Criticality and Culture: The Case of Technology Transfer[1]

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Abstract: This paper discusses four concepts: (1) criticality, (2) cultural change, (3) technology transfer, and (4) curriculum. The paper begins with exploration of the nature of the four concepts and ends with discussing their dynamic interaction and their subsequent effect. It is argued that development models which discard traditionalism (culture) as the content and the intent of these models are doomed to failure. In the past, all models which tried to discard the indigenous culture through the introduction of a foreign culture (transfer of technology) have not been successful. Only those models that integrate culture into the change process are successful in bringing about development. It is argued in this paper that creative synthesis of the indigenous culture and the foreign culture takes the form of soil and fertilizer. The indigenous culture should be taken as the soil and the foreign culture as the fertilizer for the synthesis to be symbiotic. Transfer of technology should not, therefore, be taken as replacing the indigenous culture (the soil) but only fertilizing it as a foreign culture (fertilizer). Using reasoning and arguments supported by evidence, this paper, therefore, contends that criticality is the foundation of technology transfer and cultural change.

[1] Presented and developed in a wide variety of conferences, the latest of which was a *keynote speech* in the 8th International Conference of the College of Education and Behavioral Studies held in May 2019 at Adama.

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Criticality

Criticality is a natural endowment. It was created by God or nature to serve human beings as a means of their survival. Cultures could, however, dwarf it or nurture it depending on what kind they are. Criticality could be defined as competent *judgments* about what to believe and what to do. It is the ability to see *differences* (differentiation of knowledge) in what appear to be the same; and see *communalities* in what appear to be different (integration of knowledge). Criticality attempts to establish a truth through rigorous reasoning and evidence (research). In the traditional academic culture, producing *critical thinkers* was the most dominant discourse and the mission of universities. In postmodern society, the mission of universities has shifted to producing *critical persons* rather than mere critical thinkers (Barnett, 1997). What constitutes critical persons is shown in Figure 1.

A critical person combines all three attributes of criticality: critical thinking, critical action and critical being. In socialist discourse, it is known as “all round development of personality”; in the Ethiopian literature it is referred to as development of knowledge, skills and attitude (*competence*). The latter, however, lacks unpacking of the contents of each components of competence. Competence could be useless without *energy*, the fuel to act in the right way, what Barnett (1987) calls critical energy. Thus competence shall have four components—energy, knowledge, skills and attitude.

In the Ethiopian curriculum, critical thinking was emphasized to the detriment of critical action and critical being. Parents, teachers and other stakeholders refer to it as unbalanced curriculum when asked to comment on the contents of general education curriculum (Cambridge International, 2019). The outcome of critical thinking is knowledge-ability, to accumulate as much knowledge as possible. The argument here is that critical thinking alone is not sufficient for producing the means of human survival unless one lives as a parasite or has slaves to produce for him or her—as in ancient Greece.

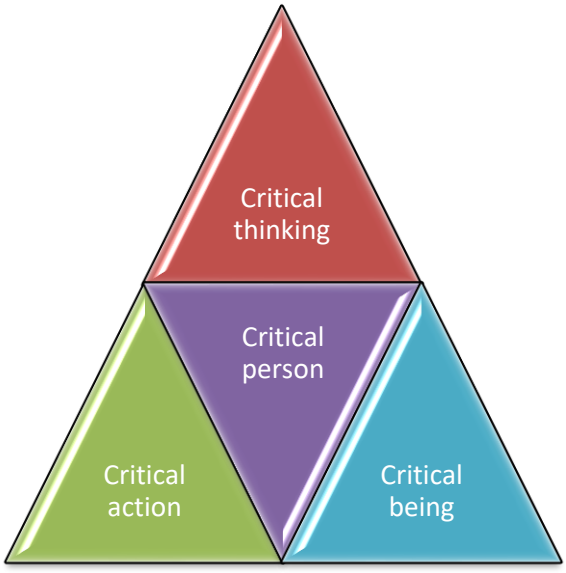

Figure 1: The components of criticality

Source: Author's design

You need critical action, the competence with energy to produce the means of life; the ability to take action in accordance with your critical thinking. Here I am not arguing for mere action without critical thinking. Mere action does not lead to improvement or change. Reflective or critical thinking must underpin critical action, a kind of praxis. The age old repetitive agricultural practices and traditional handcrafts that survived three thousand years (developed during the Axumite era) in Ethiopia were the results of human actions, but not praxis—evaluating one's action and improving it. They lacked critical thinking and critical action. They are mere actions but repetitions of what already existed. Creativity and innovativeness are so scarce in the Ethiopia education today (Ethiopian Education Roadmap, 2019) probably because of our

background of the culture of repetitiveness and the predominance of the culture of compliance/rejection over criticality (yes or not thinking). It appears that this state of affairs explains why we are left behind. For instance, if you sit with a small group for coffee, every member discusses only the dominant belief. Any deviation from the dominant belief often results in a barrage of criticisms (sometimes curses) from most members of the group. And usually when a member of the group speaks, s/he stares at the group leader not at the whole audience.

Critical being is the third attribute of criticality. Critical being is the most deficient attribute in our educational system as well as our culture. It is self-criticality whose outcomes are self-management and self-humility. It is a question of how we see ourselves in relation to others. Do we see other human beings as part of us; or do we see them as the “others”. According to the Jewish philosopher, Martin Buber (1970), “othering” is a view of seeing other human beings as one’s instruments. Buber called “othering” a kind of “I-it” relationship between humans; and that human relationships should be governed by “I-thou” relationships instead of “I-it”.

To what extent do we teach self-management and self-humility in our curriculum? The Western philosophy of science advocates logical reasoning and dispassionate reasoning as desirable intellectual activities. But is it morally right to separate reasoning from morality and judgment? In fact, in pre-capitalist society, education was integrated - inseparable from work and leisure. In my opinion, what we need is not impassionate reasoning but ‘passionate reasoning’ and ‘reasonable passions’ in the place of the disintegrating statement, “I know therefore I am” (impassionate reasoning). Our educational systems must integrate the three educational philosophies; “I know therefore I am”; (critical thinking); “I do therefore I am” (critical action); and “I feel therefore I am”; (critical being) in order to nurture critical persons instead of merely critical thinkers.

Change and innovations are unthinkable without the presence of a critical mass of critical persons. Critical thinkers are good narrators but poor producers. Critical persons provide leadership and act as role models for the people to follow and learn from them. Without engaging the learners in praxis (reflective practice), schools and universities cannot produce critical persons who can change the status of the economy and technology. The outcome of critical persons is adapting (not adopting) or producing technology not reproducing technology. You cannot be a producer of technology when education is predominantly delivered in a classroom-setting in the form of lectures and speeches to remember content and recite. Preparing producers (not reproducers) demands that education must encourage students to engage in *trail-and-error*. The present educational system is after "*the-right-answer*", the narration of the teacher. Making errors is discouraged, sometimes punishable, generating fear among participants. Students fear making mistakes in front of their colleagues and teachers. They, therefore, prefer silence and passivity in the classrooms. At present, one of the reasons for poor implementation of active methods of learning is the student-culture of silence and passivity. Hard work and commitment cannot develop outside of the practice of trial and error. Trial and error is a tireless engagement to discover. It involves emotions, deep thinking and action.

We know from the history of science how many times scientists have failed before success. In the Ethiopian context, the case of *Saint Yared and the Insect* is a good example of how many times one fails before success is achieved. Here, it is not simply repeating errors but learning from one's own errors that results in change and development. One needs to observe carefully how the error was made so as not to repeat it. Educational systems that deny the opportunity for students to make trial and error are indeed denying their natural means of learning and changing their environment.

Science is a passionate engagement in trial and error in order to solve problems, what Karl Popper, the modern philosopher of Science called,

"*All Life is Problem Solving*" (1999). Popper in his book developed a three stage model of the logic or methodology of science which roughly matches the trial and error approach; (1) the problem; (2) attempted solutions; and (3) elimination of the attempted solutions (p.9).

Box 1: The Story of Saint Yared's Education

In Ethiopia, there is a story about the education of Saint Yared. He repeatedly failed his exams. He then hopelessly decided to return home abandoning his education for ever assuming that he is not the kind of material fit for that kind of education. However, on his way home, while sitting under a tree to get some rest, he observed an insect trying to climb the tree but falling one hundred times. The insect successfully climbed the tree on the 101st trial. Saint Yared then said, 'Aha!' and made a paradigm shift in that he realized that success is the result of failure; he learned this from the insect and decided to go back to education to ultimately become the greatest leader of the Ethiopian Orthodox Church.

One needs to ask here why the Ethiopian traditional society was left behind in spite of the natural endowment, trial and error. The short answer is because we repeat errors; or in the case of teaching and learning, making errors is sanctioned by the teacher and student community. Uncritical thinking leads to repeating errors. Learning from one's errors demands a critical stance.

At present, research in the Ethiopian context has become something someone with PhD/MSc. can leisurely do to get money or recognition. The focus of this type of research is to describe the present, trying to answer "what or why" questions. A future oriented research demands to answer the "how" questions which approximates the Popperian or the trial-and-error model. Lack of criticality in research favors descriptive

research (what and why questions) and is biased against normative research (how questions).

Science as culture is still remote to the great majority of the Ethiopian society (Amare, 2014; Amare and Ridley 2015, p.92). The Ethiopian society predominantly depends on *traditional knowledge* (uncritical personal experience, faith, superstitions, and stereotypes) to solve its daily problems. I am even skeptical about the extent to which the educated elite use science in daily lives. Science could be practiced in university campuses but is kept at bay when mixing with the community, a case of part time exercise of science. Here, we must make a distinction between teaching-science to be a scientist and teaching simple science for life. I do not think we favor the latter. I think I pretend to teach science for producing scientists. Because of lack of courage to challenge traditions, we get lost in the forest of traditional knowledge and prefer to *comply with* than to *change the traditional society*. The arrow of influence then gets reversed in the Ethiopian case, tradition changing science, instead of science changing tradition.

Research and Scientific Culture

Given the fact that science or research competence is embedded in criticality, the status of Ethiopia in science and technology is much to be desired. We know that a scientific culture wholly demands a critical perspective in one's life styles. Criticality demands the competence to "see angels in devils and devils in angels" which is hard to swallow by the Ethiopian scientist let alone by the ordinary. Criticality is freedom from either-or- thinking or black and white style of thinking. Outright rejection or outright acceptance of an opinion is uncritical thinking. Criticality is not a technique or scientific procedure that we ought to follow; it is rather a perspective or a mindset (cognitive structure) of how we observe, think and do.

The absence of research-impact in the Ethiopian context could be due to the nature of the research processes and outputs. Most research in

Ethiopia takes the form of surveys and descriptive studies which are not mainly future oriented. They try to explore the present or the past to the detriment of *normative research*[2] which mainly aims at the future. Development (adaptation) of science and technology demands that research be oriented normatively, trying to answer "how" questions. Trial and error (experimental research) and RCT (Randomized Control Trials) become the most important tools to be taught in universities and schools. In addition to researcher biases, the Ethiopian Fiscal Policy[3] does not favor the use of experimental research and RCT. It rather favors surveys and descriptive studies.

We know from the literature that putting in place the right institutions and the right systems is the main cause of national development (Acemoglu and Robinson, 2008). One of these institutions is to have a Department of Research and Development (R & D) in every public and private sector. The mission of the Department of R & D is annually (biannually or quarterly) engaging in research on how to improve the institution's systems and products. The Department always comes with an improved version of a product or a system. Fashions, automobiles, cellophanes and electronic devices are good examples of the fruits of R & D. Without a strong R & D, institutions either stagnate or retrograde. It is not clear why Ethiopia does not have a robust system of R & D in its institutional structures despite the fact that the role of R & D in development is quite obvious.

The Concept of Technology Transfer

The first question about technology transfer is the question of the *source* of the technology to be transferred; and the *receiver* to which the

[2] Normative research is studying the future in contrast with descriptive research which studies the present. Most PhD studies in educational research focus on the latter. Forward looking cultures focus their research interest in normative research while backward looking cultures focus on historical and descriptive research.

[3] Here fiscal policy means budget term is one year and not convenient for research that extends beyond one year. Block grant might solve this problem.

technology is transferred. The second question is the meaning of technology itself. Is it product and/or system transfer; or is it skill transfer?

The first question can be answered either by intercultural transfer or intra-cultural transfer. My argument will focus on intercultural transfer such as transfer of technology from developed countries (sources of technology) to developing countries (recipients of technology). It cannot in anyway be the other way round. In the case of intra-cultural technology transfer, Ethiopian universities and some research institutes have recently established structures of technology transfer attached to their research programmes. Their impact is however yet to be seen in the future.

In the fields of communication and education, the word transfer has become obsolete. The word transfer is discarded from the literature because it assumes a passive adopter of the source's intent and content. The concept of a passive adopter does not exist because the audience is active and interactive; it can distort, modify or reject what is advocated by the source (the innovation or technology).

Starting from the 1960s, development researchers had toiled to modernize developing countries using technology transfer models of communication (Lerner, 1963; Weiner 1966). Foremost among the modernizers who used the dominant paradigm of development was Everett Rogers (1962, 1969, 1976, and 1986) who carried out a massive amount of research on modernization of farmers and diffusion of innovations. He developed adoption of innovation models and attributed failures to peasant conservative characteristics until his later confessions of his theoretical blinders (Melkote, 1991). Rogers had classified the adoption behavior of peasants using the normal curve which characterizes non-adopters as laggards and diehards. The few early adopters (less than 13%) called innovators by Rogers discontinued their new practices of adoption after a short practice. Overall, the

diffusion model was doomed to failure because it assumed passive adopters of innovations.

The research in development clearly shows us that ideas and technology do not simply transfer from one culture to another culture. The many attempts to transfer innovations from the North to South were doomed to failure. Only consumption items (life styles, smoking, drugs and alcohol) were pervasive in transfer. The deeper values and basic skills (hard work ethic, achievement orientation, independent thinking) simply do not transfer easily from culture to culture. Foreign cultures could be useful to domestic cultures only in the context of fertilizing the domestic culture.

Soil Fertilization—Synthesis of Cultures

To argue for the importance of cultural synthesis in the context of soil fertilization, I will use an extract of my old publication, *Culture and Development* (Amare, 1998 pp. 1-3). In this publication, I have argued that foreign cultures could be useful to domestic cultures only in the context of using the foreign culture in fertilizing the domestic one. This kind of fertilization would, however, require *compatibility*. If the gap between the domestic and foreign culture is wide, the domestic culture fails to absorb the complex strands of the borrowed culture. For instance, it has been argued that the Japanese culture of technical development was mainly attributed to four factors (Amare, 1997):

1. Japan was very selective of the strands of the imported culture.
2. Japan had the technical base to absorb the western culture into its own culture—compatibility.
3. It was the right time for borrowing. The technical distance between the two cultures was not inhibitive of synthesis.
4. The location of Japan was not convenient for being overwhelmed by a westernization process.

If a highly developed culture (in technical sense) encounters a less developed one, only the trivial strands are transmitted (Silvert, 1964). The complex components remain intact. This is exactly what happened in the Ethiopian situation. Through curriculum importation, student exchanges, scholarships, importation of science and technology, international communications, etc., the two cultures have been in contact for more than 100 years. Yet, the Ethiopian culture remained Ethiopian and the Western is Western.

Itagaki (Silvert, 1964), a Japanese scholar, pointed out that cultural values cannot truly be carried from one society into another in their basic forms. He used Toynbee's elucidation of the manner in which different elements in a cultural pattern have an inner connection with one another and form an indivisible or an organic whole. When the process of contact between civilizations starts, there also begins to work a law governing process of cultural radiation and reception. Itagaki explained that this notion means that, when a culture-ray of a radioactive civilization gets diffracted into its component strands (economic, political, linguistics, intellectual, technological, scientific, artistic, religious, etc.) by a resistance of a foreign social body, those strands that are the most *trivial in cultural value* receive the least resistance from the society impinged upon, and tend to penetrate faster and farther than others.

Itagaki's arguments clearly demonstrate to us that the western culture did not enable us to develop our own science and technology. The most important strands such as, technical skills, hard-work ethic, professional commitment, etc. have failed to transfer. The trivial components, such as living styles, consumption patterns, entertainment, wants, etc. have penetrated all through our culture. The latter, however, are not only less useful but even tend to hamper development as they imply unviable aspirations--demands beyond what they country can afford. The writer has witnessed that Michael Jackson's Break-Dance of 1983 took only a night to penetrate all through the Egyptian elite culture.

Itagaki identified three forms of cultural transmission; (1) *transplantation*–the simple movement of civilizations from one area to another, as the case of the English migration into Australia; (2) *implantation*—comparable to the grafting of apple tree onto a peer tree. In this case, the grafted tree (alien civilization) never changes the character of its substance in the least. At any rate, the apple tree is an apple tree and the peer tree is a peer tree. Itagaki called this the most miserable and unproductive type of transmission of civilizations. (3) *Soil improvement* is the third from of transmission. It is the most productive one in that an alien technology has a favorable effect on the indigenous technology. The native technology takes nutrition and improves the native soil.

The model of modernization implied development in the form of *implantatio*n, where a given imported technology would remain an enclave with little impact on development of local skills or technology and with little interaction with the surrounding people. At its best, it might reside by exploiting its new environment. To understand the effect of implanted technologies, one needs to observe the effect of the old Djibouti railway, an imported technology from France, with the longest life span but with the least effect on its surrounding.

A model of development in the form of *cultural synthesis* would assume that replacement of cultures is difficult if not impossible. The only possibility could be by eradicating the culture–holders (people) as the case in Australia but which has again been recorded in history as the most barbaric and brutal human actions. The strategy of cultural synthesis also assumes that absorption of the useful strands of a developed cultural content by the borrower requires *compatibility*, that is, the gap between the two cultures should be narrow. There must be basic similarity in the standards of the two cultures. For instance, the Science and Technology in the 18th and 19th century Europe could have been more useful to Ethiopia if enough efforts had been made for synthesis then than now (Amare, 1997).

One presently observed cultural synthesis in Ethiopia is the transfer of construction, mechanical and hard-work skills from the Italian culture in the 1940s by the mediation of the Italian lower class (army). I think the multitude of small garages in our country, with their effective skills of automotive maintenance, typified by the Somali-Tera is a good example of effective cultural transfer. And the most unfortunate thing is that our curriculum did not contain any of these. Such skills were being transferred outside of the Ethiopian educational system.

In my analysis here, I am not trying to reflect pessimism. My argument is that development strategies should incorporate the important variable, culture, to attain development objectives. In the West, the content of the educational system was their culture—the totality of skills, knowledge, values, etc. All these are transferred from generation to generation through formal, non-formal and informal education. The new Ethiopian generation is overburdened with the requirement of learning two cultures (imported and domestic ones) through the different communication media. The result of attempting to learn all is learning none.

One of my recommendations is an integration of culture with education. Our culture must be the major content of curriculum, with a possibility of a synthesis with the imported one. I do not know whether or not this has ever been a political or an academic issue in Ethiopia. What everybody knows is that we have separate ministries for both (Ministry of Education and Ministry of Culture), possibly with no special interaction although conceptually one is the content and the other is the means of the same system. I do not also think that the main problem lies in the structuring of the administrative system (having separate ministries for culture and education). The content of the educational system remained the same even during the time of the Monarch when we had the Ministry of Education and Fine Arts. The main problem lies in the attitude of the educated elite.

The Education and Training Policy (1994) aims at making curriculum relevant by considering cultural factors. Implementation was not,

however, easy as the inherited curriculum was developed on the model of modernization. It requires a completely radical approach to operationalize the intent of cultural synthesis in curriculum development and implementation. In addition to the educational system, the communication industry has the added responsibility of communicating the cultural heritage to every generation.

The concept of technology transfer from the developed to developing countries arises from the old paradigm of positivistic philosophy such as viewing human conceptions and actions obeying natural laws and to be studied using mathematical models as in Physics assuming that the researched (human beings) are like plants, animals and stones who simply implement the desires of the researcher. The researched are active and interactive who negatively or positively influence the research process itself.

Technology Transfer within a Culture

We have seen that technology transfer between two distinct cultures is highly dependent on the extent to which these cultures are convergent or divergent. If the cultural distance is high, the possibility of cultural synthesis is low. The basic strands of each culture remain intact.

Technology transfer within a culture (intra-cultural communication) from research centers or from indigenous innovation institutions could, however, be possible provided that people could really see the short term and long term benefits that accrue from adoption of the technology. Development Support Communications (DSC) which also involves adopter-participation in the design process (not merely adoption) might help in adaptation of technologies. Social mobilization models using local agents that are not very different from the peasants/workers might also be useful for adaptation of technology. But sustainability of the technology depends more on the visibility of its benefits than on the intensity of mobilization. It is undeniable truth, however, that mobilizing

the entire cultural community yields better results than waiting for a long time to complete the diffusion cycle.

Curriculum as Instrument of Science and Technology Transfer

One wonders whether a school influences its community or simply finds itself spatially located at the center of the community doing business as usual. Naturally, the community affects the school in positive ways with respect to provision of land, security and parents sending their children to the school. But how much does the school consciously engage in influencing the community especially with respect to transfer of science and technology?

According to the paradigm of *soil fertilizer*, which imports fertilizer but not soil, the school brings the community to the school and the community brings the school to itself. Only in this kind of mutual dialog and mutual influence can we talk about technology transfer (See Figure 2). The school brings the indigenous culture (knowledge, skills, values and practices) and synthesizes it with the imported culture from the west or east where the latter acts as fertilizer and the former as soil. By bringing the indigenous culture into the scientific curriculum, the school can interrogate it through research, improve it through interaction and use it broadly for national development. Outside this interaction, the school remains an enclave, living as a parasite of the community, extracting its resources with little return to the community.

Bringing the community to the school would mean bringing the community skills and values to nurture them to flourish and send them back to the community in the form of demonstrations, displays, social mobilization and through Development Support Communication (DSC). This approach forms a good method of technology transfer. This is how the east and the west developed their curriculum. Their curriculum is not context-free. It is context-bound. Only ours is context-free or uses the foreign context.

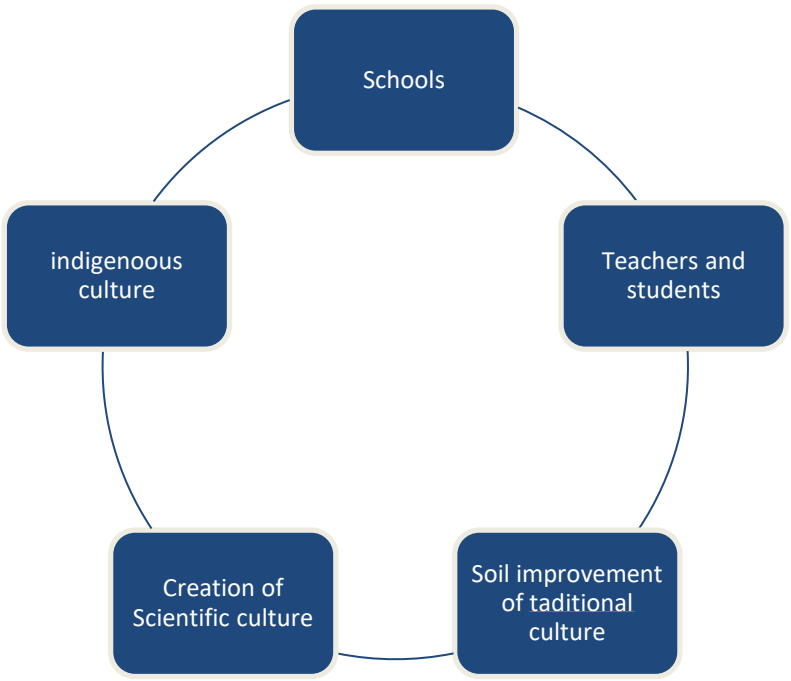

Figure 2: Process of technology transfer

Source: author's design

One good example of wrong context or irrelevance of the curriculum is that the content of the curriculum is too abstract; ideas, facts and theories are to be studied by heart for the purpose of passing examinations. Passing examinations is the hidden mission (hidden curriculum) of education in this sense. Classroom-activity-dominated education, at its best, is characterized by content transfer to make students knowledgeable or good thinkers not doers. Content study in the form of abstractions is reproductive not productive. You end up in preaching what you have mastered in theory. Predominantly, the

Ethiopian educational system can best be described by the preaching paradigm, learning for preaching as in the Bible; you master the bible only to preach it. You cannot change the content or intent of the Bible.

When rural children are brought to urban or rural schools, they undergo a process of deskilling by dropping their traditional skills and values. The traditional skills are not replaced by any other useful skills (life skills) but by reading, writing and memorization of content for recitation. In the West or East curriculum focuses on generic skills (transferable skills), occupational skills (vocational education) and job specific skills. These three are not specializations. Each student needs them to be employable and successful in life. Bringing the community into the schools means bringing agriculture into each child; bringing horticulture; bringing woodwork, mechanics and electronics into each child to practice through trial and error and with some adult guidance called vocationalization of education. This would liberate Ethiopian education from its age-old content memorization (academization of education).

Today Ethiopian students are tired of sitting, listening and studying for examinations. These are great de-motivators of learning. The root meaning of study is inquiry not reproduction of knowledge as it takes its present form. It is only through the activity of the learner, not the activity of the teacher that the student learns. The role of the teacher or the school is not delivery of knowledge; it should create the opportunities for student engagement, a process of trial and error for discovery. How could competence (knowledge, skills and attitudes) be developed without the student being engaged passionately in a discovery?

My previous research in education (Amare, 2009) has suggested to me that students' impatience to stay in the classroom while the teaching (without learning) is going on is the hidden detest of the curriculum and the teacher. When the bell rings, the classroom becomes empty in less than five minutes. The school compound becomes empty in less than 10 minutes. These are good indicators of students' attitude towards their schooling.

Conclusion

Most development theorists had ignored culture either as a dependent or independent variable in development. Those who did so, however, thought that culture was anti-development and needed to be discarded or replaced by a modern one. The consequence of such an attitude was then *dysfunctionality (*back-firing) of all development efforts. Change of culture, of course, is necessary but needs to come from within and not from without the culture. The intrusion of a foreign culture must aim at enriching the domestic one if the former is to play a constructive role.

It is, therefore, argued in this paper that a synthesis of the indigenous and foreign cultures in the context of soil fertilization must constitute the Ethiopian curriculum. Local skills should be nurtured and developed through fertilization by bringing the community into the school curriculum.

The Way Forward—the Intervention of the Ministry of Science and Technology in Curriculum Design and Delivery

If I assume that the mission of the Bureau of Science and Technology is transfer of science and technology, it must then play critical roles in the education of the country. The Ministry of culture has also a great stake in education. In this sense the three sectors have the same mission, the sacred mission of skilling Ethiopia. The fundamental cultural content of any country is education and production not the conventional activities of preserving art, music, dress or dance. These are important but not fundamental. What is fundamental is the preservation of life, production. The Ethiopian curriculum must be revised to serve the mission of producing doers, thinkers and creators not only narrators.

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