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Literature review
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A quasi-experiment on the effect of e-learning on students' mathematics scores and attitudes in Sri Lanka

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About the intervention

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- A quasi-experiment

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- to evaluate if supplementary e-learning methods would lead to improve students' achievements and their attitudes in mathematics
- Funded by the Asian Development Bank (ADB)
- Conducted jointly by the ADB and Ministry of Education (MoE), Sri Lanka

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- Mathematics is an important subject learnt at school (Zan et al., 2006)

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- 1 of the 3 compulsory subjects to qualify the General Certificate in Education Ordinary Level exam

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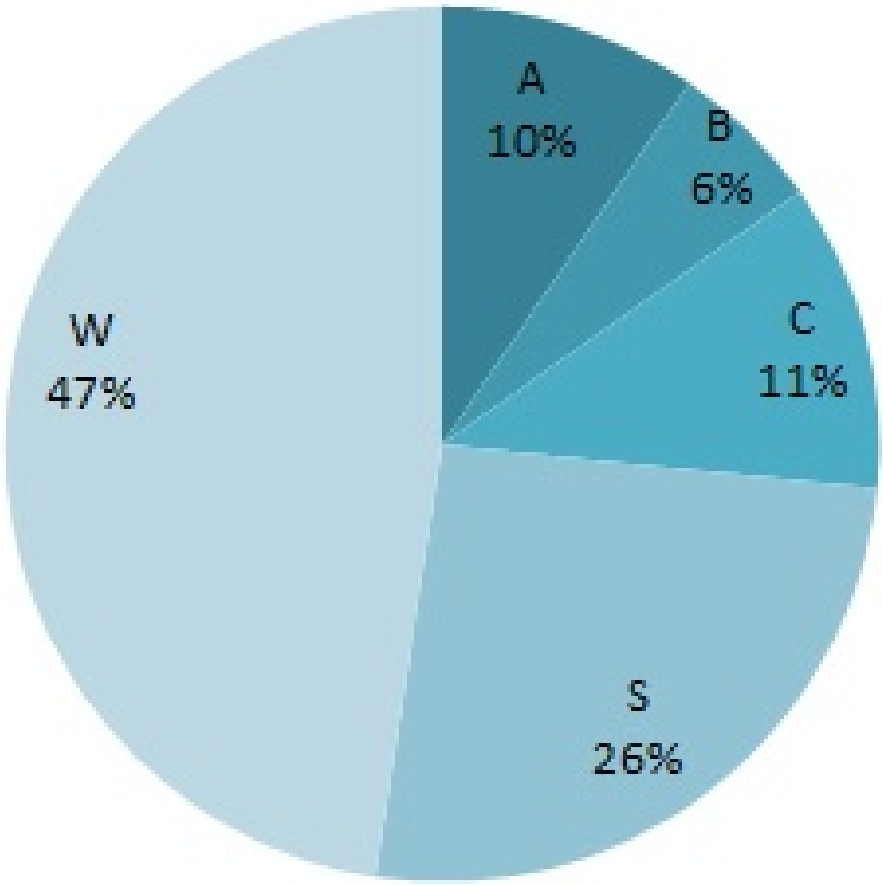
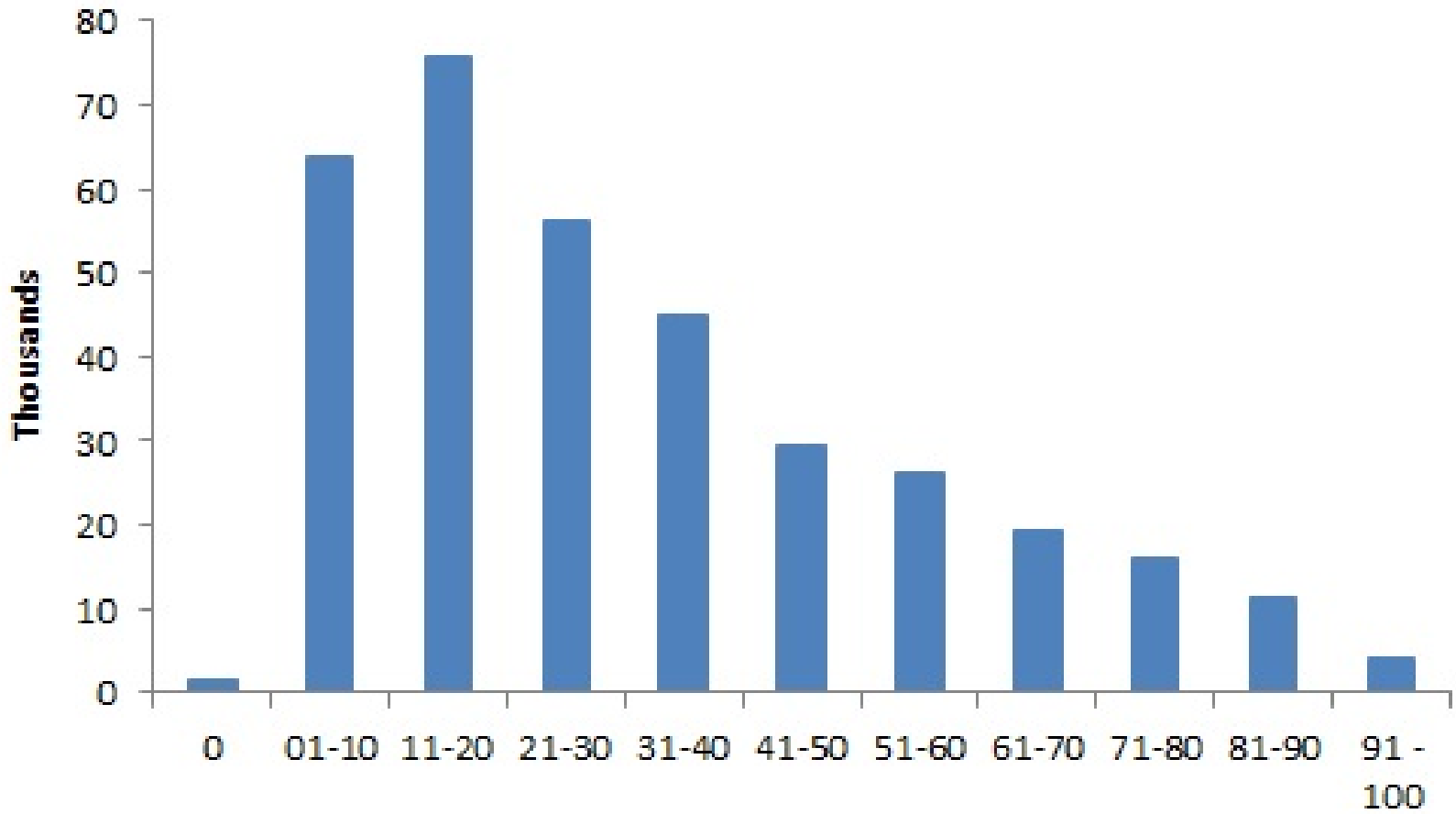
- In 2013, 42.77 percent students have failed in mathematics in the GCE O/L examination
- High failure rates translates into high drop out rates

Grade Distribution in 2011



Marks Distribution in 2011



Other aspects of education in Sri Lanka

- since independence in 1948, has made significant investments in education
- have reached impressive levels in indicators such as adult literacy rates (95.6 % in 2013)
- and primary net enrollment rates (98.4 % in 2012) (CBSL, 2014)
- A culture of signiffecant expenditure of time and money on supplementary 'tuition'

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- To discern if using supplementary e-learning methods would lead to improve students' achievements and their attitudes in mathematics

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- 'it is not always clear that they are the most cost-effective means of doing so [improving students' achievement](Dundar et al., 2014)
- Compared to a teacher based remedial program, a computer aided remedial program has the capacity to double test scores (Banerjee et al., 2007)

One Laptop Per Child (OLPC)

- OLPC was implemented in Sri Lanka in 2009
- funding from the World Bank
- 1,300 students in selected primary schools throughout the country were given laptops
- survey information of 973 students from grades 1 to 3, across eight T and eight C schools
- students in grades 2 and 3 experienced 22-23 percent increase in test scores due to the intervention

MPDA

- implemented for a sample of 224 students (107 in the T group and 117 in the C group)
- Among the eight schools (3 in T group only, 4 in the C group only and 1 in both T and C groups)
- Limited to the Western Province
- selected purposively after evaluating their IT facilities
- When standardized test scores were compared, the T groups improved by approximately 6.92 percent of the possible score range, than the C group

Current intervention

Grade 8: Mathcloud

- An adaptive e-learning mathematics system
- MC content is translated to Sinhala (the native language in Sri Lanka)
- Mapped to the local eighth grade curriculum
- 20 school and two classrooms from each school, each serving as the T group and C group, within each school
- 30-40 students in each class
- C group: regular class room environment with a mathematics teacher during all 5 days of the week
- T group: regular class room environment + supplementary computer based instructions during 2-3 days of the 5 days

Grade 9: Khan Academy

- Audio-visual tutorials on the concept of Khan Academy
- Translated + material developed by the NIE
- (another) 20 schools and two classrooms from each school, each serving as the T group and C group, within each school
- 30-40 students in each class
- C group: regular class room environment with a mathematics teacher during all 5 days of the week.
- T group: regular class room environment + supplementary self-study e-learning tutorials for 2-3 days of the 5 days.

Methodology

Difference-in-difference

$$Y_{it} = \alpha + \delta\, Time_{it} + \gamma\, Treat_{it} + \theta[Time_{it} \times Treat_{it}] + X'_{it}\beta + \epsilon$$

Outcomes

- Raw score
- Standardized score
- Scaled score

Assumption

- Parallel trends between the T/C groups

Planning

Implementation

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- 3 academic terms (9 months).

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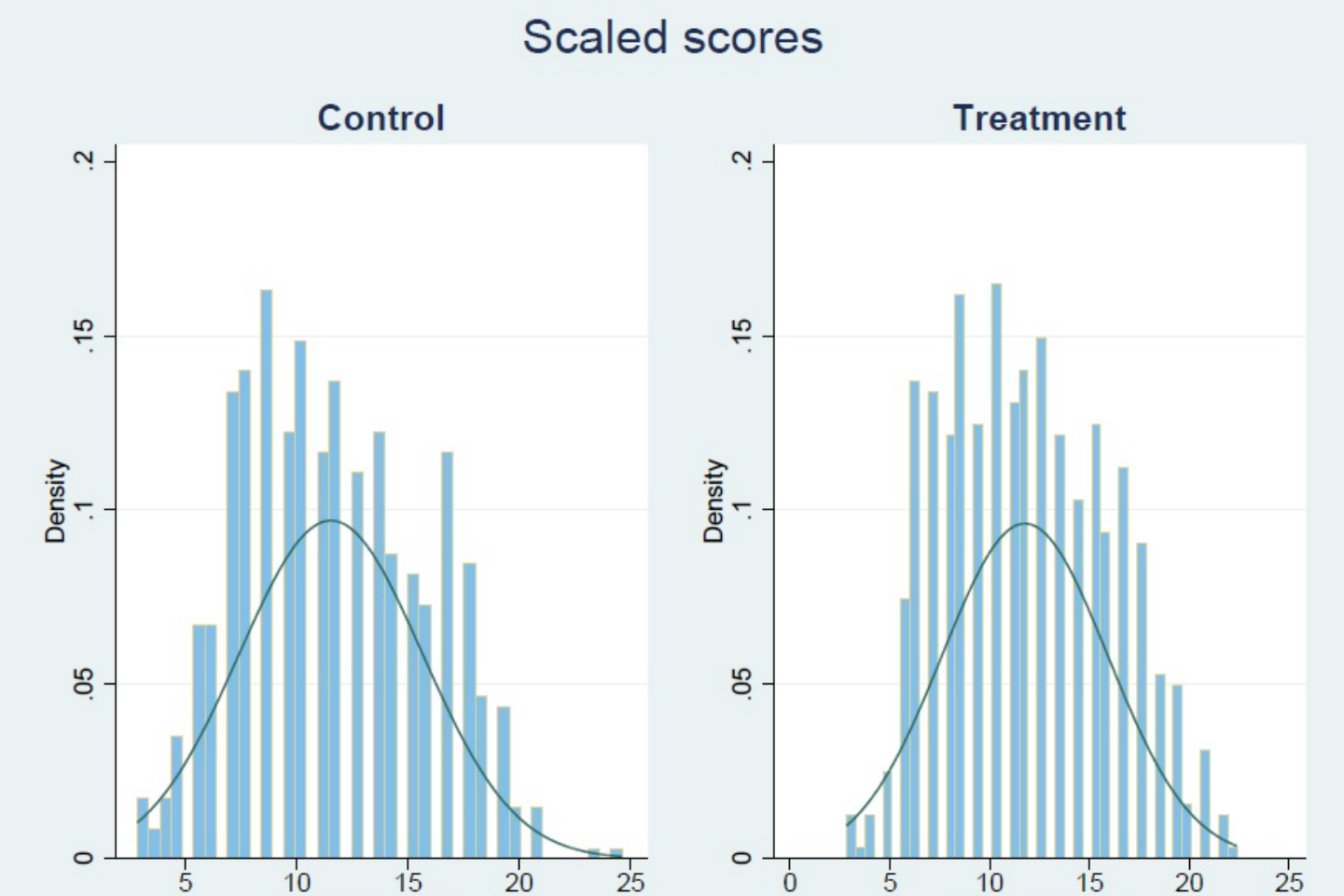
- Purposive sampling of schools.
- Within school, purposive sampling of classes into T/C groups.

Student Performance - Baseline Test - Grade 8 Raw Scores

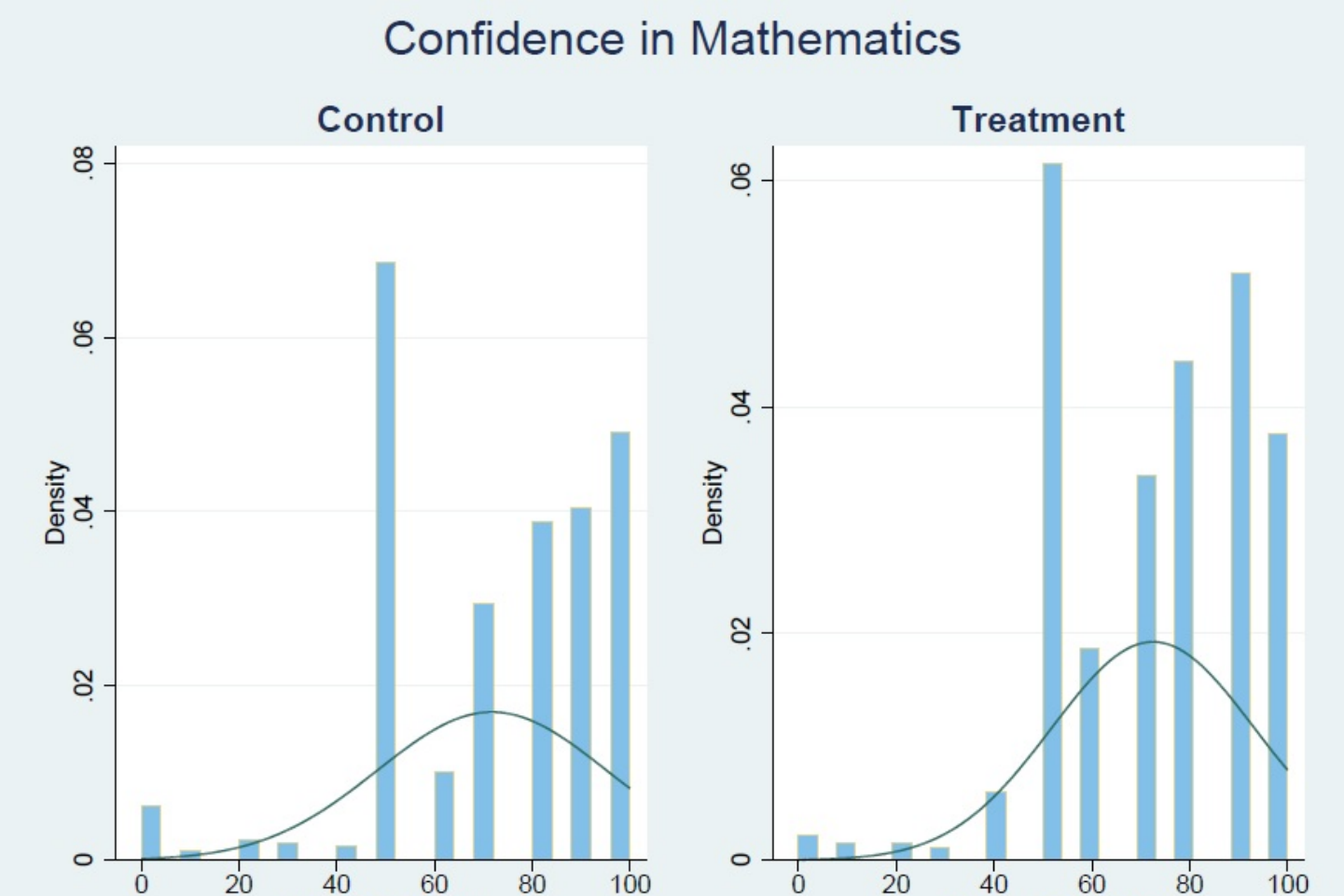
Raw Score	Freq.	Percent	Raw Score	Freq.	Percent
0	10	0.72	15	63	4.55
1	4	0.29	16	68	4.91
2	10	0.72	17	55	3.97
3	20	1.44	18	76	5.49
4	47	3.39	19	58	4.19
5	67	4.84	20	33	2.38
6	89	6.43	21	31	2.24
7	87	6.28	22	10	0.72
8	108	7.80	23	15	1.08
9	82	5.92	24	4	0.29
10	104	7.51	25	1	0.07
11	82	5.92	26	1	0.07
12	92	6.64	28	1	0.07
13	86	6.21			
14	81	5.85	Total	1,385	100

Grade 8 Standarized scores

Grade 8 scaled scores (1PL)



Grade 8 Confidence in Math



Thank you