Technological thinking among illiterate Ethiopian immigrants in Israel

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Introduction

Ethiopia typifies developing nations that are characterized by an agrarian society: inhabitants utilize the forces of nature, such as the wind, water, land and physical labor, and gain life experience through trial and error (Ben Ezer, 1992; Bodowsky, 2001) .Ethiopian immigrants in Israel come from a country characterized by an agrarian society, a primarily oral culture where some 80% of the population does not read or write. This community is part of the one billion people aged 15-65 throughout the world who are illiterate (Chen, 1999; Goody, 2000). In spite of this vast number, most studies on the subject of thinking are carried out among people living in a written culture, rather than being focused on thinking among people living in an oral culture (Ong, 1982).

Different researchers who have studied culture and psychology, such as Cole & Scribner (1978), Goody (1995) and Ong (1982) differentiate between the characteristics of thinking among oral cultures and written cultures. in written society thinking is abstract, logical, linear, intellectual, objective and factual. In contrast, thinking associated with an oral agrarian society is concrete, magical, subjective, associative and based on imagination and emotion (Cole & Scribner, 1978; Goody, 1995; Ong, 1982; Stahl, 1997 - Hebrew).

According to this distinction, we may presume that the Ethiopian Jewish community is in the early stages of the evolution of thinking.

The purpose of this study is to ascertain whether the illiterate Ethiopian Jewish community is, in fact, in the early stages of thinking; and to map out the aspects of technological thinking.

Background

The Ethiopian Jewish community

The Ethiopian Jewish community immigrated to Israel from the largest nation in an area known as "The African Horn.". These people began with a traditional, agrarian, authoritarian and patriarchal society, behaving in accordance with a system of established norms and values. The vast majority of the community lived in rural villages far from the big cities, in homes constructed of mud and straw (Ben Ezer, 1992; Bodowsky, 1994; Ehrlich, 1997; Pankhurst, 1997; Rachamim, 1999).

Studies conducted during the last two decades, such as those by BenEzer (2002), Bodowsky (2001), Pankhurst (1997), Shabbetai (2005), and documentation trips made in 2001 and 2004 on the rural way of life in Ethiopia, indicate that the lifestyle hasn't changed and is similar to that found in pre-industrial times. The population engages in simple agriculture, blacksmith and carpentry work, fishing and forestry, and metalworking. They utilize the forces of nature, such as the wind, water, land and physical labor, and gain life experience through trial and error. From this simple lifestyle, Ethiopian Jews had to make a swift transition to modern Israel society, a transition that took place without any intermediate stages or processes that would have allowed them to gradually adapt and adjust to the new society.

The more time the immigrant spends in the new culture, the more likely he is to enter the job market (Benita & Noam, 1997). Thus, we can assume, he would also be able to integrate into various aspects of society as a whole.

Technological thinking

Technological thinking is – The ability to solve technological problems using cognitive skills such as system thinking, problem solving, planning and preparation, decision-making, application and evaluation (Chen & Stroup, 1993; Simon, 1985).This is a person's ability to overcome his physical limitations aimed at addressing human needs (Chen, 1996, 1998; Mioduser, 1998) using the following cognitive skills: future-oriented thinking, system thinking, problem-solving, planning and preparation, decision-making, application and evaluation (Chen & Stroup, 1993; Simon, 1985;). According to Mioduser (1998), technological thinking includes two key components: the first refers to a repertoire of technological primitives that entail four categories: rudiments, mental models, method and meta-knowledge.

The second component of technological thinking refers to learning space and technological problem-solving. According to the model, the learning space in technological thinking involves five levels, where each level includes features from previous levels: knowledgeable user, problem-solver, technology practitioner, craftman and expert.

Research Questions

1. What are the technological thinking skills prevalent among illiterate Ethiopian immigrants?
2. Is there a relationship between the degree of exposure to technological culture and thinking skills among Ethiopian immigrants in Israel?

Methodology

Research population

There were 50 Illiterate Ethiopian adults in the research population, who had been in Israel between 10-20 years. There were 20 men and 30 women between the ages of 40-60 years old. The population

was selected using nonprobability snowball sampling in geographic locales with high concentrations of Ethiopian immigrants.

Research Tools

1. interviews.
2. Raven's Progressive Matrices.
3. Tasks involving assembly of two simple technological mechanisms.

Findings

Statistical analysis to examine the relationship between the amount of time spent in Israel and the Raven's Matrices scores, shows a very high and statistically significant correlation between the amount of time spent in Israel and test scores, where $r = 0.86$, $p<0.001$. The longer a subject had been in Israel, the higher his score.

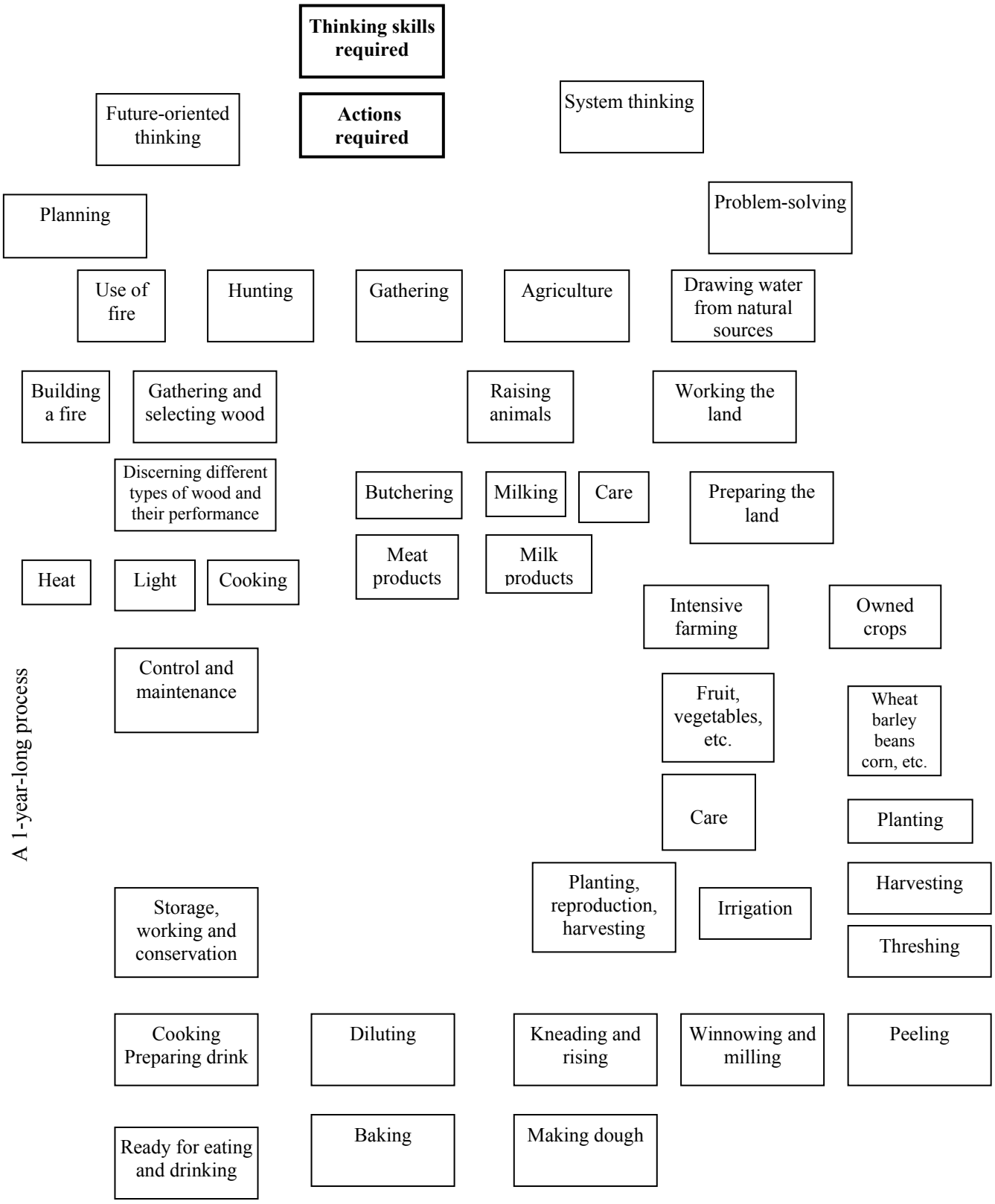
To test these technological thinking skills, subjects were given two simple technological tasks – a flashlight and a mechanism with screws. They were asked to assemble the mechanisms and diagnose hypothetical problems, and to solve problems in the flashlight.

About half of the subjects (60% for the flashlight and 50% for the screw) looked at the pieces, sorted them according to function and put the mechanisms together on the first try without any difficulty identifying and assembling the pieces. In contrast with this, about one-third of the participants (35% for the flashlight and 30% for the screw) looked at the pieces and sorted them successfully, but managed to put them together only after a few attempts. This group demonstrated sorting and planning ability, but their perception of the mechanism and the reciprocal relationships it contains and the relationship between the whole and its parts were not understood; about 20% of the subjects failed to assemble the screw mechanism and about 5% failed to put together the flashlight.

All of the participants demonstrated an ability to plan, systematically examine the device and return it to its functioning state in the case of the broken flashlight. All the subjects raised hypotheses regarding factors that would cause the device to malfunction. Around 40% of them suggested to identify the source of the malfunction and repair it. Nearly half (44%) of the participants discussed whether repair of the device was worthwhile – cost/benefit analysis. Approximately 16% of them preferred to turn to an expert in order to return the device to its proper condition.

Chart (figure 1) describes the thinking processes and actions needed in order to acquire food in Ethiopia.

Figure 1: Thinking skills and actions for acquiring food in Ethiopia



The graph indicates the (figure 1) complexity of the process, which requires thinking skills and the undertaking of complex actions until the final product is attained. This process takes about one year (preparing the land, planting, harvesting) and requires planning with system thinking and future-oriented thinking takes into account long-term processes. In Israel, on the other hand, because the acquisition of food is based on comprehensive systems that produce the food products and energy and offer them for sale in a manner that is accessible to anyone, the required knowledge and thinking skills involve tactical judgment combined with short-term planning and thinking. Therefore, the main skills required by the subjects in Israel are the ability to adjust and to adapt to the Israeli reality.

Discussion

Technological thinking skills

Indications of technological skills were found among subjects who were asked to assemble two technological mechanism of low complexity – a flashlight and a screw mechanism. The subjects demonstrated system thinking in that they were able to distinguish between the components of the mechanisms presented to them, their function and the reciprocal relationship between the parts, and they were able to synthesize the parts in order to form a whole (Chen & Stroup, 1993; Simon, 1985).

The indication with regard to problem-solving ability was found among the subjects when they were asked to restore a malfunctioning device to its normal status. The subjects displayed a basic perception of the device's structure and function, were able to identify and envision the malfunction and plan out steps to repair it, to adapt existing solutions to new contexts, and to create and improvise solutions that corresponded to appropriate stimuli, as described by Mioduser (1998), Dagan (2004) and Rice (1994). Indications of the ability to solve hypothetical problems were found among subjects who were asked about possible malfunctions in the flashlight, and their solutions. Participants understood that there was no single, absolute solution but rather that each problem could have multiple solutions (Chen, 1996; Mioduser, 1998), and they offered several suggestions for repairing the device. The subjects went from an operative definition of the concept of problem solving to the practical-theoretical level of the flashlight (Hill, 1970; Rice, 1994).

Technological thinking skills used in Ethiopia

The conventional wisdom is that illiterate populations living in an agrarian society have a lower cognitive level (Stahl, 1977; Goody, 1995; Ong, 1982). But the unexpected findings reveal that the thinking skills required for the daily life in an Ethiopian village are higher than those required for modern daily life. It is the very simplicity, and the lack of sophistication and convenience in village life that necessitates many and varied thinking skills, which have led to the development among the villagers of thinking patterns that characterize technological thinking, enabling them to provide for their needs. These thinking skills are reflected in the context of their culture in Ethiopia. These findings correspond to studies conducted by Bruner (1977), Cole & Scribner (1978) and Guilford (1967), who found that thinking and classification skills among oral cultures have a different basis than among technological cultures.

Finally, it is important to stress that the findings and their discussion helps us see the cognitive abilities and the potential of illiterate Ethiopians in the community. In order to obtain unequivocal conclusions regarding their cognitive ability in intellectual, developmental and technological spheres, we must use several tests and comprehensive tasks in order to test the thinking component.

Summary and Conclusions

This study has specific conclusions regarding the research population, and universal conclusions concerning illiterate populations as a whole:

- Illiteracy does not preclude the development of thinking skills, even under rural living conditions in an agrarian society, as in Ethiopia.
- Illiteracy is not necessarily ignorance. It would appear that reading and writing are not the only conditions for the development of abstract and higher thinking.
- Universal thinking skills, such as system thinking, planning and others, can also develop in an oral culture, but they are applied according to local requirements and under the conditions suited to the local culture.
- Exposure to a technological society had an impact on the continued development of intellectual thinking among the subjects.

The state absorbing immigration should recognize the thinking skills that typify the illiterate population and design intervention programs in various areas of life that are appropriate for these abilities. This would significantly improve the absorption, adjustment and vocational placement processes, and help promote the immigrants' social integration.

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