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Methods Note
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Descriptive Learning Trajectories and Policy Simulations Using MICS6 Data

Michelle Kaffenberger and Jason Silberstein

Abstract

In recent years, scholars associated with the RISE Programme have analysed learning trajectories using a variety of global datasets to shed light on the global learning crisis and diagnose what might help address it (Crouch, Kaffenberger, and Savage, 2021). For those who may want to build and analyse learning trajectories, this note acts as a methodological guide for doing so using an important new dataset on foundational learning, the Multiple Indicator Cluster Surveys Round 6 (MICS6). We have applied the methods described in this note and, in partnership with the Global Education Monitoring Report (GEMR), developed a tool to showcase the results. The resulting "Learning Trajectories" webpage serves as an interactive introduction to learning trajectories and related policy simulations, and features a flexible data explorer for those who want to conveniently build, analyse, and apply learning trajectories and policy simulations to their own work and context.

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Descriptive Learning Trajectories and Policy Simulations Using MICS6 Data

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1. Introduction

Learning trajectories show the dynamics of children's learning as they progress through school. They are typically visualized as line graphs which show the relationship between a measure of learning and grade attainment or age.

Representing and analyzing learning as a trajectory offers a few key advantages in comparison to the more familiar focus on learning as an outcome (Kaffenberger, 2019). First, since trajectories show how learning evolves across multiple grades or ages, they can shed light on the process of learning. This is in contrast to many national or international assessments which only measure learning for a single age or grade, and therefore can only offer at snapshot of the education system for a single point in time. Second, learning trajectories typically include early grades or ages, providing insight on the first years of schooling when many children begin to fall behind the assumed curricular pace (Belafi et al. 2020; Muralidharan and Singh 2021). Again, this contrasts with assessments of cumulative learning outcomes that occur relatively late in the schooling cycle, especially at the end of primary or secondary school. Finally, learning trajectories typically analyze the progress of the full cohort of in-school and out-of-school children, while other assessments administered during the school day may only be representative of the portion of the cohort that is currently attending school.

In recent years, scholars associated with the RISE Programme have analyzed learning trajectories using a variety of global datasets to shed light on the global learning crisis and diagnose what might help address it (Kaffenberger, Savage and Crouch, 2021).[1] For those who may want to build and analyze learning trajectories, this note acts as an methodological guide for doing so using an important new dataset on foundational learning, the Multiple Indicator Cluster Surveys Round 6 (MICS6). We have applied the methods described in this note and, in partnership with the Global Education Monitoring Report (GEMR), developed a tool to showcase the results. The resulting "Learning Trajectories" webpage[2] serves as an interactive introduction to learning trajectories and related policy simulations, and features a flexible data explorer for those who want to conveniently build, analyze, and apply learning trajectories and policy simulations to their own work and context.

Section 2 below discusses the MICS6 data structure, and the way the dataset measures foundational reading and numeracy skills. Section 3 describes the methods used to construct the MICS6 learning trajectories and run a number of policy simulations built on learning trajectories. The methods described apply and adapt methods from Pritchett and Sandefur (2020), Kaffenberger and Pritchett (2020), and Akmal and Pritchett (2021) whom we acknowledge at the top rather than citing throughout. The Stata code to create the learning trajectories and policy simulations described below using the publicly available MICS6 data is available from the authors upon request.[3]

2. Data

2.a. Dataset

This methods note details the data and methods used to analyze learning trajectories and policy simulations based on MICS6 data. MICS are international household surveys that have been implemented by UNICEF in partnership with national governments since 1995. In the survey's 6th and most recent round, a module was added directly measuring children's foundational reading and numeracy skills, making MICS6 one of the largest internationally comparable sources of data on foundational learning. MICS sampling is nationally representative[4], and the learning

[1] The wider literature often refers to learning trajectories as learning profiles. The two terms are synonymous.
[2] https://www.education-progress.org/en/articles/learning
[3] Write to jason.silberstein@bsg.ox.ac.uk
[4] The one exception to this is the MICS6 data from Pakistan, which have been released on a province-by-province basis. A national dataset was constructed for Pakistan by taking a weighted average of the 3 available provincial datasets (Punjab, Khyber Pakhtunkhwa, and Sindh) based on each province's share of the national population as reported in the 2017 census (with FATA's population added to Khyber Pakhtunkhwa since the MICS6 survey was administered in 2019 following the provinces' merger). When combined, Punjab, Khyber Pakhtunkhwa, and Sindh account for over 93 percent of the national population in the census.

assessments are representative of children ages 7 to 14 in each country. Data for 31 countries, including 23 low or lower-middle income countries, are currently in the public domain (Table 1).[5]

Table 1. *Countries with available MICS6 data on foundational learning*

Country	Income group	Years of survey	Children assessed (weighted total)
Bangladesh	Lower-middle income	2019	38332
Belarus	Upper-middle income	2019	2310
CAR	Low income	2018-19	9437
Chad	Low income	2019	28140
DRC	Low income	2017-18	22169
Ghana	Lower-middle income	2017-18	13741
Guinea-Bissau	Low income	2018-19	10419
Kiribati	Lower-middle income	2018-19	3268
Kyrgyzstan	Lower-middle income	2018	4645
Lesotho	Lower-middle income	2018	5416
Madagascar	Low income	2018	15552
Malawi	Low income	2019-20	24908
Mongolia	Lower-middle income	2018	7582
Nepal	Lower-middle income	2019	8862
North Macedonia	Upper-middle income	2018-19	1275
Pakistan	Lower-middle income	2017-19	108685
Palestine	Lower-middle income	2019-20	8469
Samoa	Lower-middle income	2019-20	3727
Sao Tome & Principe	Lower-middle income	2019	2874
Sierra Leone	Low income	2017	15227
Suriname	Upper-middle income	2018	3891
Thailand	Upper-middle income	2019	13109
The Gambia	Low income	2018	12813
Togo	Low income	2017	7451
Tonga	Upper-middle income	2019	2462
Tunisia	Lower-middle income	2018	5510
Turkmenistan	Upper-middle income	2019	4856
Turks and Caicos Islands	High income	2019-20	385
Tuvalu	Upper-middle income	2019-20	550
Vietnam	Lower-middle income	2020-21	5836
Zimbabwe	Lower-middle income	2019	9288
TOTAL			401189

The MICS6 surveys are well suited for analyzing learning trajectories. Because MICS6 assesses children, this data can be used to analyze contemporaneous cross section learning trajectories, or learning trajectories that reflect the

[5] The MICS6 raw survey data and reports are available here. Country income classification follows the World Bank's 2023 FY lending groups accessed here.

current learning levels and progressions in the education systems (Kaffenberger, 2019).[6] Furthermore, because the surveys assess children beginning at age seven, they provide data on learning in the early primary school grades, which are often not covered in more traditional sources of learning data.

Another advantage of MICS6 for analyzing learning trajectories is that, because they are household-based surveys, they sample the full cohort of in-school and out-of-school children. The data can therefore be used to construct both grade-based trajectories (which sort children by highest grade attended, whether the children are still in school or have dropped out) as well as age-based learning trajectories (which include all children whether they are in school, have dropped out, or never attended school).

2.b. Measure of learning

The MICS6 learning assessment is designed to measure foundational reading and numeracy skills, or skills generally expected to be achieved by grade 2 or 3. To pass the MICS6 reading assessment, a child had to correctly read aloud 90 percent of the words in an approximately 70-word story and correctly answer five simple questions about it. To pass the MICS6 numeracy assessment, a child had to correctly answer all 21 questions covering 4 domains: reading numbers aloud (1 to 3 digits); determining which of two numbers is larger (1 to 3 digits); simple addition (1 to 2 digits); and completing simple number sequences (i.e. 2, 4, 6, __). All children aged 7 to 14 were given the same assessment. More detail on these standards and thresholds are available in UNICEF (2020), and example survey instruments for the reading and numeracy assessments used in Vietnam are available in Appendix 1 in English (General Statistics Office and UNICEF, 2021).

Whether the MICS6 foundational skills assessment represents a low or high bar is an important question for interpreting resulting learning trajectories. The assessment is relatively stringent in that it requires children to get all questions on the assessment correct in order to pass. However, the skills tested are foundational skills that are typically at the Grade 2-3 level, and children of all ages and grades took the same assessment. Passing the assessment therefore does not reflect mastery of grade-level-appropriate material. Rather, it reflects mastery of foundational skills that are considered prerequisite for learning in later grades.

3. Methods

3.a. Descriptive learning trajectories

Learning trajectories are descriptive statistics that can be calculated by grade and by age. With MICS6 data, learning trajectories by grade show the share of children with a particular grade attainment who have passed the MICS6 reading or numeracy assessment. Children are grouped by their highest grade attained, regardless of whether they were still in school at the time of the survey or had previously dropped-out (and attended that grade in the past).

Learning trajectories by age show the share of children of a particular age or group of ages who have passed the reading or numeracy assessment. Each age or group of ages includes all children, whether they were in-school at the time of the survey, had dropped out, or had never attended school. Since out-of-school children tend to have lower learning achievement than their in-school peers of the same age, trajectories by age are almost always lower than those by grade.

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[6] This is in contrast to household surveys which assess foundational skills among adults, providing a retrospective understanding of education quality.

3.b. Simulations

Multiple policy simulations can be analyzed based on learning trajectories. The simulations all derive from a simple identity which shows that learning depends on grade attainment and learning per grade. This is represented mathematically:

$$\%\ with\ Foundational\ Skills_A = \sum_{g=0}^{g} (\alpha_{A,g}) * (s_{A,g}) \quad (1)$$

where A is an age cohort; $\alpha_{A,g}$ is the share of the age cohort with highest grade attained g; and $s_{A,g}$ is the share of the age cohort with highest grade attained g that passed the foundational skills test (in reading or numeracy).

This leads to two intuitive conclusions. First, the impact on learning of increasing children's grade attainment will depend on the rate of learning per grade. Many children currently complete many grades of school but learn little in each grade, and leave school having learned little overall. Second, the impact on learning of increasing children's rate of learning per grade will depend on how many grades children complete. Learning is a process that happens over time, and needs to accumulate over multiple grades to lead to high overall learning outcomes.

The simulations are run by substituting the grade attainment parameter, learning per grade parameter, or both parameters at once for a counterfactual population of interest. Because the simulations depend on descriptive data, they are best thought of as reasonable, empirically-informed simulations of what could happen, not as causal estimates of what would happen.

3.b.i. Access simulation

The first simulation estimates what might happen if all children who never went to school or dropped out had instead attained the same grade and associated learning level as the average child their age who is in school. This simulates the potential learning gains from a policy focused on increasing school access and grade attainment. The simulation is described by Equation 2:

$$Simulated\ \%\ with\ Foundational\ Skills_A = \sum_{g=0}^{g} (\alpha_{In-school,A,g}) * (s_{In-school,A,g}) \quad (2)$$

where A is an age cohort; $\alpha_{In-school,A,g}$ is the share of in-school children of age A with highest grade attained g; and $s_{In-school,A,g}$ is the share of in-school children of age A with highest grade attained g that passed the foundational skills test (in reading or numeracy).

These simulations of increased schooling access will tend to overestimate the actual likely learning gains from such a policy, for two primary reasons. The first is that they assume children who have dropped out or never attended school would, if in school, achieve the same learning as children who stayed in school. Because lower performers are more likely to drop out, it is likely the children who enter school under such a policy would be on a shallower learning trajectory (if there are not accompanying improvements to the instructional process). Second, the simulation assumes that education systems would be able to expand while maintaining constant quality, which may not be feasible.

3.b.ii. Learning simulation

The second simulation estimates what might happen if all children from country X maintained their current grade attainment, but had the rate of learning per grade of a higher-performing country Y. To simulate this, the grade attainment parameter is the same as in Equation 1, but the learning per grade parameter is adjusted, as in Equation 3:

$$Simulated\ \%\ with\ Foundational\ Skills_{X,A} = \sum_{g=0}^{g} (\alpha_{X,A,g} * s_{Y,g}) \quad (3)$$

where X,A is an age cohort from country X; $\alpha_{X,A,g}$ is the share of the age cohort in country X with highest grade attained g; and $s_{Y,g}$ is the share of children in country Y with highest grade attained g that passed the foundational skills test.

Note that parameter s no longer varies with the age cohort. Instead, the learning per grade parameter depends on the share of children with each grade attainment in the higher-performing country that passed the reading or numeracy test, regardless of their age.[7]

3.b.iii. Equality simulations

A third scenario, simulating policies that prioritized "equal access", considers how learning levels would change for the poor in a particular country if they had the grade attainment of the rich in that country but maintained their current rate of learning per grade. This is simulating a policy scenario prioritizing expanding schooling attainment for the poor without regard for the learning achieved per grade. The poor are defined as children from families in the lowest wealth quintile, while the rich are defined as children from families in the highest wealth quintile (here and throughout). To simulate this, we multiply the grade attainment parameter of the rich with the learning per grade parameter of poor:

$$Simulated\ \%\ with\ Foundational\ Skills_{Poor,A} = \sum_{g=0}^{g} (\alpha_{Rich,A,g} * s_{Poor,g}) \qquad (4)$$

where Poor,A is an age cohort of children from poor families; $\alpha_{Rich,A,g}$ is the share of the same age cohort of children from rich families with highest grade attained g; and $s_{Poor,g}$ is the share of children from poor families with highest grade attained g that passed the foundational skills test. As in Section 3.b.ii., the learning per grade parameter does not vary with the age cohort.

A fourth scenario, simulating policies that prioritized "equal learning", asks the inverse question: how would learning levels change for the poor in a particular country if they maintained their current grade attainment but had the rate of learning per grade of the rich in the same country? To simulate this, we multiply the grade attainment parameter of the poor with the learning per grade parameter of rich:

$$Simulated\ \%\ with\ Foundational\ Skills_{Poor,A} = \sum_{g=0}^{g} (\alpha_{Poor,A,g} * s_{Rich,g}) \qquad (5)$$

where Poor,A is an age cohort of children from poor families; $\alpha_{Poor,A,g}$ is the share of the age cohort of children from poor families with highest grade attained g; and $s_{Rich,g}$ is the share of children from rich families with highest grade attained g that passed the foundational skills test. Again, as in Section 3.b.ii., the learning per grade parameter does not vary with the age cohort.

Variations of the equal access and equal learning simulations are also run for other dimensions of inequality, including gender and geography. The gender equality simulations follow the same formulas as equations (4) and (5), but substitute "girls" for "poor", and "boys" for "rich". The geographic equality simulations also follow equations (4) and (5), but substitute "rural" for "poor", and "urban" for "rich".

3.c. Sample considerations

Two data cleaning protocols were implemented to address groupings that resulted in small sample sizes.

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[7] This is to accommodate a particular feature of the data, which is that in higher-performing countries children are mostly in the appropriate grade-for-age, whereas this is not true in lower-performing countries. At the extremes: there are no 14-year-olds in Grade 1 in high-performing countries, so there is no counterfactual learning-per-grade parameter available in the data to assign to the many 14-year-olds in Grade 1 in lower-performing countries.

First, all learning averages based on 25 unweighted observations or fewer were dropped to ameliorate potential noise due to sampling. Where learning averages were dropped following this rule for the group of children who had never attended any primary school (their highest grade attained was less than Grade 1), then average learning levels of zero were imputed for this group.[8]

Second, simulation results were dropped for specific groups when there were inadequate samples to meaningfully run them. Consider, for example, the equal access simulations, which involve multiplying the grade attainment profiles of the rich for each age cohort with the average learning per grade of the poor (equation 4 above). For higher age cohorts, substantial shares of rich children have progressed to the later grades of secondary school. However, in many countries, there were only small samples of poor children (less than 25 unweighted observations) in these later grades, making it difficult to confidently calculate the counterfactual parameter of average learning per grade of the poor. Analogous problems were present for the learning simulations (equation 3) and equal learning simulations (equation 5). When a counterfactual learning per grade value could not be calculated due to small sample sizes for more than 5 percent of an age cohort in a given country, the simulation results for that age cohort were dropped. This is why some of the simulation results are not reported for particular ages, but available for others, and why there are more unreported values for simulations which require relatively greater subdivision of the data (i.e. into wealth quintiles).

[8] This follows the logic of other international efforts to measure learning such as the World Bank's metric of learning poverty, which assumes that all out-of-school children are experiencing learning poverty.

Bibliography

Akmal, Maryam & Lant Pritchett. 2021. Learning equity requires more than equality: learning goals and achievement gaps between the rich and the poor in five developing countries. Int. J. Educ. Dev., 82 (2021), Article 102350. https://doi.org/10.1016/j.ijedudev.2021.102350

Belafi, Carmen, Yue-Yi Hwa, and Michelle Kaffenberger. 2020. "Building on Solid Foundations: Prioritising Universal, Early, Conceptual and Procedural Mastery of Foundational Skills." RISE Programme, RISE Insight Series, 2020/021. https://doi.org/10.35489/BSG-RISERI_2020/021.

Crouch, Luis, Michelle Kaffenberger, and Laura Savage. 2021. Using Learning Profiles to Inform Education Priorities: An Editors' Overview of the Special Issue. International Journal of Educational Development, Volume 86, 2021, 102477, ISSN 0738-0593. https://doi.org/10.1016/j.ijedudev.2021.102477

General Statistics Office and UNICEF. 2021. Survey measuring Viet Nam Sustainable Development Goal indicators on Children and Women 2020-2021, Survey Findings Report. Ha Noi, Viet Nam: General Statistics Office. Accessed at: https://mics-surveys-prod.s3.amazonaws.com/MICS6/East%20Asia%20and%20the%20Pacific/Viet%20Nam/2020-2021/Survey%20findings/Viet%20Nam%202020-21%20MICS-SDGCW_English.pdf

Kaffenberger, Michelle & Lant Pritchett. Aiming higher: learning profiles and gender equality in 10 low- and middle-income countries. Int. J. Educ. Dev., 79 (2021), Article 102272. https://doi.org/10.1016/j.ijedudev.2020.102272

Muralidharan, Karthik & Abhijeet Singh. 2021. "India's new National Education Policy: Evidence and challenges." Science 02 Apr 2021: Vol. 372, Issue 6537, pp. 36-38. https://doi.org/10.1126/science.abf6655

Pritchett, Lant & Justin Sandefur. 2021. Girls' schooling and women's literacy: schooling targets alone won't reach learning goals. Int. J. Educ. Dev., 78 (2021), Article 102242. https://doi.org/10.1016/j.ijedudev.2020.102242

UNICEF. 2020. Toward Achieving Inclusive and Equitable Quality Education for All: A Manual for Statistical Data Analysis Using Multiple Indicator Cluster Surveys (MICS6). https://data.unicef.org/resources/mics-education-analysis-for-global-learning-and-equity/

Appendix 1 – Example MICS6 Foundational Skills Survey Instrument

Reading

The MICS6 reading assessment tests the three skills in Figure A.1. (UNICEF, 2020).

Figure A.1. Reading assessment skills

Figures A.2. and A.3. show the questions from the survey instrument used in Vietnam that correspond with each of the three assessed reading skills (presented here in English but administered in Vietnamese). While survey instruments were extremely similar across countries, they were also lightly customized at the national level (i.e. the number of words in the story was approximately 70 words, but varied in length across languages). These excerpts from the Vietnamese MICS6 survey instrument are from the appendices of General Statistics Office and UNICEF (2021) pages 690-693.

Figure A.2. *Read 90% of words accurately*

<table>
<tr><td rowspan="22">FL19. Turn the page to reveal the reading passage.

Thank you. Now I want you to try this.

Here is a story. I want you to read it aloud as carefully as you can.

You will start here (point to the first word on the first line) and you will read line by line (point to the direction for reading each line).

When you finish I will ask you some questions about what you have read.

If you come to a word you do not know, go onto the next word.

Put your finger on the first word. Ready? Begin.</td><td>Manh</td><td>is</td><td>in</td><td>class</td><td>two.</td><td>One</td><td>day,</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Manh</td><td>was</td><td>going</td><td>home</td><td>from</td><td>school.</td><td>He</td></tr>
<tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr>
<tr><td>saw</td><td>some</td><td>red</td><td>flowers</td><td>on</td><td>the</td><td>way.</td></tr>
<tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr>
<tr><td>The</td><td>flowers</td><td>were</td><td>near</td><td>a</td><td>tomato</td><td>farm.</td></tr>
<tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr>
<tr><td>Manh</td><td>wanted</td><td>to</td><td>get</td><td>some</td><td>flowers</td><td>for</td></tr>
<tr><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td></tr>
<tr><td>his</td><td>mother.</td><td>Manh</td><td>ran</td><td>fast</td><td>across</td><td>the</td></tr>
<tr><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td></tr>
<tr><td>farm</td><td>to</td><td>get</td><td>the</td><td>flowers.</td><td>He</td><td>fell</td></tr>
<tr><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td></tr>
<tr><td>down</td><td>near</td><td>a</td><td>banana</td><td>tree.</td><td>Manh</td><td>started</td></tr>
<tr><td>50</td><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td></tr>
<tr><td>crying.</td><td>The</td><td>farmer</td><td>saw</td><td>him</td><td>and</td><td>came.</td></tr>
<tr><td>57</td><td>58</td><td>59</td><td>60</td><td>61</td><td>62</td><td>63</td></tr>
<tr><td>He</td><td>gave</td><td>Manh</td><td>many</td><td>flowers.</td><td>Moses</td><td>was</td></tr>
<tr><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td></tr>
<tr><td>very</td><td>happy.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>71</td><td>72</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

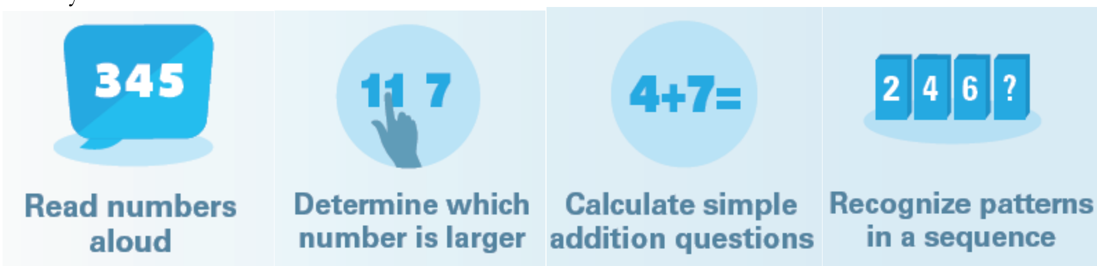
Figure A.3. *Interpret information (A-C) and answer inferential questions (D&E).*

FL22. Now I am going to ask you a few questions about what you have read. *If the child does not provide a response after a few seconds, repeat the question. If the child seems unable to provide an answer after repeating the question, mark 'No response' and say:* Thank you. That is ok. We will move on. *Make sure the child can still see the passage and ask:*	
[A] What class is Mạnh in?	CORRECT ((MẠNH IS) IN CLASS TWO)...........1 INCORRECT ....2 NO RESPONSE / SAYS 'I DON'T KNOW' 3
[B] What did Mạnh see on the way home?	CORRECT (HE SAW SOME FLOWERS)............1 INCORRECT ....2 NO RESPONSE / SAYS 'I DON'T KNOW' 3
[C] Why did Mạnh start crying?	CORRECT (BECAUSE HE FELL)........................1 INCORRECT ....2 NO RESPONSE / SAYS 'I DON'T KNOW' 3
[D] Where did Mạnh fall (down)?	CORRECT ((MẠNH FELL DOWN) NEAR A BANANA TREE)..1 INCORRECT ....2 NO RESPONSE / SAYS 'I DON'T KNOW' 3
[E] Why was Mạnh happy?	CORRECT (BECAUSE THE FARMER GAVE HIM MANY FLOWERS / BECAUSE HE HAD FLOWERS TO GIVE TO HIS MOTHER)..........1 INCORRECT ....2 NO RESPONSE / SAYS 'I DON'T KNOW' 3

Numeracy

The MICS6 numeracy assessment tests the four skills in Figure A.4. (UNICEF, 2020).

Figure A.4. Numeracy assessment skills



Figures A.5. – A.8. show the questions from the survey instrument used in Vietnam (presented here in English but administered in Vietnamese). These are also from General Statistics Office and UNICEF (2021) pages 690-693.

Table A.5. *Read numbers aloud*

FL23. *Turn the page in the READING & NUMBERS BOOK so the child is looking at the list of numbers. Make sure the child is looking at this page.* Now here are some numbers. I want you to point to each number and tell me what the number is. *Point to the first number and say:* Start here. *If the child stops on a number for a while, tell the child what the number is, mark the number as 'No Attempt', point to the next number and say:* What is this number? *If the child does not attempt to read 2 consecutive numbers, say:* Thank you. That is ok.	**9** CORRECT ....1 INCORRECT ....2 NO ATTEMPT....................3 **12** CORRECT ....1 INCORRECT ....2 NO ATTEMPT....................3 **30** CORRECT ....1 INCORRECT ....2 NO ATTEMPT....................3 **48** CORRECT ....1 INCORRECT ....2 NO ATTEMPT....................3 **74** CORRECT ....1 INCORRECT ....2 NO ATTEMPT....................3 **731** CORRECT ....1 INCORRECT ....2 NO ATTEMPT....................3

Table A.6. *Determine which number is larger*

FL24. *Turn the page so the child is looking at the first pair of numbers. Make sure the child is looking at this page. Say:* Look at these numbers. Tell me which one is bigger. *Record the child's answer before turning the page in the book and repeating the question for the next pair of numbers.* *If the child does not provide a response after a few seconds, repeat the question. If the child seems unable to provide an answer after repeating the question, record '3', no attempt, for the appropriate pair of numbers, turn the booklet page and show the child the next pair of numbers.* *If the child does not attempt 2 consecutive pairs, record '3', no attempt, for remaining pairs and say:* Thank you. That is ok. We will go to the next activity.	**7 & 5** CORRECT (7)....................1 INCORRECT....................2 NO ATTEMPT....................3 **11 & 24** CORRECT (24)....................1 INCORRECT....................2 NO ATTEMPT....................3 **58 & 49** CORRECT (58)....................1 INCORRECT....................2 NO ATTEMPT....................3 **65 & 67** CORRECT (67)....................1 INCORRECT....................2 NO ATTEMPT....................3 **146 & 154** CORRECT (154)....................1 INCORRECT....................2 NO ATTEMPT....................3

Table A.7. *Calculate simple addition questions*

FL25. *Give the child a pencil and paper. Turn the page so the child is looking at the first addition. Make sure the child is looking at this page. Say:* Look at this sum. How much is (***number plus number***)? Tell me the answer. You can use the pencil and paper if it helps you. *Record the child's answer before turning the page in the book and repeating the question for the next sum.* *If the child does not provide a response after a few seconds, repeat the question. If the child seems unable to provide an answer after repeating the question, record '3', no attempt, for the appropriate sum, turn the booklet page and show the child the next addition.* *If the child does not attempt 2 consecutive sums, record '3', no attempt, for remaining sums and say:* Thank you. That is ok. We will go to the next activity.	**3 + 2** CORRECT (5)....................1 INCORRECT....................2 NO ATTEMPT....................3 **8 + 6** CORRECT (14)....................1 INCORRECT....................2 NO ATTEMPT....................3 **7 + 3** CORRECT (10)....................1 INCORRECT....................2 NO ATTEMPT....................3 **13 + 6** CORRECT (19)....................1 INCORRECT....................2 NO ATTEMPT....................3 **12 + 24** CORRECT (36)....................1 INCORRECT....................2 NO ATTEMPT....................3

Table A.8. *Recognize patterns in a sequence*

FL27. Now I want you to try this on your own. Here are some more numbers. Tell me what number goes here (*pointing to the missing number*). *Record the child's answer before turning the page in the book and repeating the question.* *If the child does not provide a response after a few seconds, repeat the question. If the child seems unable to provide an answer after repeating the question, record '3', no attempt, for the appropriate question, turn the page and show the child the next question.* *If the child does not attempt 2 consecutive patterns, record '3', no attempt, for remaining patterns and say:* Thank you. That is ok.	**5, 6, 7, __** CORRECT (8)........1 INCORRECT ....2 NO ATTEMPT........3 **14, 15, __, 17** CORRECT (16)........1 INCORRECT ....2 NO ATTEMPT........3 **20, __, 40, 50** CORRECT (30)........1 INCORRECT ....2 NO ATTEMPT........3 **2, 4, 6, __** CORRECT (8)........1 INCORRECT ....2 NO ATTEMPT........3 **5, 8, 11, __** CORRECT (14)........1 INCORRECT ....2 NO ATTEMPT........3