

LEGEND-LESS MAPS

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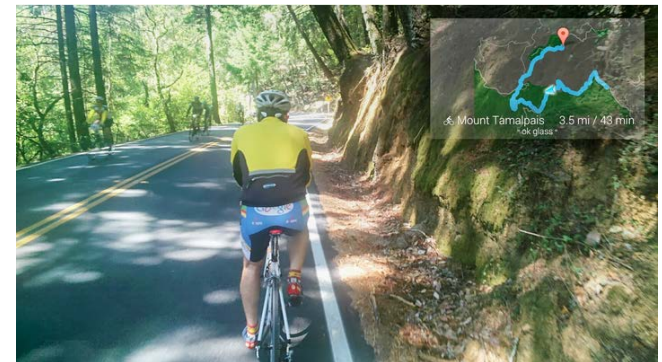
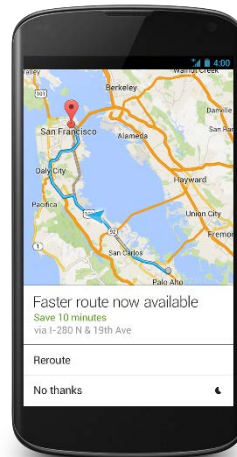
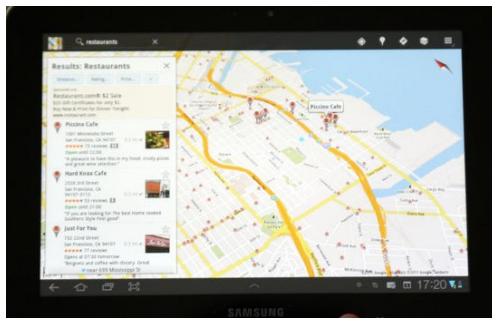
27th September 2017

INTRODUCTION

Motivation of the research ?



SIGNIFICANCE





OBJECTIVES

Objective

To design and evaluate legend-less maps.

Sub-objectives

1. Examine the role of legend in map reading.
2. Find out if legend can be omitted or replaced, if so, for which map types.
3. Compare the usability of maps with and without a legend.



RESEARCH QUESTIONS

Q1.1 How does the map reading process work?

Q1.2 What is the function of map legend?

Q2.1 How can the map reading process go without a legend?

Q2.2 How can title and/or content replace a legend?

Q2.3 Are these options valid for all types of map?

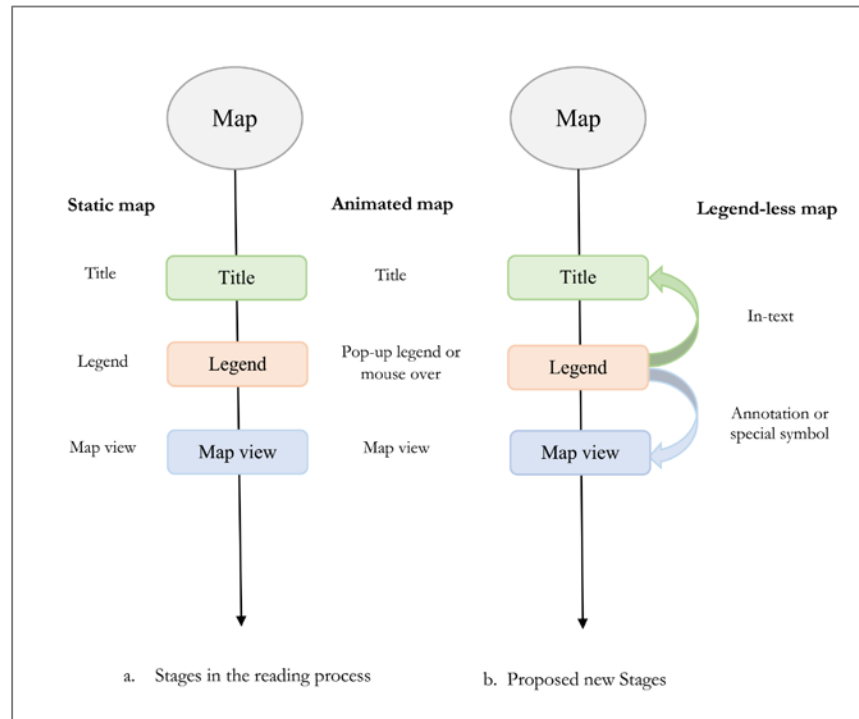
Q3.1 How to verify map reading process?

Q3.2 How do legend-less map alternative performed compare to maps with legend?

Q3.3 How to evaluate the legend-less map?

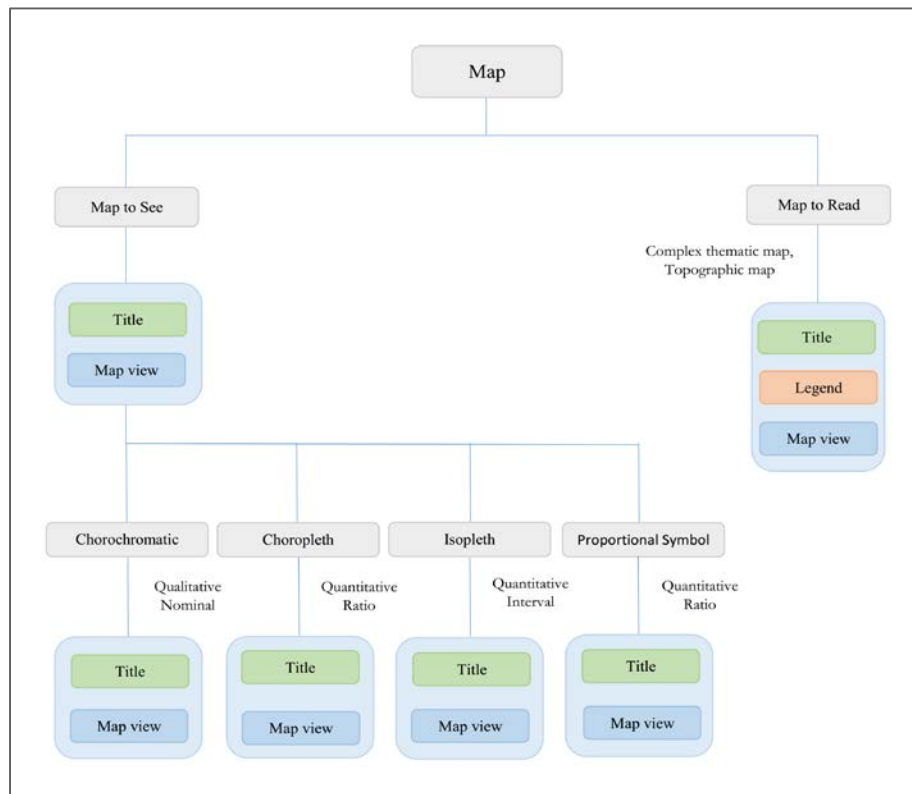
METHODOLOGY

Objective 1:



METHODOLOGY

Objective 2:



(Kraak & Ormeling, 2010)

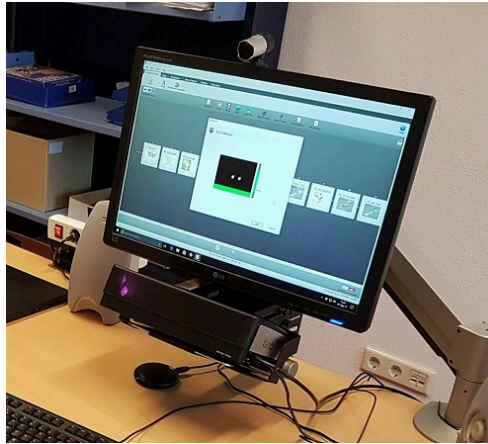
	Dots	Dashes	Patches
Size	4	4	5
(Grey) Value	3	4	5
Texture	2	4	5
Colour Hue	7	7	8
Orientation	4	2	-
Shape	-	-	-

METHODOLOGY

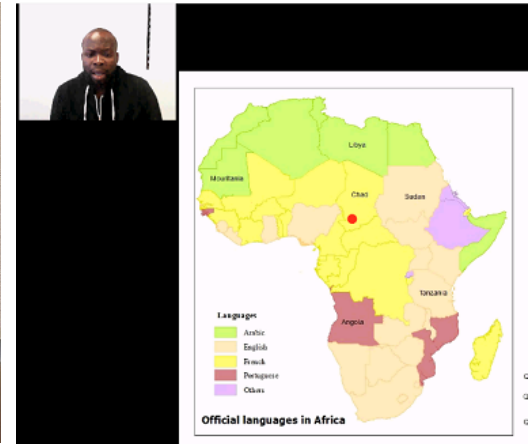
Objective 3:



Questionnaire



Eye tracking



Thinking aloud



DATA SOURCES AND USED SOFTWARE



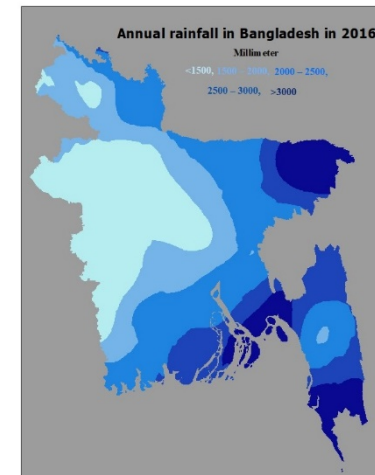
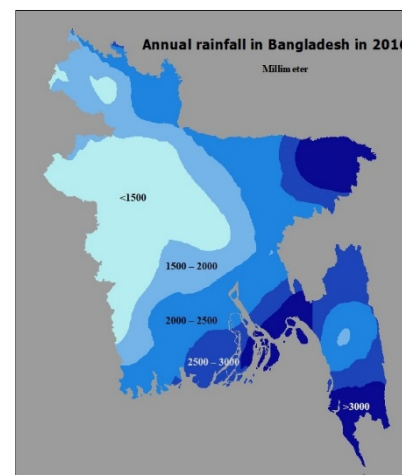
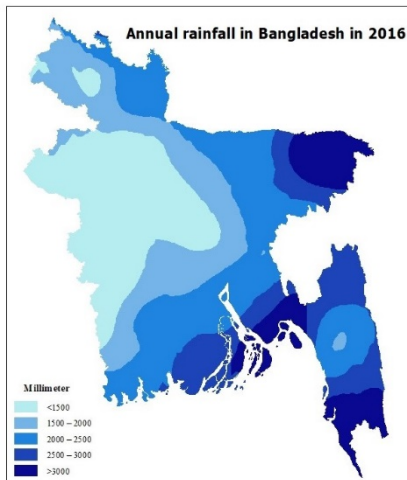
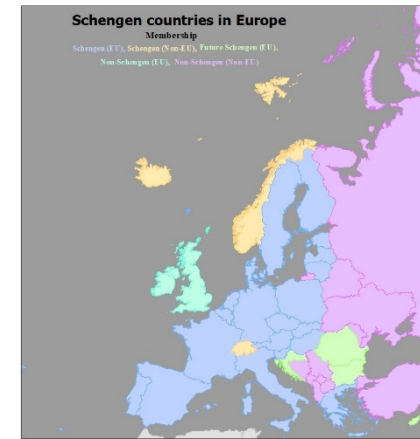
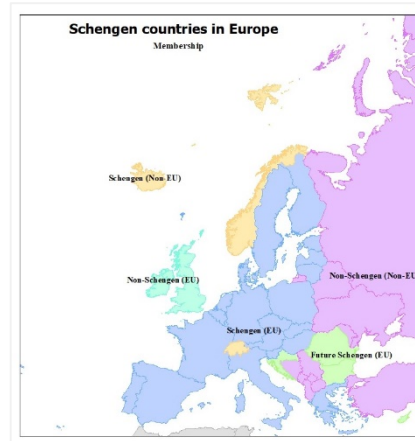
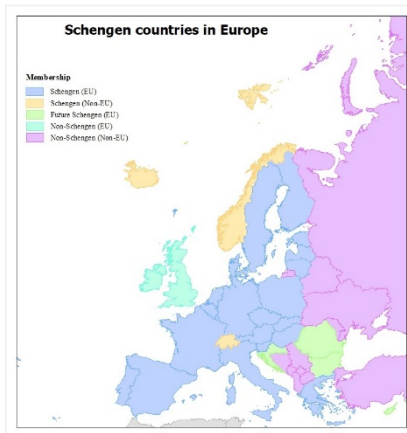


LEGEND

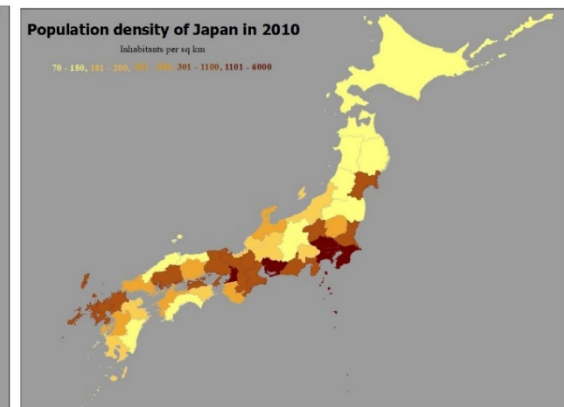
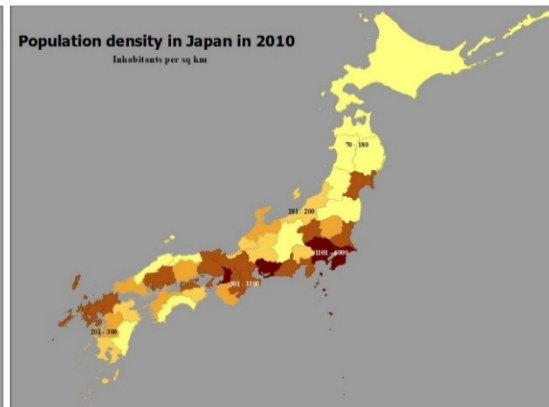
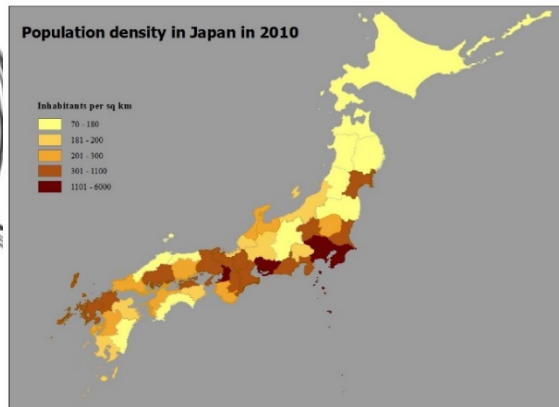
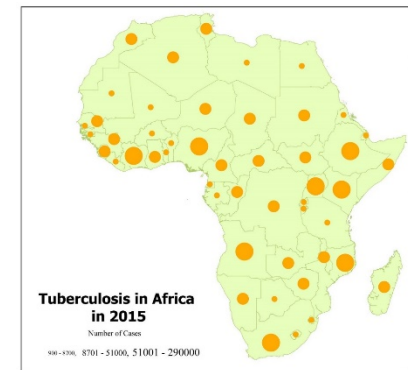
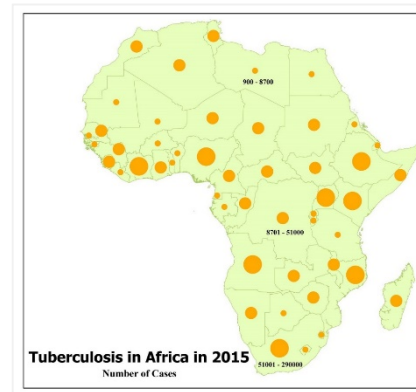
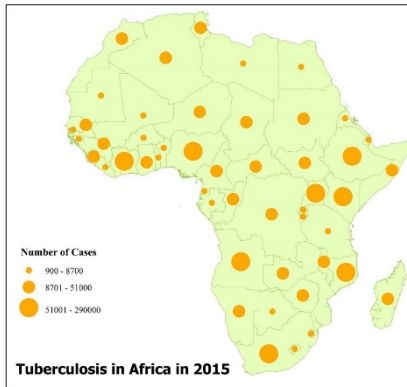
Map legend ?

What is the function of a legend?

LEGEND-LESS MAPS



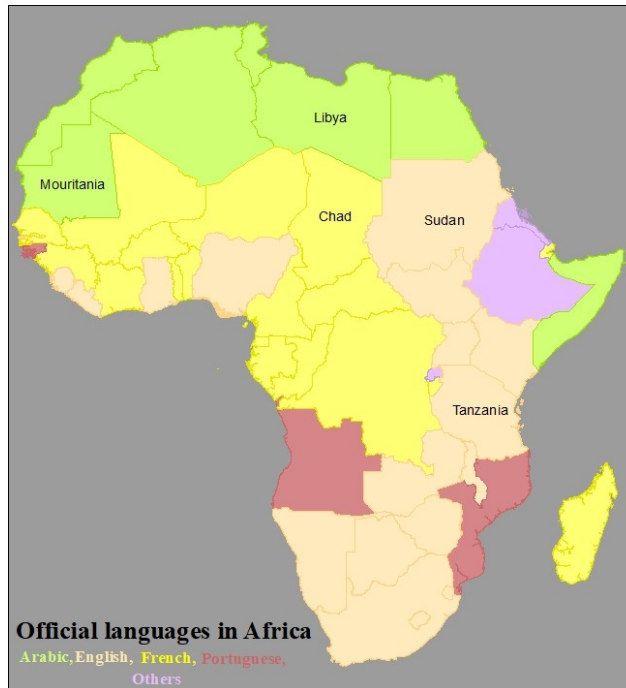
LEGEND-LESS MAPS



USABILITY TEST

Test Person (TP)		Required time for the test (Minutes: Seconds)	Effectiveness (%)		
			Not Answered	Incorrect	Correct
Test 1	TP 1	19:54	2	7	91
	TP 4	21:40	5	0	95
	TP 7	20:35	0	0	100
	TP 10	20:22	0	0	100
	TP 13	36:42	2	0	98
Test 2	TP 2	18:47	0	7	93
	TP 5	21:40	0	0	100
	TP 8	12:02	7	8	85
	TP 11	19:05	2	2	96
	TP 15	21:24	0	5	95
Test 3	TP 3	20:55	0	0	100
	TP 6	22:48	2	11	87
	TP 9	22:39	0	0	100
	TP 12	27:54	2	20	78
	TP 16	16:24	0	2	98

USABILITY TEST: STIMULI



Q1. What is the official language in the Western parts of Africa?

Q2. What is the official language in Tanzania?

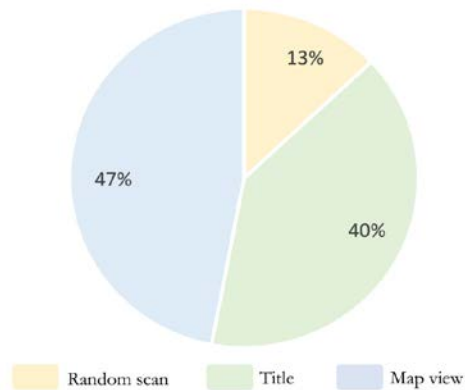
Q3. What pattern of languages spoken can be drawn from the map?

USABILITY TEST: DATA ANALYSIS

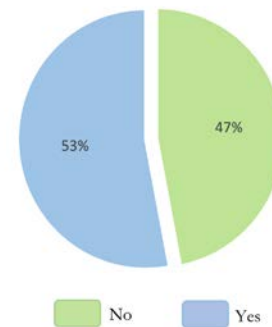
TP 12		Map with Legend		Annotated map		Map with legend in Title	
Task level		Effectiveness	Efficiency (s)	Effectiveness	Efficiency (s)	Effectiveness	Efficiency (s)
Chorochromatic	Elementary	I	70	I	17	C	4
	Intermediate	C	10	I	18	C	13
	Overall	C	36	I	31	C	31
Choropleth	Elementary	C	11	C	12	I	16
	Intermediate	C	32	C	10	C	31
	Overall	C	50	C	25	C	17
Isopleth	Elementary	C	9	C	10	C	15
	Intermediate	C	13	C	21	C	7
	Overall	C	21	N	-	I	33
Graduated Symbol	Elementary	I	48	C	19	C	27
	Intermediate	C	7	I	12	C	29
	Overall	I	56	C	26	C	24
Effectiveness: C= Correct, I = Incorrect, N= Not answered; Efficiency in seconds (S)							

TEST PERSONS' VIEWS ON MAP READING, MAP LEGEND AND TITLE

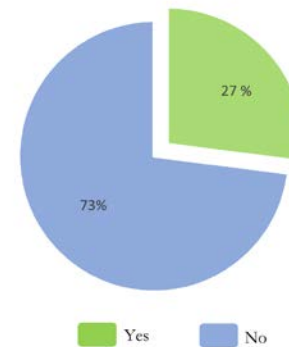
First gaze during map use or reading



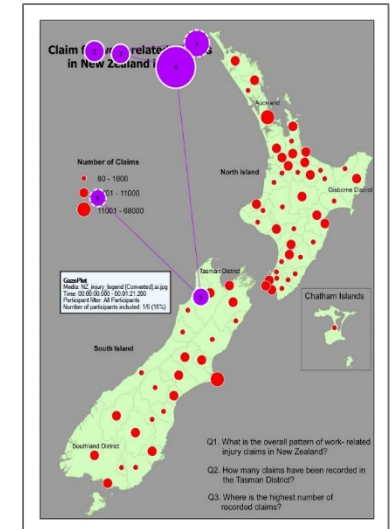
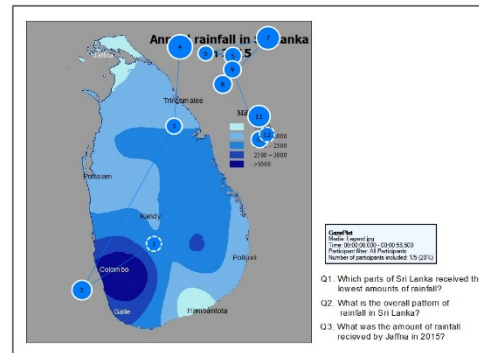
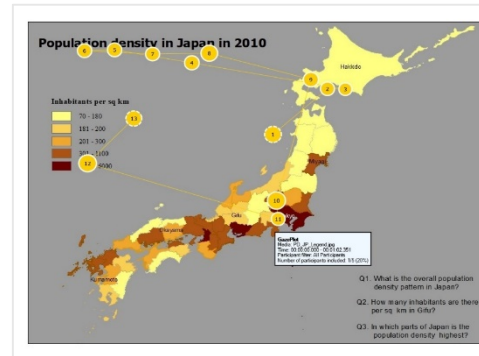
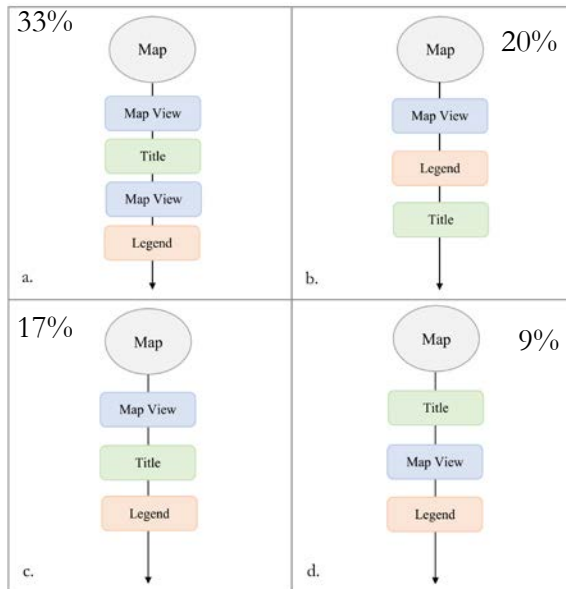
Whether every map should have a title?



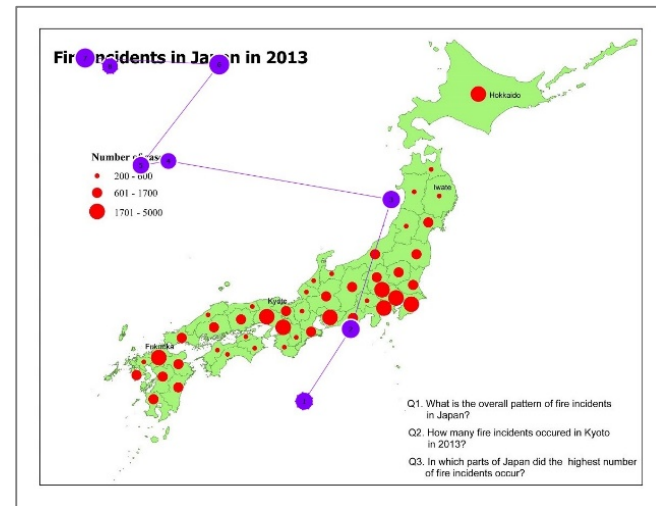
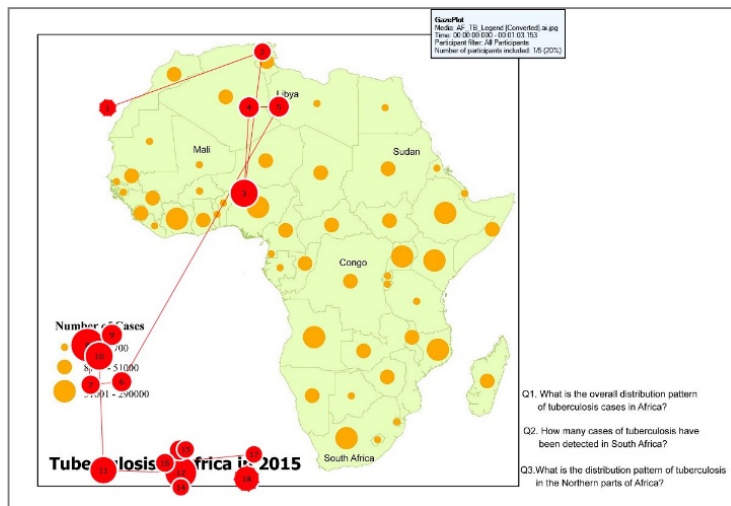
Whether every map should have a legend?



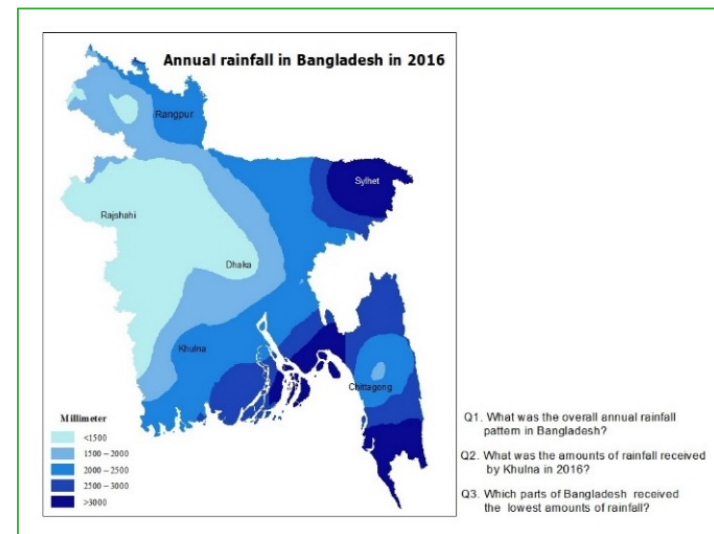
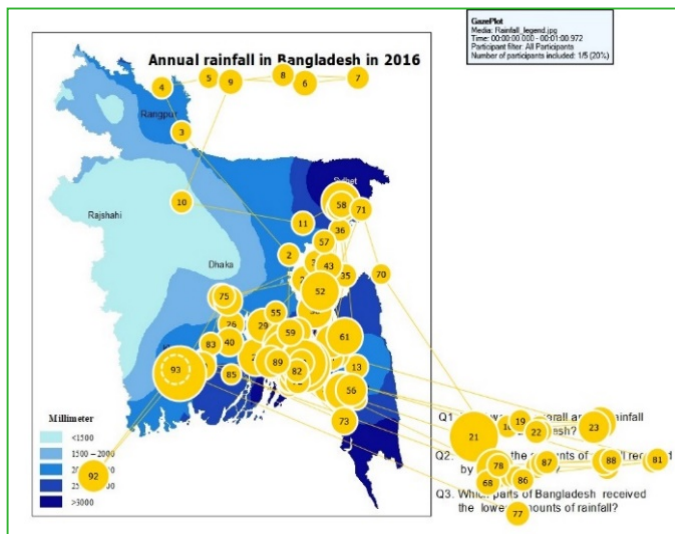
MAP READING PROCESS



MAP READING PROCESS

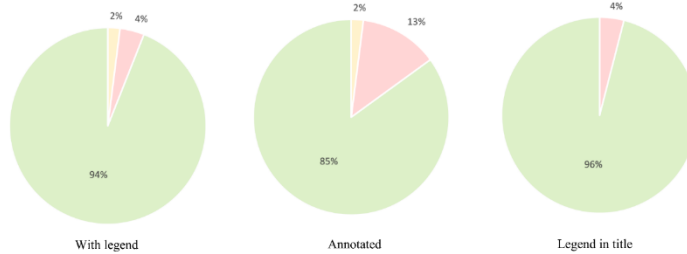


MAP READING PROCESS

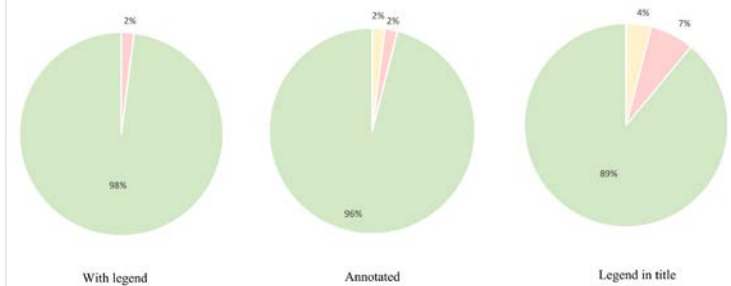


EFFECTIVENESS

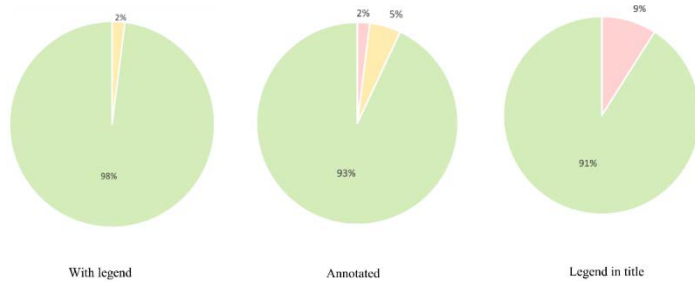
Chorochromatic



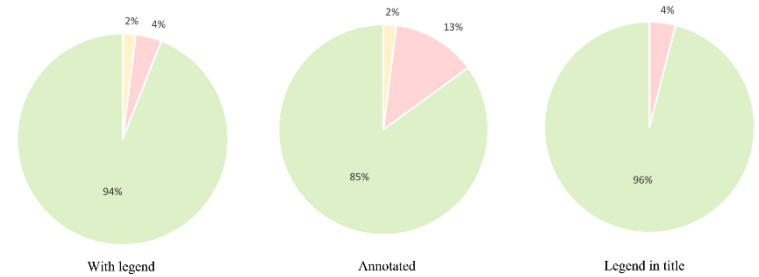
Choropleth



Isopleth



Graduated symbol

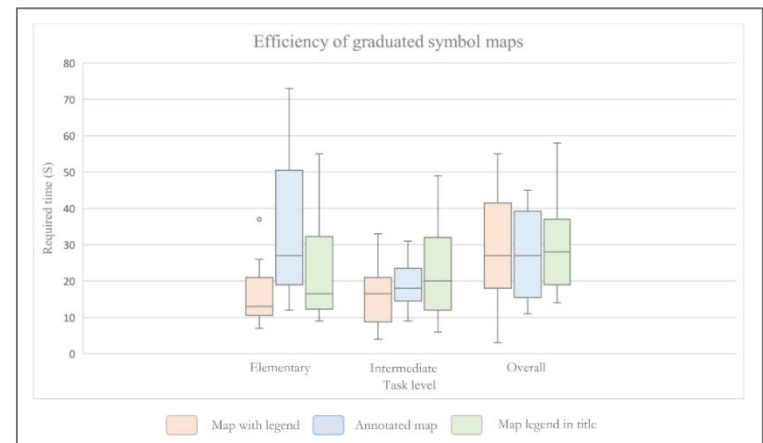
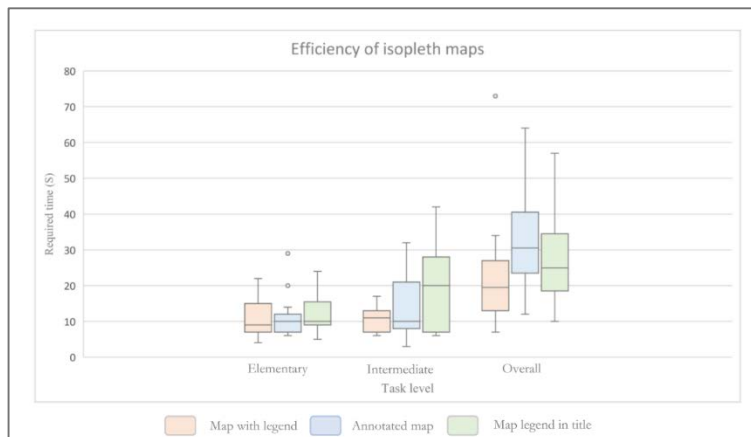
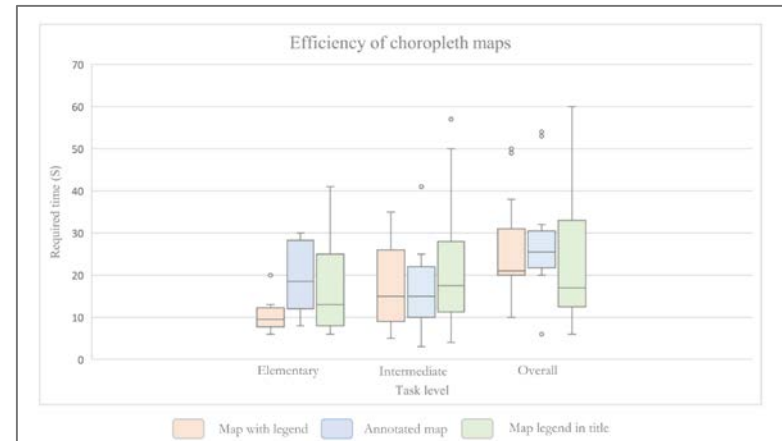
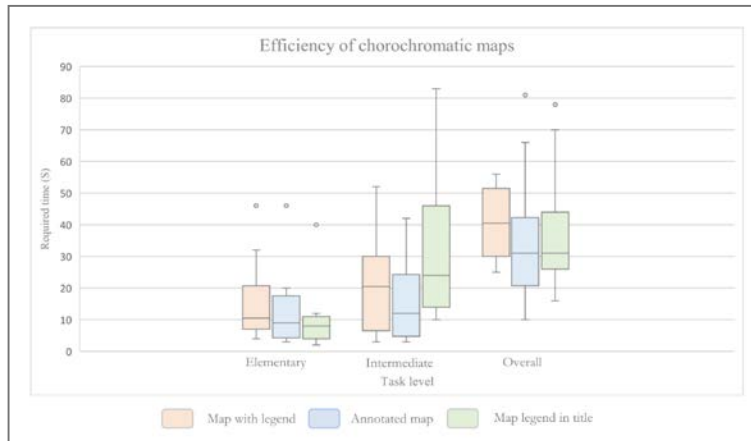


Not answered
 Incorrect
 Correct

EFFECTIVENESS

Elementary level task	Effectiveness (%)								
	With legend			Annotated			Legend in title		
Map types	C	I	N	C	I	N	C	I	N
Chorochromatic	93	7	0	80	20	0	93	7	0
Choropleth	93	7	0	93	7	0	74	13	13
Isopleth	100	0	0	100	0	0	87	13	0
Graduated symbol	87	13	0	87	13	0	86	7	7
C = Correct, I = Incorrect, N = Not answered									

EFFICIENCY





SATISFACTION

“It could have a legend! it is very hard”

“This is a kind of annoying! I have to look for one with same colour”.

“I would love if there is a legend with size.....”

“Oh! This is interesting! I thought there will be a legend at the bottom but it is in title”.

“This is interesting!”; “This is also good idea!”.



FINDINGS

No pattern matched with Bertin' proposed map reading process (1983).

In terms of effectiveness, annotated maps perform better (choropleth, isopleth, and graduated symbol) compare to “title version”.

In terms of efficiency, “title version” perform better than annotated maps for above three cases.

Overall and intermediate level of reading can be performed without legend in above three cases. In chorochromatic, some form of legend is always necessary to perform any level of map reading.

Chorochromatic maps is the best option for designing without legend and choropleth is the least suitable option.



FUTURE RESEARCH

Map reading process can be tested further.

Further test/research for legend-less maps can be done changing number of classes/categories.



Maybe he's caught in the legend
Maybe he's caught in the mood
Maybe these maps and legends
Have been misunderstood

*R.E.M., "Maps and Legends"

THANK YOU

