

Forensic Science Fingerprint Project 2010



By: RMSC 9th grade Forensic Science Class



Introduction

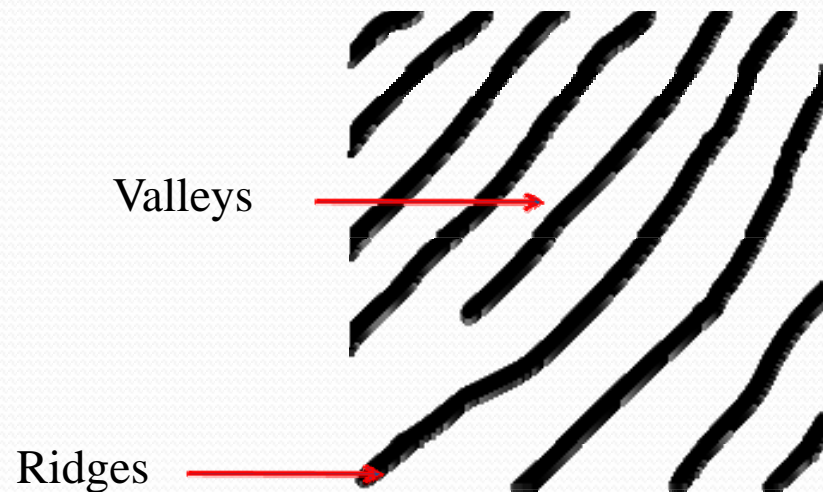


How Fingerprints are used?

- Natural Disasters
- Identification
- Missing Persons
- Criminal Records

What are Fingerprints?

- Fingerprints are valleys and ridges on the skin that form patterns.





Facts about fingerprints

- Permanent
- Unique
- Persistence

3 Stages of Development

- Initial
 - Primary Ridges Form
- Secondary
 - Secondary Ridge Form
- Final
 - The Dermal Papillae Forms



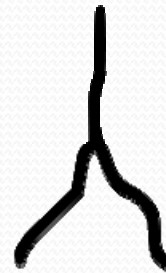
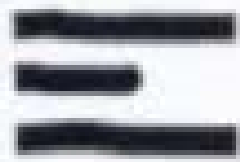
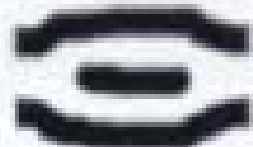
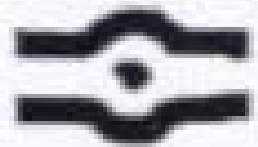
Timeline for Development

- Weeks 5-7
 - Fingers separate
- Weeks 7-11
 - Volar Pads form
- Weeks 10-17
 - Primary Ridges form
- Weeks 24-27
 - Formation stops



Movement in the Womb

- Cause different characteristics within the fingerprint pattern
- Causes dots, short ridges, enclosures, ending ridges and bifurcation.





Heredity

- Patterns are passed on from parents to offspring



Types of Patterns

- Loops
- Whorls
- Arches

Definition of Loops

- Loops are Fingerprints that have:
 - One delta
 - Recurve
 - A core



Types of Loops

- Radial- delta on Left
- Ulnar- delta on Right



Definition of A Delta



- A delta is a “V” shaped design in the pattern.

Definition of Whorls

- Whorls are fingerprints that have:
 - Two Deltas
 - Repeated circles



Types of Whorls

- Plain Whorl, Central Pocket Loop Whorl, Double Loop Whorl, Accidental Whorl



Definition of Arches

- Arches are fingerprints that have:
 - No deltas
 - And start on one side
 - Make a wave in the middle
 - And flow on the other side



Types of Arches

- Tented
- Plain





ACE-V Method

- The ACE-V is a method used for classifying fingerprints
- It stands for:
 - Analysis
 - Comparison
 - Evaluation
 - Verification

Known Percentages Of Fingerprints

- The known percentages of the population are:
 - Loops 65%
 - Whorls 30%
 - Arches 5 %



Purpose

- The purpose of this project is to compare the percentages of the fingerprints from the 9th grade Forensics class with the known percentages of the population.



Rationale

- Ethnic diversity
- Different genders
- ACE-V method



Hypothesis

- Out of 140 fingerprints taken from the RMSC 9th grade Forensics group 65% of the fingerprints will be loops, 30% will be whorls, and 5% will be arches.



Methods



Location

- Frostburg State University : Compton Science Center Room 135
- June 29, 2010
- From 1:30 pm – 2:30 pm



Materials

- Vinyl gloves
- Two ink pads
- Ten print cards (01-14)
- 14 RMSC 9th grade Forensics Students
digits 1-10

Ten Print Card





Procedures

- Assigned numbers to ten-print cards labeled one through fourteen.
- Split up into groups of 8 and 6.
- The group handed out the materials
- Students split into partners of two to start fingerprinting.
- To take the rolled impressions of fingerprints using the FATT method
 - **Fingers Away Thumbs Toward**



Procedures continued

- Plain impressions of fingerprints were taken
- Ten print cards were collected
- Ten-print cards were handed out randomly to students to be classified
- Fingerprints were analyzed by using ACE-V method

Rolling Prints





ACE-V Method

- Analysis-look at characteristics of pattern
- Comparison-compare the students' patterns to the known patterns on back on Ten Print cards
- Evaluation-assigned pattern
- Verification-checked pattern

Classifying Prints





Blind Verification

- When another person verifies the fingerprint without knowing the answer
- If any fingerprints were disagreed upon, a third person checks the pattern and verifies the pattern.



Results

Table 1. Classification of patterns on the fingerprinting cards

Card #	R. Thumb	R. Index	R. Middle	R. Ring	R. Little	L. Thumb	L. Index	L. Middle	L. Ring	L. Little
01	L	L	AA	L	L	AA	AA	L	AA	AA
02	W	L	L	L	L	W	L	L	L	L
03	L	W	L	L	L	L	W	L	AA	L
04	W	W	W	L	L	L	W	L	L	L
05	W	L	AA	L	L	W	L	L	L	L
06	L	AA	AA	L	L	L	L	AA	L	L
07	L	L	L	L	L	W	L	L	L	L
08	W	L	L	L	L	W	W	L	L	L
09	W	W	W	W	W	L	W	W	L	W
10	W	W	L	L	L	W	W	L	L	L
11	L	W	L	L	L	L	L	W	W	L
12	W	L	W	L	L	W	L	L	W	L
13	W	L	L	W	W	W	W	L	L	L
14	L	W	L	L	L	L	L	W	W	W

Table 2. Numbers and percentages of RMSC 9th grade Forensics class fingerprints

Pattern	#	%
Loops	82	59
Whorls	48	34
Arches	10	7

Experimental & Known Percentages

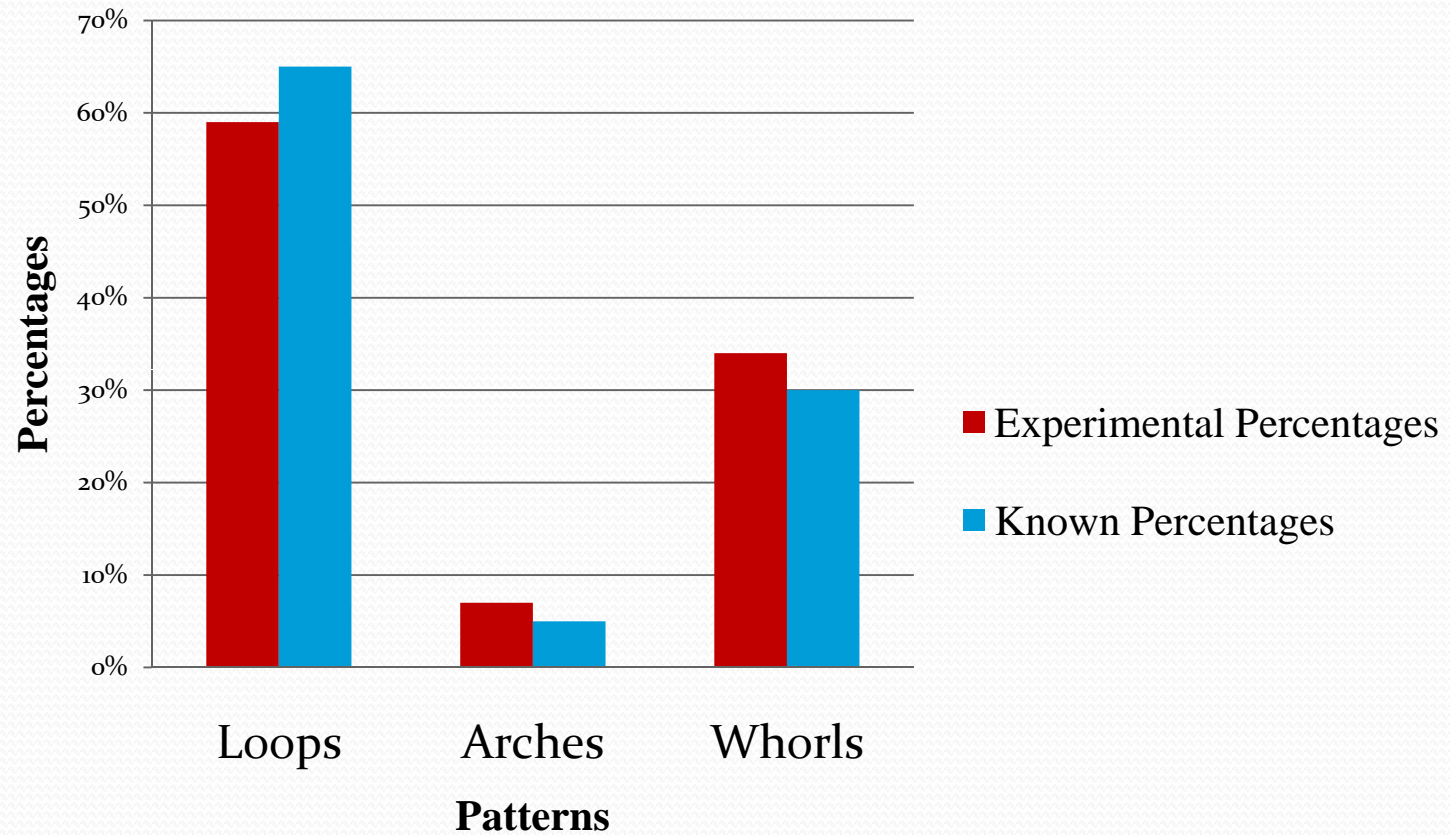


Figure 1: Experimental and Known Percentages of Fingerprint patterns

Table 3: Chi Square Table of Observed and Expected Percentages of Fingerprint Patterns

Pattern	(o) Observed	(e) Expected	(o-e)	(o-e) ²	(o-e) ²	Decimal form
Arch	10	7	3	9	9/7	1.286
Loop	82	91	-9	81	81/91	0.890
Whorl	48	42	6	36	36/42	0.851
						3.033



Discussion and Conclusion

The Chi Square

Patterns	Observed (O)	Expected (E)	(O-E)	(O-E) ²	(O-E) ² /E	Decimal
Arches	10	7	3	9	9/7	1.286
Whorls	48	42	6	36	6/7	0.857
Loops	82	91	-9	81	81/91	0.890

Total

3.033

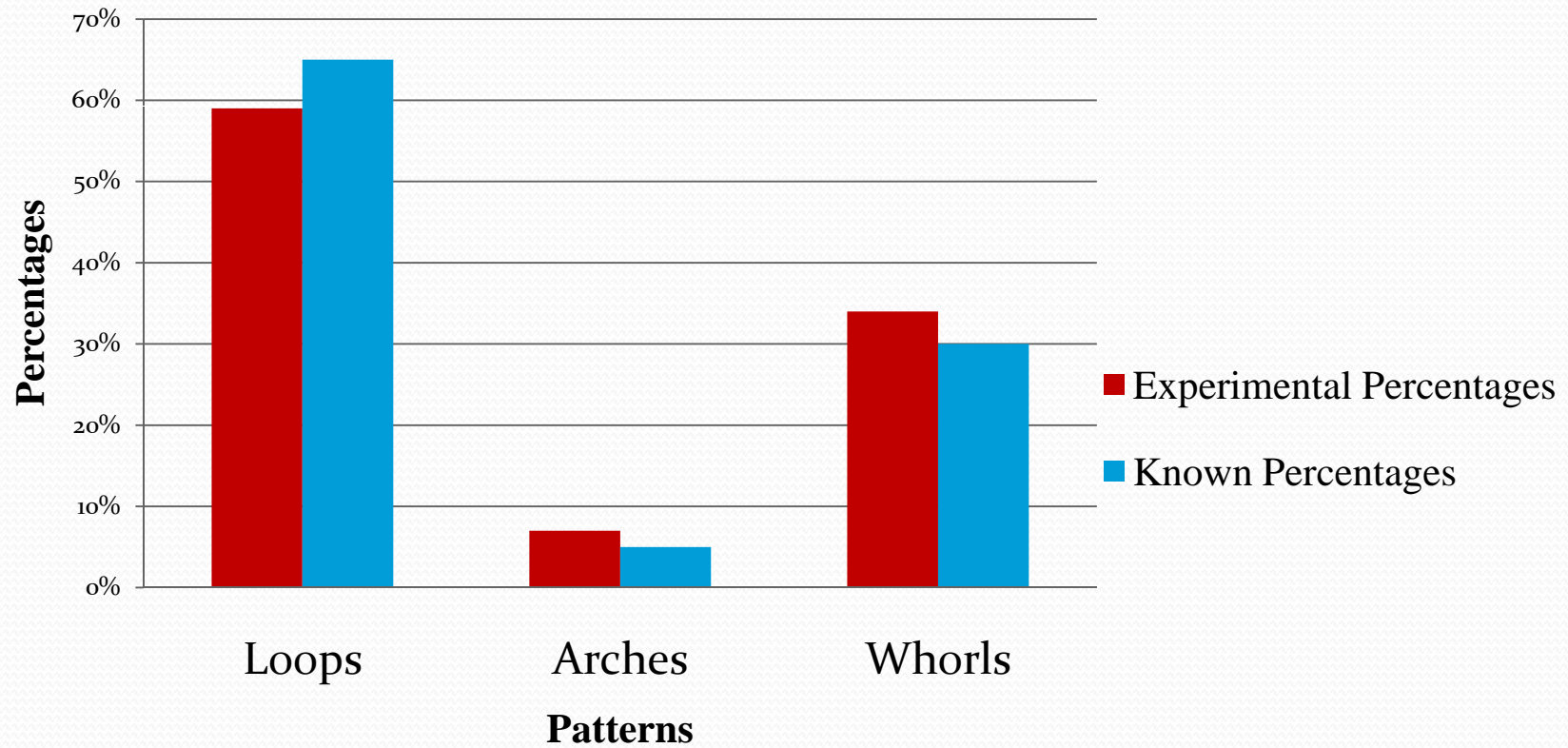


The Chi Square (Cont.)

- The level of significance from the Chi Square table was 5.99
- Since the calculated value that was determined was 3.033 which is less than 5.99 there is no significant difference
- The hypothesis was accepted

The Trends of a graph

Experimental & Known Percentages





Purpose

- The purpose of this experiment is to compare the 9th grade forensics class of RMSC fingerprints to the worlds known percentages of fingerprint patterns



The Significance of the Purpose

- The significance of the purpose is whether the purpose of the experiment was achieved



Limitations

- Number of fingerprints
- Limited resources and time to print and analyze fingerprints
- Type of Ink
- Inexperience in classification



Suggestions

- More time to do the experiment
- Testers with more experience rolling fingerprints
- Testers with more experience classifying fingerprints
- Use a better type of ink
- A larger amount of people should be tested



Questions Raised

- What is the percentage of different subgroups of loops, whorls, and arches on a fingerprint?
- What kind of fingerprint pattern is on each specific finger?