testing shown in previous scenarios, the p-value is shown below the difference, and again, p-values less than 0.05 indicate a significant difference. To fully answer our question, we would scroll down to look at the testing for other levels of educational attainment and for both native and non-native born to see which changes over time were significant.

**Slide 32: Research Question 5b (Video Time: 1:13:09-1:16:34)**

The next scenario will continue from the previous analysis and look at a related research question:

> **Research Question 5b:** ***How has the percentage of native and non-native born adults at higher levels of educational attainment changed over time?***

So, rather than looking at characteristics of each educational attainment level like we did in the previous scenario, for this question we are interested instead in looking at the educational characteristics within the native and non-native born populations. This example will focus on showing you how to edit reports and change the table layout in the IDE.

*(Go to IDE)*

Starting from the analysis done in the previous scenario, we will return to the **3. Edit Reports** page by clicking the **3. Edit Reports** tab at the top of the page. On this page, we will go to the **Cross-Tabulated Report** row, which should still be selected.

We will again click on the **Edit** option for the cross-tabulated report, and focus on the **3rd** section in the window that pops up.

For this question, we want to look at the **distribution of nativity status within each education level**, rather than the distribution of education level within each nativity status, so we will need to put the **Background - Born in country (Trend-IALS/ALL)** variable in the column section and the **Education - Highest qualification – Level (Trend-IALS/ALL)** variable in the row section. To move these items, we will need to drag and drop the **nativity variable** from the **row to column** section and drag and drop the **education variable** from the **column to the row** section. After we have done this, we can click **Done**, and then go to the next page, **4. Build Reports**.

In these results, the percentage of native and non-native born at each education level is shown over time. You can see that of those **with above a high school education, 87%** were born in the country **in PIAAC (2012/2014)**, **84%** were born in the country **in ALL (2003-2008)**, and **88%** were born in the country **in IALS (1994-1998)**.

We'll save the results of this analysis by selecting the **"Link to this Page"** button above the table. In the window that pops up, we can copy and go to the link in a new tab. The same table is then reproduced in the browser.

Note that only the main results table is produced through this link, and if you had collapsed variables, conducted significance testing, or created charts for the analysis, they would not be directly available and would need to be reproduced if you use the **Link to this Page** option to save or recreate these results. However, using the **Export Reports** option to save results, which was shown in an earlier scenario, allows one to save these additional items.

**Slide 33: Research Question 6 (Video Time: 1:16:35-1:22:09)**

For this next scenario, we will answer the question:

> **Research Question 6**: ***What is the distribution of health status among U.S. young adults 16-34 within each numeracy proficiency level?***

Respondents across all countries were asked to report about their own health, using a five-point scale to rate their health as excellent, very good, good, fair, or poor. Their responses are used for this analysis. In this scenario, we will show you a new IDE capability that is possible because proficiency levels are available as variables here in the U.S. PIAAC IDE. You will create profiles of those at different skill levels

by looking at the percentage distribution of characteristics within each level. We'll also go over how to display these results in a column chart format.

*(Go to IDE)*

Because this analysis focuses on young adults, we will choose the **Young Adults, 16-34** display. We will choose the **PIAAC Numeracy: Overall scale** as our measure since we are interested in finding out the relationship between self-reported health status and numeracy skills. We will then choose the **United States** as our jurisdiction and continue to the next page.

On this page, the **2. Select Variables** page, we want to select the **PIAAC Numeracy proficiency levels** variable within the **Proficiency level** subcategory. We will also need the health status variable to answer our question. Since this is an international variable and common across all countries, we select the **International background questionnaire** category and then the **Health** subcategory, where we will select the variable **About yourself - Health - State**. Please note, if you select from US national variables (**National variables - United States**), you'll find additional health variables such as health information that are U.S.-specific and are not needed for this analysis. We can then go to the **3. Edit Reports** page.

We want to focus on the **Cross-Tabulated Report** that has both questions needed to answer our question: numeracy proficiency levels and health status, so we will **unselect the first two reports**. We can then select **Edit** from the cross-tabulated report.

We can also change our statistic type for an individual report within this **Edit Report** window, since we want to look a percentage distribution of health status, so in the statistic column on the right, we will unselect **Averages** and select **Percentages**.

Since we want to find the distribution of health status within each numeracy proficiency level, we need the **health status** variable (**About yourself - Health - State**) to be our **column** variable and the **PIAAC Numeracy proficiency levels** to be our **row** variable, as the IDE will create a profile of each row variable category by the column variable, so we will drag and drop each variable to the appropriate place. We can then select the **Done** button at the top right of the window. Now we can go to the **4. Build Reports** page.

This table shows us results of the health status within each numeracy level, indicating that only **25% of those with numeracy Below Level 1** report having excellent health while **37% of those at Level 4** do.

Now, to get a better picture of the distributions, we'll create a graph to display these results. We'll select the **Chart** button above the table. We cannot change any selections on the **Data Options** window that appears, so we'll continue to the **Chart Options**. We'll choose to display these results in a **Column Chart** format. We want the distribution of health status to be displayed by proficiency level, so we'll select the **health status** variable as our **Column Values**, and from the dropdown menu (**"Values Grouped by"**), we'll select **numeracy proficiency levels**. Now we'll continue to the chart **Preview** to see the percentages of health status within each level. Then we'll select **Done** to finalize our chart. It looks like a larger percentage of those at higher numeracy levels self-report having **"Excellent"** or **"Very good"** health compared to those at lower levels. However, significance testing was not done here, and, as noted previously, one would have to conduct this testing to know which differences are statistically significant.

**Practice Scenario B (Video Time: 1:22:10-1:23:30)**

**Slide 34**

Here is another practice scenario to test what you have learned in the previous examples. On your own, you can work on answering the question:

> **Practice Scenario B**: ***How do the literacy proficiency level distributions across 10-year age groups (AGEG10LFS) of employed (CD05) U.S. adults ages 16-65 compare to employed adults internationally?***

You can then conduct testing to see if there are significant differences.

The next few slides will show you the results you should get in your analysis. Like the last practice scenario, you may want to pause to conduct your own practice analysis.

**Slide 35**

Shown on this slide are the expected proficiency level distributions among employed adults at each age band.

**Slide 36**

This slide shows a few example significance tests comparing employed adults in the U.S. and internationally.

**Slide 37**

The next part, **Group C of the PIAAC IDE Training Research Question Scenarios**, covers topics such as looking at relationships between cognitive domains, collapsing categories within variables or proficiency levels, and conducting averages and standard deviation analysis for non-cognitive variables.

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**Research Question Scenarios: Group C**

**Slide 38**

Research Question Scenarios Group C

**Slide 39: Research Question 7 (Video Time: 1:24:00-1:31:34)**

In this scenario, we want to find out:

**Research Question 7**: ***What is the average numeracy score at each literacy proficiency level for U.S. adults 16-74 in households and in prisons?***

The goal here is to show you one way that you can look at the relationship between different cognitive domains within the IDE. In addition, we will show you how to combine proficiency level categories.

We choose the **U.S. Adults, 16-74 (Household and Prison)** display because our question focuses on the U.S. household and prison population. Our question involves finding the average numeracy score, so we select **PIAAC Numeracy**: **Overall scale** as our measure.

We want to compare the U.S. Household and U.S. Prison populations, so we will select both in the **Jurisdictions** section and then move to the **2. Select Variables** page.

In the **2. Select Variables** page, we scroll down to the **Proficiency levels** subcategory and select the **PIAAC Literacy proficiency levels.** Now that we've selected the measure and variable needed to answer our question, we can go to the **3. Edit Reports** page.

On this page, we can confirm that our **Measure**, **Variable**, **Year/Study**, and **Jurisdiction** are as expected and we can leave the **Statistic** as **Averages** since we want to look at the average numeracy scores within each literacy level.

However, since the higher literacy levels may have smaller sample sizes, particularly for the prison population, let's **combine levels 3, 4, and 5** to get a more reliable estimate for those with higher literacy skills. To do this, we will select the **Edit** button in the **Action** column.

In the **Edit Report** window that opens, you will see **a Variable** column. Under the Variable column header, we will click on the link for **"Create new…"** In the **Create Variables** window, in the first dropdown menu, we need to select the variable we want to edit, so we will select our only variable selected, **PIAAC Literacy proficiency levels**. The values or categories for the variable will then appear in the second option.

To combine the higher levels, we will select all three categories we want to group, **Level 3**, **Level 4**, **and Level 5**. We can then create a category name for the new grouping in the third step, so we will enter **"Level 3 and above"** in the text box and then click the **Create** button**.**

The new **collapsed grouping** should now appear in the category listing above. Note that the newly created category will always be placed at the very end of the category listing, regardless of where it should logically be placed. You could also collapse the lower levels if you wanted to compare the low-skilled and high-skilled in literacy more generally, but for now we can click the **Done** button at the bottom of the box.

In the Variable column, you will now see a **new variable** listed with collapsed at the end of the variable name. To use the new variable, we need to **unselect the original variable** and **select the new collapsed one**.

We can then select **Done** in the top right of the **Edit Report** window and after confirming that the collapsed variable is now included in variable column of our report listing, let's go to the next page, **4. Build Reports.**

On this page, you can see the results of numeracy scores within each literacy proficiency level for both **U.S. Household** and **U.S. Prison**. The results show that for both groups, average numeracy score is increasing as literacy level increases. For example, for the household population, the **average numeracy score** for those **Below Level 1** in literacy is **142**, while the average score for those at **Level 1** in literacy is **192**. However, it appears the household population has higher numeracy scores at each literacy level compared to the prison population. For example, those at **Level 3 and above** in literacy in the **household population** score at **296** in numeracy while in the **prison population**, they score at **270**.

Now we will conduct **significance tests** to see whether these differences are statistically significant. We will click on the **Significance Test** button above the table.

To look at the differences *within* the prison population and *within* the household population by level, we will select **"Within Variables"** on the first step. Note that if you wanted to compare scores at each level *between* household and prison, you would need to leave **"Between Jurisdictions"** selected. We will leave the **Table** option selected in the third step and the **Show table details** selected in the fourth step.

In the fifth step, we will select **All Jurisdictions** in the **Jurisdiction** column, to include both household and prison populations, and all **PIAAC Literacy proficiency levels (collapsed)** in the **Variable** column to compare all of the levels. All of our selections have been made, so we can click **Done** on the bottom of the page.

In the significance test result window are results for each population comparing scores for each level. Looking at the last line of the title of the first table, you can see that the first table shows results for the **U.S. Household population**. Reading across the table, you can see that those **Below Level 1** in literacy have significantly lower average numeracy scores than those at each higher literacy level. In the second table, you can see that the same pattern is found in the **Prison population**.

**Slide 40: Research Question 8 (Video Time: 1:31:35-1:38:26)**

Next, we will look at the questions:

> **Research Question 8**: ***Do older adults ages 55-74 who are employed use ICT skills more in their everyday lives than those who are unemployed or out of the labor force?***
>
> ***And is the standard deviation in the skill use index different between the groups?***

This scenario will cover Averages analysis for non-cognitive variables and introduce the Standard Deviations statistic type. The analysis also involves combining categories within a variable. We also will show alternative way of searching for variables.

*(Go to IDE)*

This scenario focuses on older adults, so we will need to use the **U.S. Adults, 16-74** display.

On the **1. Select Criteria** page, we find the ICT skill use at home index. Although we could go to the **Skill Use** category, we use the **search function** to find our measure. In the **Search** box, which is located in the light blue bar under the display menu, we can type the topic or keyword of the variable. In this case, we will type **"ICT,"** rather than a longer search term, since it has to match the text in the variable label or

details exactly. A few variables related to ICT appear and we will select the **Index of use of ICT skills at home** which is the focus of our question.

In the **Jurisdiction** section we will select **U.S. Household (16-74 years old)**, since we are only focusing on that population.

In the **2. Select Variables** page, we select our age variable. Note, there are several options to choose from for age group variables. After checking the details of the **"Age groups in 10-year intervals"** and **"Age in 10 year bands extended to include ages over 65"** variables, we select the second variable that includes the **"66 plus"** age group, because our analysis looks at older adults.

We can also find variables by entering a variable ID in the **Search** box.

For example, in the US codebook and BQ, we find names of two variables, **CD05** and **CQ07**, that may be used to answer this question. CD05 is derived based on respondents' answers to several questions on their employment activities, so it's a more precise measure than CQ07, which is self-identified employment status. Another reason to use CDO5 is because it has the employment categories relevant to our question – **Employed**, **Unemployed**, and **Out of the labor force**.

After we have identified **CD05** as our variable of interest, we can type that variable name in the **Search** box. Only our variable of interest shows up in our results, so we can select it and then go to the **3. Edit Reports** page.

We **unselect the first two reports** and leave selected the **Cross-Tabulated Report** that contains all of the variables necessary to answer our question. Next, we need to collapse the older age bands into a single category, by selecting the **Edit** option of the cross-tabulated report.

Similar to collapsing the proficiency levels in the previous example, we'll select **"Create new…"** under the **Variable** column. In the new window, we need to select the variable we want to collapse from the dropdown menu, which in this case is **age**.

We want to look at the group of 55-74-year-olds, so we will select the **55-65** and **66 plus** groups to collapse in the second step. We will name this combined group **"55-74"** in the textbox in the third step and then click **Create** and then click **Done** to go back to the **Edit Report** window. To use the collapsed variable we just created, we'll **unselect the original age variable** and **select the new one**.

In the **Statistics** column, we can see that **Averages** is already selected. Since we also want results of **Standard Deviations**, we select that in the **Statistics** column as well. Note that one can select no more than two statistics to be displayed in a report. We can then select **Done** to go back to the report listing. Notice that changing the statistic using **Edit Report** only changes it for the specific report while using **Statistic Options** changes it for all reports listed.

Now we will go to the **4. Build Reports** page.

This table shows the results for the ICT skill use index for all age groups by employment status. To find the answer to our question, we will focus on the last column of the table that shows the results for older adults 55-74, the average ICT skill use at home index is **2.08 for Employed** older adults while it is **2.18 for Unemployed** and **1.86 for those Out of the labor force**. So, it looks like older adults who are employed or unemployed use more ICT skills more frequently at home than those who are out of the labor force,

but again we would have to conduct significance testing to know if these are measurable differences and if we could make these kind of statements as actual findings. The Standard Deviations are **0.94 for Employed**, **0.97 for Unemployed**, and **0.87 for Out of the labor force**, indicating that there is less variation in ICT skill use for the out of the labor force group than for the employed and unemployed.

**Slide 41: Practice Scenario C (Video Time: 1:38:27-1:39:48)**

This scenario will have you practice what was covered in the last few scenarios. You can use the IDE to answer the question:

> **Practice Scenario C:** ***What is the average monthly earnings (EARNMTHALLPPPUS_C) for U.S. adults ages 16-74 by gender (GENDER_R) for those at lower (level 2 and below) and higher (level 3 and above) numeracy proficiency levels?***

You can then conduct testing to see if there are significant differences by gender and levels.

The next few slides will show you the results you should get in your analysis. Again, pause to take time to conduct your own practice analysis.

**Slide 42**

This slide shows you the average income by gender and numeracy proficiency level.

**Slide 43**

This slide shows the results testing whether there were any significant differences by gender or level.

**Slide 44**

The next part, **Group D of the PIAAC IDE Training Research Question Scenarios**, will focus on the topics of conducting gap analysis and regression analysis in the IDE

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**Research Question Scenarios: Group D**

**Slide 45**

Research Question Scenarios Group D

**Slide 46**

Before beginning the next scenario, we will go over the gap analysis function in the IDE, which can compare differences in gaps between jurisdictions and/or across years.

The difference measure, or gap, can be viewed between groups, between years, between groups *and* years, or between percentiles within the selected variable.

The most basic type of gap analysis, if you compute average literacy scores by gender for two countries, for example, would be to compare the male-female gap (or score difference between males and females) in one country to the male-female gap in another country. The IDE can also produce testing for other types of gaps described on the slide, such as looking at the gap at two time points within a country.

**Slide 47: Research Question 9 (Video Time: 1:41:04-1:46:00)**

Now we will go over a scenario demonstrating how to use the gap analysis function in the IDE. This scenario will look at the question:

> **Research Question 9**: ***Is the gap in numeracy skills between young adults (16-24) and older adults (55-65) different in the U.S. than internationally?***

*(Go to IDE)*

We'll select **Adults, 16-65** display to conduct this international comparison. On the **1. Select Criteria** page, we select our measure, the **PIAAC Numeracy: Overall scale**, since we want to look at the gap in numeracy skills, and in our jurisdictions, the **Average of All Jurisdictions** and the **United States**.

We can go to the next page, and in the **Major reporting groups** category, we can select **Age groups in 10-year intervals (derived)** as our variable. We can use this to identify young adults and older adults.

After continuing to the **3. Edit Reports** page, we can view our selections in the report listing. We want to leave the statistic set as **Averages**, since our gap analysis will be comparing the differences between averages of the age groups, so we can go to the next page.

On the **4. Build Reports** page, you will see a table displaying average numeracy scores by age band in the U.S. and internationally. All of the steps to conduct a gap analysis are the same as to conduct the average scores analysis by age up to this point. Now we want to test the gaps, or differences between age groups in these average scores, in the U.S. and internationally by selecting the **Gap Analysis** in the center of the light blue bar above the table.

In the **Gap Analysis** window that pops up, we will leave **Between Jurisdictions** selected as our comparison in step 1, because we want to compare the gap in the U.S. and internationally.

In the third step, our only option is selecting the gap **"Between Groups"** as we do not have trend data or percentiles selected.

We will leave the output type as **Table** and **Show table details** selected in steps 4 and 5.

In step 6 we will select **All Jurisdictions** and in the **Variable** column we will use the plus sign + next to the age variable to expand all categories of the variable. We only want to compare the gap between the youngest and oldest groups so we will select only the **24 or less** and **55 plus** categories. We can then click **Done.**

In the **Gap Test** tab, you will see a table similar to the tables produced for significance testing. The title of the table indicates that this testing is looking at **Differences between jurisdictions for gaps in averages between Age groups**. Reading across the table you can see that the gap for **Average of All Jurisdictions** has a **significant positive difference** compared to the **United States**, meaning that the gap in numeracy skills between younger and older adults is larger internationally than in the U.S.

Looking at the details of the table, you can see the size of the gap, or score point difference, in parentheses next to each jurisdiction, so the **2** next to United States is the difference between the **254 numeracy score for younger adults** and the **252 score for older adults** listed in the additional table details under the testing. These gaps are what are being tested or compared here. Also within the table, under the symbol indicating the direction of the difference, is the difference in the size of the gap and its standard error, so in this case the **gap internationally is 19 points larger than the U.S. gap**. Note that these gaps and differences between the gaps are calculated based on unrounded estimates, so they may not always match the expected values based on the rounded estimates for the differences shown. Under that, the p-value is listed.

**Slide 48**

Next, we will look at one last analytical function available in the IDE, regression analysis. The IDE regression analysis function produces linear regression. Although the function is more restrictive, meaning you have fewer options than if you were to conduct the analysis using standard statistical packages, this function allows you to examine and test the level of association between one dependent variable and up to three independent variables. Here, dummy coding is used to code the independent variable, where the first subgroup of the independent variable is the reference group and cannot be changed. This is useful for comparing each subgroup against a reference group. For example, if the subgroup **"Excellent"** is the reference group for the independent variable **Health Status**, the IDE creates a **"Very Good"** dummy variable (**1 for respondents who answered "Very Good", 0 otherwise**), a **"Good"** dummy variable (**1 for respondents who answered "Good", 0 otherwise**), a **"Fair"** dummy variable (**1 for respondents who answered "Fair", 0 otherwise**), and a **"Poor"** dummy variable (**1 for respondents who answered "Poor", 0 otherwise**). The reference group **"Excellent"** is excluded from the regression analysis. This way, each of the other health groups are compared to the **“Excellent”** group.

**Slide 49**

Regressions in the IDE can only be conducted for **one jurisdiction** at a time and can include **up to three independent variables**. The statistics available in the output include the **R-squared value**, the **intercept**, **standardized and unstandardized regression coefficients and standard errors**, ***t* values**, and a **significance** column.

**Slide 49: Research Question 10 (Video Time: 1:47:52-1:55:50)**

This last scenario will demonstrate how to use the regression analysis function in the IDE and look at this question:

> **Research Question 10**: ***Do U.S. adults (16-74) who have seen a dentist in the past year have higher numeracy skills, even when controlling for age and employment status?***

*(Go to IDE)*

We are focusing on the full **U.S. 16-74 population**, so we will choose the third display. Next, we will select the **PIAAC Numeracy scale: Overall scale** as our measure, so numeracy scores will become the dependent variable for regression. Notice that only the continuous variables found on the **1. Select Criteria** page can be used as your dependent variable.

After selecting **U.S. Household (16-74 years old)** as our jurisdiction, we can continue to the next page.

On the **2. Select Variables** page, we will select all of the independent variables that will go into our regression. So here, in the **Major reporting groups** category, we will select the **Age in 10-year bands extended to include ages over 65** variable to use as a control for age, and the **Current status/work history - Employment status (derived)** variable to use as a control for employment status. As mentioned in a previous scenario, we will use the derived employment status variable for a more precise measure of employment compared to the self-reported employment status variable.

The last variable we want to include in our regression on dentist visits is U.S.-only, so we will go to the **National variables - United States** category and **Health** subcategory to find it.

We will select the last variable in that subcategory list, **About yourself - Health - Seen dentist in past year**, and go to the **3. Edit Reports** page**.**

When doing regression analysis, we can leave the statistic set as **Averages**. We need to use the **Cross-Tabulated Report** that contains all of the variables we want included in our regression, so we will **unselect the first three reports** before going to the next page.

Again, these steps so far have been the same as to produce a cross-tab of average scores results, but now we will complete the last step by selecting the **Regression Analysis** button above the table to the right.

In the **Regression Analysis** window, we will select our only **Jurisdiction** and only **Year** available and for the **Variable** column, we will select **All Variables** to include all three—age, employment status, and dentist visits—in our analysis. We can then select **Done** to produce our regression results.

The title for the regression results table includes the information of the outcome variable that is called the **dependent variable**, which in here is **numeracy**; explanatory variables that are called the **independent variables**, which in here are **age**, **employment status**, and **seen dentist**; and the reference groups for the explanatory variables called the **contrast coding reference groups**, which are the categories for each variable that all other categories of the variable are compared to, which in here is **16-24 age group**, the **employed group**, and **those who have seen a dentist**. So the dummy coding concept we talked about previously is applied in this regression analysis based on these three reference categories.

The next thing to review is how much explanatory power do our variables have on the numeracy or our outcome variable. That information is listed under **R Squared** in the top portion of the results. The **R-squared value in here is 0.09**, which means that only 9 percent of the variation in the numeracy scores are accounted for by the independent variables in our model.

After that, in the next section we will look at, we find the intercept that indicates the scores of respondents in the reference category for each variable. So, in this case the intercept of **270** means that those who **are age 24 or less**, **are employed**, and **said "Yes" to having seen a dentist** score at 270 on the numeracy scale.

Next, we will focus on the regression coefficients for our variables. This includes the **standardized** and **unstandardized regression coefficients**, along with their **standard errors**. The standardized regression coefficients are standardized against the mean and standard deviation, which is done to be able to compare the units across the variables. Using the **standardized coefficient**, you can answer the question which of the categories have a stronger or weaker relationship with the outcome variable (or numeracy). For example, looking at **seeing a dentist**, which has a standardized regression coefficient of **-0.18**, and comparing that to the standardized coefficient for **unemployed**, **-0.10**, we can say that seeing a dentist has a stronger relationship with the dependent variable or numeracy than being unemployed.

In order to interpret the results within each of the variables, we can look at the **unstandardized regression coefficients**, labeled here as just regression coefficients. So, for example, the unstandardized regression coefficient for **"No" (seen a dentist)** is **-21**, meaning that those who did not see a dentist in the past year scored **21** points lower in numeracy than those who did, holding other explanatory variables included here constant. As mentioned before, the reference group is excluded from the regression analysis and therefore is not included in the coefficient tables.

Moving to the right of the table, we see that the ***t*-statistic** is **-10** and the **probability** is **0**, which is less than our significance threshold of probability less than 0.05. This means that the independent variable, having seen a dentist, is significantly associated with changes in the dependent variable, numeracy score, and that this statistical significance is also marked in the significance column, where you will find a **less than <** symbol. So, controlling for the two other explanatory variables (age and employment status) in our regression, numeracy scores for those who have not seen a dentist are lower than scores for those that have.

**Slide 51: Practice Scenario D (Video Time: 1:55:51-1:56:37)**

Now that we have covered all of the features of the IDE, we will give you one last practice scenario:

> **Practice Scenario D**: ***Do U.S. adults 16-74 who have participated in non-formal education in the past year (NFE12) have higher literacy skills, even when controlling for educational attainment (EDLEVEL3) and employment status (C_D05)?***

Please pause if you want to conduct your own practice analysis.

**Slide 52**

Here are the regression results for this question.

**Slide 53**

Thank you for your attention. Please contact the AIR-PIAAC team at piaac@air.org with any questions or comments about this video.