

SUMMARISED READING MATERIAL ABOUT CLOCK TIME

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1. HISTORICAL PERSPECTIVE OF TIME

This section provides a glimpse into how time awareness developed as an important human activity and why time became a powerful and important daily phenomenon in society. I chose to look at human beings' meaning making of telling time using cultural artifacts primarily the mechanical clock. Furthermore I provide a brief historical significance of the clock as it developed as a cultural tool to keep the time and also to measure the passing of time in a more precise way.

1.1. MEANING AND INTERPRETATION OF TIME

Literature more often described time as multi-facet with different meanings and interpretation with related function (Lakoff & Johnson, 1980; Burny, 2012). The awareness of time has been described as a fundamental human characteristic of human experience by reflecting on our continuous experience. Whitrow (1988) suggests that although we as humans tend not to access the physical presence of time the "sense of time" involves some feeling or awareness of duration" that depends on our attentional interest of such events we experience (p. 5).

The gradual acquisition of time sense in learners can be closely correlated with the development of his/ her use of language as a thought articulator. Wallis (1966) as cited in Whitrow (1988) highlights that human awareness of the idea of the time is a product of human evolution that is neither innate nor automatically learned.

1.2 TIME TELLING DEVELOPMENT

This section explains why time telling became important as human development happened. Herein I also highlight some cultural contributions in the process of time telling such as the day consisting of a total of 24 hours as we know it today.

The development of time telling was solved with the aid of the shadow sticks, sundials, and clocks of various kinds (Williams, 2004). The practical challenges the above presented to record the actual and relative time of events (here-and-now and also future) necessitated a device that could measure durations of time with two fixed points relative to each other.

The natural systems became impractical because of the non-standard scale used and change in the time position of the object being measured. For example if the location has a long winter or short summer then natural systems to measure time and duration become less accurate. Furthermore the sun's apparent motion produces three distinct reference points: sunrise, apex, and sunset. The above seem to point to the need to develop a measuring tool that could not be influenced by natural changes.

The English history of the word 'clock' relates to the Medieval Latin word clocca and the French word cloche, meaning bell (Dutch klok). As mentioned before the sundial was already mathematically divided into twelve segments, which is similar to the face of the mechanical clock. Significantly the mechanical clock device enabled us to measure daytime and night time hours through a second revolution of the indicator around the dial. Noticeable was bringing the daytime and night time hours together in a single device, thus clock time is displayed as a continuous process.

1.3 THE INFLUENCE OF THE MECHANICAL CLOCK

The practice of time telling and their associated artifacts were shaped by the cultural activities of particular social groups and their shifting power relations. Whitrow (1988, p. 112) eloquently describe the "economic power of the public clock in medieval time to open and close markets, to

signal the start and end of work and to move people around”. The popular complaint of Jean in the Gargantua (1535) of Rabelais that applies even today was that “the hours are made for man and not man for the hours!” (Whitrow, 1988, p. 114)

2 MEASUREMENT OF ANALOGUE CLOCK TIME

Long & Kamii (2001) distinguish measurement of time as different from reading clocks. Additionally time is one aspect of measurement that has not gone metric, so the relationships between the units, for example, 24 hours in one day; 60 minutes in an hour, and 60 seconds in a minute, seems to make converting units challenging. For example, the learners use a subtraction algorithm for finding the time intervals from one time to another presents various problems.

Haylock (2001) recommends that such challenges be done on an ad hoc process of adding-on. He suggests that learners use a number-line to find the time-interval from example 10.45 a.m. to 1.30 p.m. and avoid using a circle to represent it. Haylock (2001) puts that the conventional dial-clock is complicated by the fact that the hands go round twice in a day. Thus the use of the number-line can assist and make adding and subtracting of time-intervals easier for learners to calculate.

3 COMPLEXITY OF TIME

According to Williams (2004, p.86) learners find it difficult to understand that the motion of each hand on the clock face “starts” at the top (the 12) and proceeds in a particular direction (clockwise), completing a cycle when it reaches the top again—even though the motion of the hands is actually continuous, neither starting nor stopping at any point, and is so slow that the hands appear stationary.

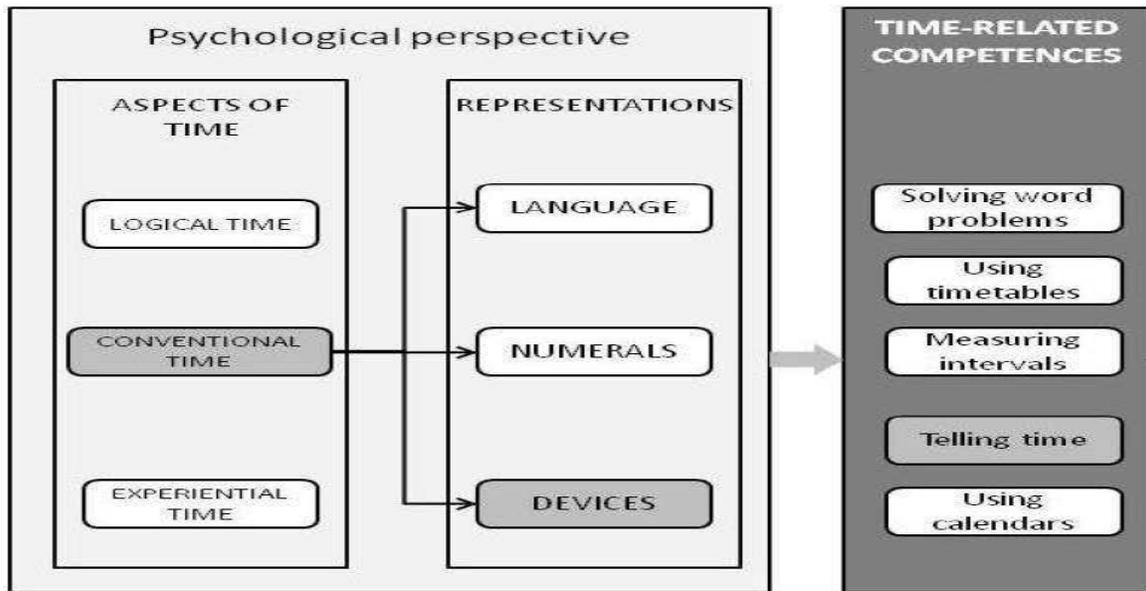
4 THE LABEL ‘12’ HAS MANY ASSOCIATIONS:

- (1) In terms of order, it stands for the number between 11 and 1 in the repeating cycle;
- (2) In terms of quantity, it stands for twelve, zero, sixty, no quarters, and four quarters (or a whole);
- (3) In terms of the scales, it marks the origin and upper bound;
- (4) In terms of the indicators, it marks the starting point and endpoint of motion around the dial;
- (5) In terms of the solar day, it stands for midday (noon) and midnight; and
- (6) In terms of the system of time measurement, it marks the boundary between one sixty-minute hour and the next (on the minute dial). (Williams, 2004, p. 50)

5 READ AND TELL TIME WHEN THE MINUTE HAND PASSED THE HALF-HOUR MARK

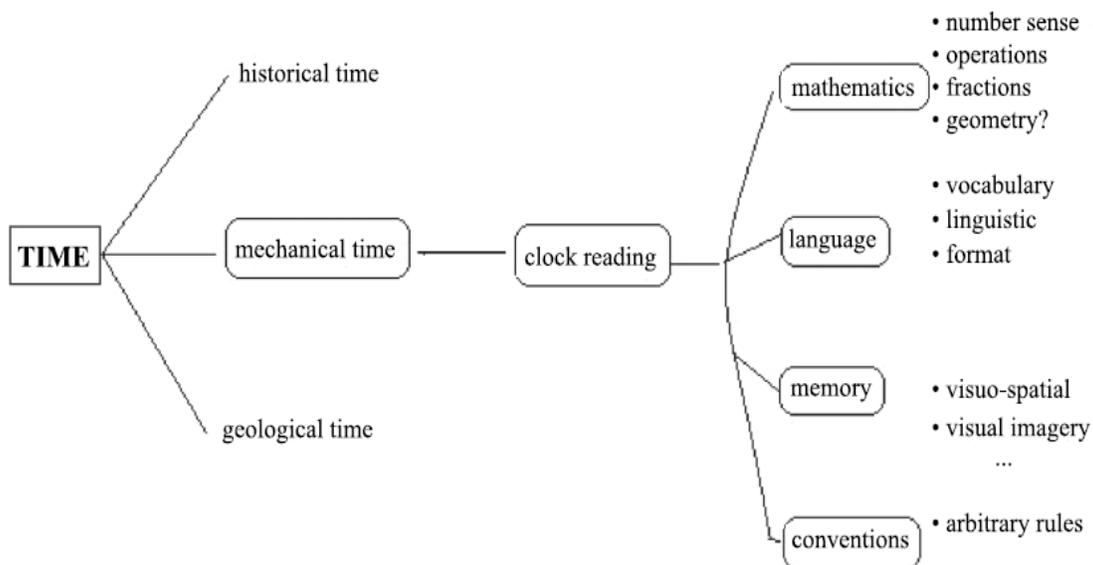
- Learners more often read ‘past the hour side’ like 11:20 successfully than ‘to the hour side’ like 11:40 or 20 to 12 because learners are influenced by the ‘right sector advantage’ of the clock face (Friedman & Laycock, 1989)
- Familiar with the landmarks of 3, 6, 9, and 12 as representative of the quarter hours
- This generate confidence in reading whole and half-hour analogue clock time because the child with experience use their mental image of the movement of the two hands on the clock

6 MULTIFACETED PERSPECTIVE OF CLOCK TIME



Above: Time- related competence within framework of friedman (1978) cited in Burny (2012, p.9)

7 READING MECHANICAL TIME



Above: Conceptual framework of Burny et al. (2009, p. 488)

8 CONCLUSION

- The clock as a social artifact contributes to the internalisation of mediation beyond a practical level to the cognitive level (Bartolini-Bussi & Mariotti, 2008)
- The clock both support calculating the passing of time and mediate sense making of the concept of time
- The clock is an important tool in mediating learning analogue clock time(as oppose to iconic representation)
- Tools matter: they stand between the user and the phenomenon to be modelled, and shape activity structures” (Hoyles & Noss, 2003)

9. DESCRIPTION OF STRATEGIES FOR CLOCK READING

	Strategies	Explanation
Immature strategies	<p>AnRef - ANALOG REFERENCE (Friedman & Laycock, 1989)</p> <p>DiRef - DIGITAL REFERENCE</p> <p>NoExp - No explanation (Boulton-Lewis et al., 1997; Friedman & Laycock, 1989)</p>	<p>The child referred to an analogue clock when explaining the reading of digital times</p> <p>The child referred to a digital clock time when explaining the reading of analogue times</p> <p>The child could not answer, or gave an incorrect answer and could not explain how this answer was reached</p>
Conceptual strategies	<p>IdHands - IDENTIFIED HANDS (Analogue) (Boulton-Lewis et al., 1997; Case, Sandieson & Dennis, 1986)</p> <p>LaQu - LANDMARKS (Friedman & Laycock, 1989; Siegler & McGilly, 1989), Quarters (Boulton-Lewis et al., 1997)</p> <p>PassHr - Passed Hour Rule (Boulton-Lewis et al., 1997 ; Friedman & Laycock, 1989)</p> <p>PassHr - Afrikaans & English half hour rule</p>	<p>The child recognised the short hand as the hours and the long hand as the minutes</p> <p>The child recognises 3 as 15 minutes or quarter past, 6 as 30 minutes or half, 9 as 45 minutes or quarter to and 12 as 60 minutes or o'clock</p> <p>The child refers to the upcoming hour when more than 30 minutes have passed</p> <p>The child refers to half hour time as a hour in advance in relative time in Afrikaans (e.g. 1h30 as half twee) The child refers to half hour time in English in absolute time (e.g. 1h30 as half past 1)</p>
Procedural strategies	<p>Inc5/1s - INCREMENTING IN 5's AND/OR 1's (Boulton-Lewis et al., 1997; Case, Sandieson & Dennis, 1986; Friedman & Laycock, 1989)</p> <p>Cal60 - CALCULATION ON 60 (Boulton-Lewis et al., 1997 ; Friedman & Laycock, 1989)</p> <p>Multi5 - Multiplication by 5 (Kamii & Russel, 2012)</p>	<p>The child counts around the clock face in increments of five, five and one, or one</p> <p>The child showed recognition of the fact that there are 60 minutes in an hour</p> <p>The child refers to the multiplication table of 5</p>
Retrieval strategies	<p>Knew - KNEW IT (Boulton-Lewis et al., 1997 ; Case, Sandieson & Dennis, 1986; Friedman & Laycock, 1989)</p> <p>NumVal - HIERACHIAL NUMBER VALUE (Kamii & Long, 2001)</p>	<p>The child stated the answer with no further explanation</p> <p>The child recognises the superimposed number values on the clock (e.g. long hand on 4 equals 20 min)</p>