CHAPTER IV

ANALYTICAL RESULT OF BLOOM’S AND PORTRAYALS

4.1 CONCEPT WORDS AND INSTRUCTIONAL THEORIES

4.1.1 Bloom’s Taxonomy

U.S Educationist Benjamin Bloom in 1956 constructed taxonomy based learning stages. The taxonomies are presented below.

i) Knowledge (Kn), ii) Comprehension (Co), iii) Application (Ap)

iv) Analysis (An) v) Synthesis (Sn) vi) Evaluation (Ev)

4.1.2 Instructions and Cognitive Structures

A classification scheme that was used to accomplish a comparative Scrutiny on the Illustrative Contents of political party broadcasts between 1989 and 1994 appears to be closer to that of present day’s textual content Scrutiny (Carvalho 2000). This was probably adopted from a coding frame that was earlier used to compare different modes of competition between British and American parties (David Robertson 1976). It was developed later in 1979 for comparative content-analytic approaches on different policy positions of political parties. It has been stressed that every content Scrutiny should depart from any hypothetical approach. Therefore ‘Content Scrutiny’ can well be adapted as a descriptive study methodology for analyzing conceptual written communication of any textual subject content material. Three main uses of content (communication) Scrutiny were categorized (Ole Holsti 1969) as: 1. To make inferences about the antecedents of a content communication; 2. To describe and make inferences about the characteristics of a content communication; and 3. To make inferences about the effects of a content communication. Text books could well be considered as the content material (Palmquist 1990). Thus the content Scrutiny could analyze textual materials first by breaking into sentence by sentence. The analytical process could be either conceptual or relational. In any case the sentence needs to be broken down into categories of words, such as nouns, verbs articles etc. These categories are then examined through rules that are specific to the purpose of content Scrutiny.

4.1.3 The First Principles of Instruction

According to the ‘First Principles of Instruction’ (Merrill 2002), any instructional object could be divided into four segments. The first segment depicts the conception already obtained by the learners but those are required for understanding the current concept (object).
Many verbs of these selected Depiction Representations, which could be used for the intended content study on document is presented below.

i. Explicit content (E)

ii. Illustrative content (I)

iii. Analytical content (A)

Concept words for Content investigation:

Learning objectives communicate the expectations of both the teacher as well as the learner (chapter II). Consequently, the learning objective (outcome) has to be identified for a traditional 50-minute lecture, three to seven learning objectives/tasks could be constructed (Merrill 2002). This is very important for the intended content Scrutiny on the subject documents. Action verbs may be used, which could indicate a particular learning objective (or Depiction Representation). From the simple definitions of the four Depiction Representations, many keywords can be taken from published literature apart from ones derived from the definitions for specific domain. Definitions of these four Depiction Representations and the relevant keywords are presented below:

Explicit content:

Instructions of this Depiction Representation use (keywords): recall, relate, remember, repeat or recognize the information from relevant past experience that can be used as a basis for the new knowledge (problem)?

i) If learners have limited prior experience, does the instruction provide relevant knowledge that could be used as a basis for the new knowledge?

Based on the above, a set of keywords for this Depiction Representation, as taken from literature and used (presented in next chapter)

Illustrative content:

- Does the instruction demonstrates (or explains) of what is to be learnt rather than merely giving information about what is to be learnt?

- Are the Illustrative Content s (explanations) steady with the content being taught?

- Do learners have a chance to practice and apply their newly acquired knowledge?
Are the Illustrative Content (practice) and assessment (tests) consistent with the stated or implied objectives?

Based on the above, a set of keywords for this Depiction Representation, as taken from literature and used (presented in next chapter)

**Analytical Content:**

- Does the instruction provide techniques that support learners to integrate (or transfer) their newly acquired knowledge into their everyday professional life?
- Does the instruction provide an opportunity for learners to create, or explore new and personal ways to apply their new knowledge?
- Based on the above, a set of keywords for this Depiction Representation, as taken from literature and used (presented in next chapter)
- The chosen Depiction Representation keywords and the heads (portrayal class titles) for this research have been validated by experts as listed below.
  1. E-Instructional Designer (one)
  2. Research Supervisor (one)
  3. Statistician (one)
  4. Doctoral Committee members (Two) and the researcher herself.

**4.1.4 Difference between Bloom’s Taxonomical approach and Merrill’s Portrayal approach:**

1. Bloom’s taxonomy doesn’t explicitly connect each taxonomy (for example, K is treated separately from C, even though they are hierarchical). FPI clearly specifies a rule that ‘Activate’ those essentially required for ‘Demonstration’ phase. More precisely, FPI follows Information Processing theory of In-put – Process –Output, in a pure hierarchical process manner with one needed for the next.

2. Relevant past experience must be brought before moving to the next level in the case of FPI, but no such compulsion in Bloom’s.

3. While Bloom merely recalls information, FPI recalls not only information and experience, but mental model as well.
4. FPI performs demonstration through ‘what is to be learnt’ unlike Bloom’s (Comprehension) ‘what is to be understood’. Media plays an important role in FPI’s ‘demonstration’ leading to learner centric approach.

5. Most importantly, FPI is a cyclic process around a problem centric theme, where as Bloom’s model is linear, uni-directional and hierarchical.

In view of the above, FPI is quantifiable explicitly using mostly well defined independent non dependable words; whereas Bloom’s taxonomies of different levels might use repeated words.

4.2 CONTENT ANALYSIS

Content analyzed results are subjected to qualitative ratings by researches. For any research programmer, it is important to establish a good level of inter-rater reliability, also known as inter observer reliability (Martyn Shuttleworth 2009). This ensures that such generated results will meet the accepted criteria defining reliability. There should be an agreement between two or more observations (This research assumes significance value of 10%).

4.2.1 Reorganized Pedestal Contents on ‘Statistics, Probability and Random Processes’

Subject Id and Titles:
S1. Statistics Methods
S2. Probability and Random Processes Concepts

Episodic Id and Titles of S1:

PCDS Id and Titles of each Episode of S1:
E1: Data Representation. (Total No. of PCDs: 4)
P1: Data Collection Methods. (Class: E)
P2: Classification of Data. (Class: E)
P3: Graphical Representation of Data. (Class: I)
P4: Examples of Data Representations. (Class: I)

E2: Statistical Measurements. (Total No. of PCDs: 8)
P1: Principles of Frequency Distributions. (Class: A) 348
P2: Measures of Central Tendencies. (Class: I) 982
P3: Solved Examples of Central Tendencies. (Class: I) 2013
P4: Measures of Dispersion. (Class: E) 216
P5: Representation of Mean Deviation. (Class: E) 111
P6: Representation of Standard Deviation. (Class: E) 375
P7: Computation of Standard Deviation. (Class: I) 656
P8: Coefficients of Variation. (Class: I) 1209

E3.Standard Distributions.(Total No. of PCDs:3)
P1: Computation of Moments. (Class: I) 435
P2: Computation of Skewness and Kurtosis. (Class: I) 765
P3: Solved Examples of Standard Distributions. (Class: I) 1887

E4.Corrrelations. (Total No. of PCDs:7)
P1: Definition of Correlations. (Class: E) 200
P2: Construction of Scatter Diagram. (Class: I) 454
P3: Computation of Co-efficient of Correlations. (Class: I) 2002
P4: Representation Lines of Regression. (Class: E) 321
P5: Importance of Standard Error of Estimate. (Class: A) 400
P6: Computation of Rank Correlation. (Class: I) 664
P7: Solved Examples of Correlations. (Class: I) 3251

E5.Spectral Densities. (Total No. of PCDs:4)
P1: Introduction of Power Spectral Density. (Class: E) 564
P2: Worked out Examples of Power Spectral Densities. (Class: I) 4536
P3: Description of Cross Spectral Density. (Class: I) 765
P4: Worked out Examples of Cross Spectral Densities. (Class: I) 3452
Episodic Id and Titles of S2:

PCDS Id and Titles of each Episode of S2:
E1: Baye’s Theorem. (Total No. of PCDs: 3)
P1: Statement of the Theorem (Class: E) 50
P2: Classification of the Theorem (Class: I) 180
P3: Solved Examples of the Theorem (Class: I) 484
E2: Random Variables. (Total No. of PCDs: 6)
P1: Define Random Variables (Class: E) 80
P2: Types of Random Variables (Class: I) 230
P3: Properties of Probability Density Function (Class: I) 345
P4: Conditions of Density Function (Class: A) 243
P5: Principles of Distribution Function (Class: I) 468
P6: Solved Examples of Random Variables (Class: I) 1884
E3: Moment generation function. (Total No. of PCDs: 6)
P1: Notations of Moment generating function (Class: E) 188
P2: Origin of Moments (Class: E) 522
P3: Limitations of Moment generating function (Class: A) 90
P4: Properties of Moment generating function (Class: I) 239
P5: Solved Examples of Moment generating function (Class: I) 984
P6: Uniqueness Theorem of Moment generating function (Class: A) 77
E4.Chebyshev’s Inequality. (Total No. of PCDs:3)
P1: Properties of Chebyshev’s Polynomial (Class: I) 222
P2: Worked out Examples of Chebyshev’s Polynomials (Class: I) 641
4.2.2 Content Analytical Procedure

Sample Content:

PCD on ‘Data and Variables’

Data and variables are mostly used in descriptive statistics. Descriptive statistics deal with qualitative aspects. An example of qualitative survey could be: a feedback with an answer “Working well” of a test result of an electronic control system. The other type is quantitative. Quantitative on the other hand measures numerical values. For example, the measured voltage value of a particular SMPS is 4.9 Volts. There are two types of quantitative data namely, discrete and continuous. Example of a discrete value is 9600 KHz. Data and variables are not only used in descriptive statistics, but also used in inferential statistics and in other areas. Descriptive statistics is a branch of statistics that are concerned with describing sets of measurements of both samples and population. The term ‘Measurements’ must be known first. Measurements are defined as technique of measuring data for categorizing certain values of them into some types of data that are likely to be encountered in real life. For example, the calibrated values of several electronic measuring devices. Data in statistics is also known as collection of facts. A variable on the other hand is a characteristic that changes or varies over time and/or for different
individuals or objects under consideration. For example, the radio waves received from a satellite from morning 8 am till evening 8 pm at every one hour.

Sample Analysis:

The verb ‘define’ of the sentence “Define Data”, enables the learner to recall the meaning of data already learnt in the portrayal class ‘Explicit content’ and ‘Knowledge’ of the Bloom’s taxonomy.

The words ‘deal’ and ‘draw’ in the sentence “Statistics ‘deal’ with the methods for collection, classification and analysis of numerical data for ‘draw’(ing) valid conclusions”, after stemming classifies the concept into ‘Illustrative content’ of the portrayal category or ‘Application’ of the Bloom’s category.

The verb ‘show’ helps the learner to demonstrate “the role of representing or show(ing) the frequency distribution with respect to…”.

The verb ‘prove’ is used to establish a procedure for a specific computation, of the sentence : “If \( x_1, x_2 \) and \( x_3 \) are 3 independent observations of \( x \), ‘prove’ that the probability of one of the three is greater than 1.5 ”.This is classified under ‘Analytical content’ of portrayal class and ‘Application’ / ‘Synthesis’ of Bloom’s.

Sample Categorization:

Table 4.1 Rhetoric concept words on sample sentences

<table>
<thead>
<tr>
<th>Concept Word</th>
<th>Sample Concept Sentence</th>
<th>Probable Bloom’s Categor(y/ies)</th>
<th>Probable Portrayal Categor(y/ies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>write</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>verify</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>apply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evolve/identify/generate</td>
<td>A generaliz(e/ation) of a geometric distribution in which the random variable is the number of Bernoulli trials required to obtain r successes evolve(s) / is identify(y/ied) into / as negative binomial distribution.</td>
<td>Knowledge / Comprehension / Analysis</td>
<td>Analytical</td>
</tr>
<tr>
<td>modify</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
“It is recall(ed) that the probability of occurrence of both events of A and B together is joint probability.

<table>
<thead>
<tr>
<th>construct</th>
<th>explain</th>
<th>design</th>
<th>construct</th>
</tr>
</thead>
<tbody>
<tr>
<td>recall</td>
<td>“It is recall(ed) that the probability of occurrence of both events of A and B together is joint probability.”</td>
<td>Comprehension / Knowledge</td>
<td>Explicit</td>
</tr>
</tbody>
</table>

4.3 CONTENT ANALYSIS RESULTS

E1: Data Representation. (Total No. of PCDs:4)

Total number of words in S1E1 content = 2567

Bloom’s taxonomy concepts in percentages of the combined document:

Kn=15%; Co=25%; Ap=60%;

After Splitting into S1E1 PCDs according to portrayal classes:

S1E1P1: “Data Collection Methods”. (Class: E; No. of words 128);

S1E1P2: Classification of Data. (Class: E; No. of words 540);

S1E1P3: Graphical Representation of Data. (Class: I; No. of words 879)

S1E1P4: Examples of Data Representations. (Class: I; No. of words 1020)

Class E = 26% and Class I = 74% in S1E1
4.3.1 Subject S1 and Episode E1

**Figure 4.1 Distributions of Bloom’s Concepts in S1E1**

‘Application’ is the major contributing factor in S1E1 (Figure 4.1). There are no higher order concepts such as synthesis, Analysis and Evaluation present in S1E1, as ‘Data collection’ topic does not require such higher order abilities.

**Figure 4.2 Distributions of portrayals in S1E1**

In figure 4.2 illustrative plays a major role around 74% , the remaining 26% by explicit and there is no analytical contribution of portrayals in S1E1.
4.3.2 Subject S1 and Episode E2

In figure 4.3, Application plays a major role in Statistical Measurements (S1E2) than the remaining concepts knowledge, comprehension, analysis, synthesis and evaluation.

Figure 4.3 Distributions of Bloom’s concepts in S1E2

Figure 4.4 Distributions of portrayals in S1E2
In figure 4.4 illustrative plays a major role around 83% than the remaining concepts explicit and analytical.

### 4.3.3 Subject S1 and Episode E3

#### Figure 4.5 Distributions of Blooms concepts in S1E3

‘Application’ is the major contributing factor in S1E3 (Figure 4.5). There are no higher order concepts such as analysis, synthesis and evaluation in S1E3, as ‘standard distributions’ topic does not require such higher order abilities.

#### Figure 4.5 Distributions of Blooms concepts in S1E3

<table>
<thead>
<tr>
<th>S1E3 Bloom's Concepts</th>
<th>Kn</th>
<th>Co</th>
<th>Ap</th>
<th>An</th>
<th>Sn</th>
<th>Ev</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80%</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S1E3 Portrayals</th>
<th>Explicit</th>
<th>Illustrative</th>
<th>Analytical</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4.6 Distributions of Portrayals in S1E3

In figure 4.6, illustrative content is the only contribution in standard distributions (S1E3).

4.3.4 Subject S1 and Episode E4

Figure 4.7 Distributions of Blooms concepts in S1E4

In figure 4.7 Applications plays a major role around 74% than the remaining concepts Knowledge, comprehension, analysis, synthesis and evaluation.

Figure 4.8, Distributions of Portrayals in S1E4
In figure 4.7, Illustrative plays a major role around 88% than the remaining concepts in Correlations (S1E4).

4.3.5 Subject S1 and Episode E5.

![S1E5 Bloom's Concepts](image)

**Figure 4.9 Distributions of Blooms concepts in S1E5**

In figure 4.9, Application plays a major role in spectral density (S1E5) than the remaining concepts knowledge and comprehension.

![S1E5 Portrayals](image)

**Figure 4.10 Distributions of Portrayals in S1E5**
In figure 4.10, illustrative plays the major role in spectral density (S1E5).

4.3.6 Subject S2 and Episode E1

![S2E1 Bloom's Concepts](image1)

**Figure 4.11 Distributions of Blooms concepts in S2E1**

In figure 4.11, Applications plays a major role than the remaining concepts in Baye’s theorem (S2E1).

![S2E1 Portrayals](image2)

**Figure 4.12 Distributions of Portrayals in S2E1**

In figure 4.12, illustrative plays the major role than explicit and there is no contribution of analytic thinking in Baye’s theorem (S2E1).
4.3.7 Subject S2 and Episode E2

**Figure 4.13, Distributions of Blooms concept in S2E2**

In figure 4.13, Applications plays more than half of the role in random variables (S2E2), than the remaining concepts.

**Figure 4.14 Distributions of Portrayals in S2E2**
In figure 4.14 illustrative occupies a major role in random variables (S2E2).

4.3.8 Subject S2 and Episode E3

Figure 4.15 Distributions of Blooms concept in S2E3

In figure 4.15 applications plays an important role than the remaining factors in the moment generating function (S2E3)

Figure 4.16 Distributions of Portrayals in S2E3

In the figure 4.16 illustrative plays a major role of 57% in moment generating function (S2E3)
4.3.9 Subject S2 and Episode E4

**Figure 4.17 Distributions of Blooms concept in S2E4**

In figure 4.17 application plays an important role in Chebyshev’s inequality (S2E4) and there is no contribution of synthesis and evaluation.

**Figure 4.18 Distributions of Portrayals in S2E4**

In figure 4.18 of portrayal based classification illustrative plays a major role of 81% in Chebyshev’s inequality.
4.3.10 Subject S2 and Episode E5

**Figure 4.19 Distributions of Blooms concept in S2E5**

In figure 4.19 application plays a majority role in functions of random variables (S2E5) than the other concepts of Bloom’s

**Figure 4.20 Distributions of Portrayals in S2E5**

In figure 4.20 illustrative plays 77% in functions of random variables (S2E5) and the remaining occupies explicit.
4.3.11 Subject S2 and Episode E6

**Figure 4.21 Distributions of Blooms concept in S2E6**

In figure 4.21 Bloom’s concept Application plays major role of 64% and analysis plays the least role of 3% in Marginal and Conditional distributions (S2E6).

**Figure 4.22 Distributions of Portrayals in S2E6**

In figure 4.22 illustrative plays 78% and the remaining occupies explicit.

4.3.12 Summary

The chapter has yielded content analytical results on two concepts namely Bloom’s and Portrayals. These content analytical results show similarity between the two chosen tools. These results will be used as strategies for later research on extraction of concepts using probability theories.