Building an Integrative Framework for Transparent Thinking Approach (TTA) Solution: Calling for Collaboration in Putting TTA Factory into Educational Production

Mohammad A. Aliedeh
Mutah University

Transparent Thinking Approach (TTA) is an inherently generic, micro-scale, value-engrained, thinking-based reform approach. TTA passed the critical phase by developing a process, tools and pilot products. TTA "factory" is framed in an integrative nested frameworks. A five integrative nested frameworks are constructed to accommodate different TTA operations. Enhanced Article and Enhanced Teaching Learning Sequence (TLS) are already established as TTA products. Enhanced EArticle and Enhanced EBook are still under development. Integrative TTA paved the road to develop a Generic Electronic Instructional Material that can be employed in all domains and fields. Integrative TTA "factory" is now in operation and planning to diffuse in other development fields.

INTRODUCTION: TTA SOLUTION INTEGRATIVE FRAMEWORK

Overwhelming Problems and TTA Solution

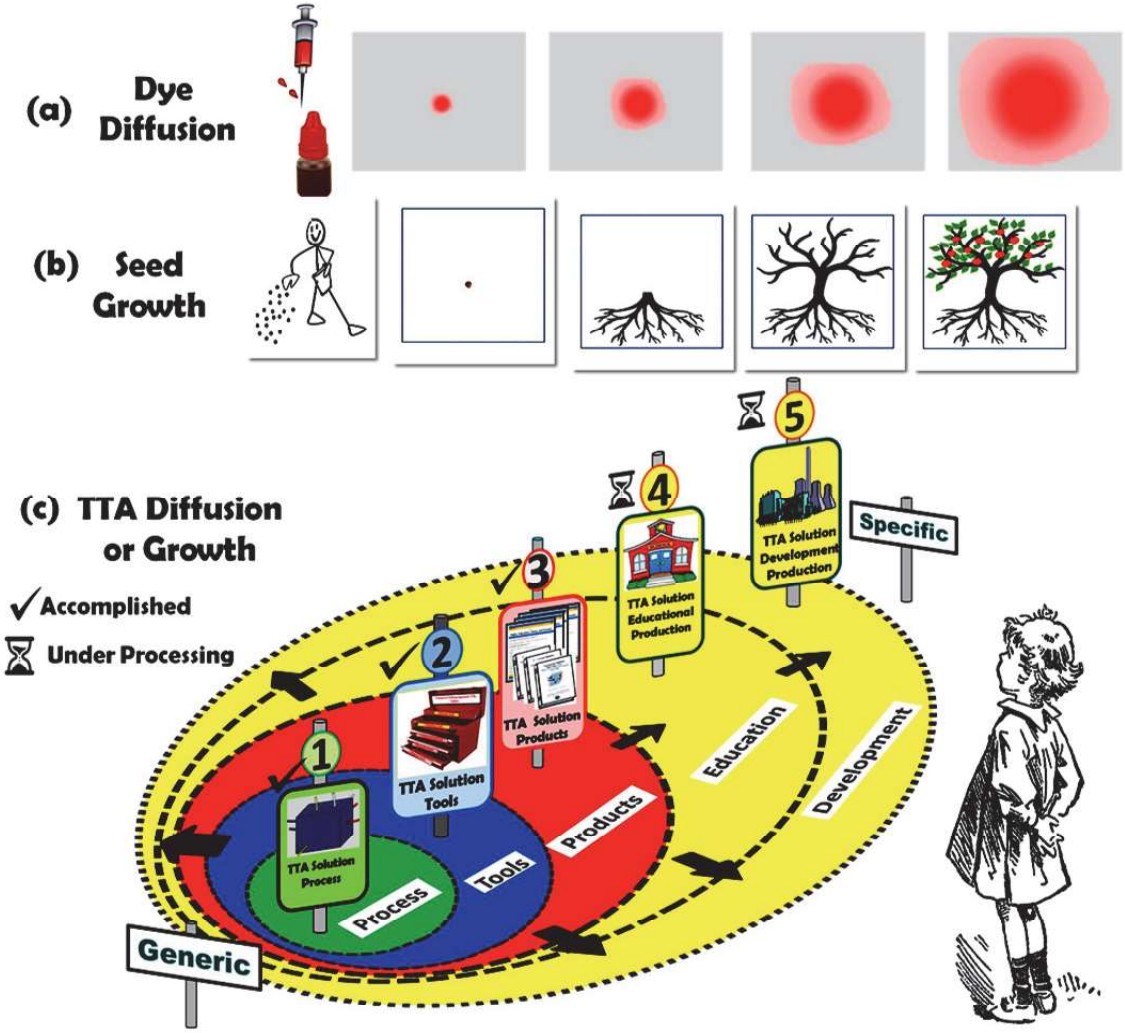
Humanity is overburdened by an overwhelming challenges, problems and failures that are plaguing development system, in general, and educational system in specific. Transparent Thinking Approach (**TTA**) is developed in response to these multi scale and multi domain problems by offering a *generic reform approach* that enable the thinker to *maneuver* between numerous perspectives, frameworks, models, fields, and domains while looking for a solution. **TTA** is a newly developed *micro-scale*, *value-engrained* and *thinking-based* educational reform approach. Its generic and unique features enables it to *easily diffuse in all domains and fields* (Aliedeh, M. A., 2015 a, b, c, 2016 and 2017).

Getting Back and Looking at TTA Solution Big Picture

TTA solution is approaching the educational production stage (4th stage) after passing the long road of getting equipped with fully developed and mature frameworks, models, processes (1st stage), tools (2nd stage) and pilot products (3rd stage), as illustrated in FIGURE 1 (c). Dye diffusion and seed growth are two important analogies that are used to illustrate the evolution of TTA constructs and the extension of its practical application in different domains and fields, see FIGURE 1 (a) and (b). The TTA Solution growth passed the critical stages of building a TTA process (frameworks and models), TTA tools and pilot TTA products. The developed TTA Solution frameworks and models are included as a part of the process zone. TTA tools is well developed through the introduction of Generic TTA Toolbox, and preliminary products was in the form of an enhanced articles or a validated and enhanced teaching learning sequence (TLS), as shown in FIGURE 1 (c). With the above established TTA solution infrastructure, TTA journey has reached the educational production stage (4th stage) that aims to

implement TTA reform approach in the educational field. It is time to put this reform approach into educational production and hopefully in the near future in development production, as clarified in Figure 1

FIGURE 1
EVOLUTION AND DIFFUSION OF TTA SOLUTION



TTA Solution Passed the Critical Point

TTA solution passed the critical point by publishing the developed frameworks, processes, tools and pilot products in five papers, as visually illustrated in Figure 2. These five papers cover most of the necessary TTA Solution constructs and tools needed for the design, construction, start-up and pilot product production of TTA Knowledge Production Process. The first paper (A1) mainly focused on developing the needed core frameworks and models. The second and the fourth one (A2 and A4) presented the customized version of TTA solution by developing a generic thinking toolbox. The third and fifth articles focused on presenting a numerous pilot and practical TTA pilot products.

FIGURE 2
VISUAL MAPPING FOR THE EVOLUTION OF TTA INSTRUCTIONAL PRODUCTS

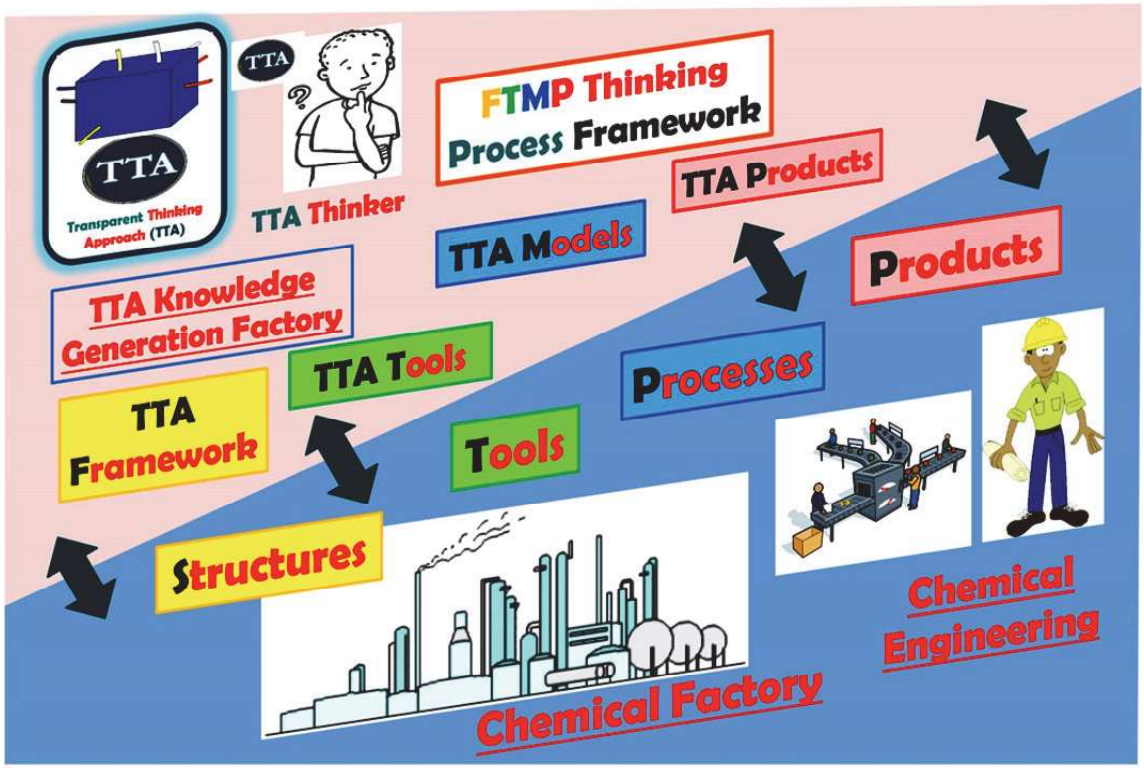
Nested and Integrative Framework of TTA Solution

The gradual evolution of the TTA solution constructs entails the author to adopt an evolutionary way of presenting TTA Solution in the previously published five papers (A1 to A5 in Figure 2. Because TTA solution has reached the Educational Production Stage (4th stage), this necessitates the shift in presentation style from evolutionary mode to functional mode. The functional mode aims to devise a nested and integrative frameworks that helps to accommodate all TTA constructs, tools and products. Therefore, the main objective of this paper is to present TTA solution constructs and tools in a functional form through creating a nested and integrative frameworks. TTA integrative frameworks will greatly help the TTA solution factory to be set for educational production.

Telling TTA solution story in an integrative and functional way necessitate revisiting a number of TTA concepts that is covered in the previously published papers (summed up to 141 pages and 104 figures). This paper is telling a concise and integrative TTA solution story that may be easier to be introduced to the educational community.

This paper is considered a continuation of publishing the outcomes of a big higher educational reform project that is called "Transparent Thinking Approach (TTA)". The real "fruits" of this integrative TTA reform approach will be "tasted" by "feeling" the TTA created harmony between depth, meaningfulness, connectedness and simplicity which is reflected in the practical application of TTA concepts, tools, perspectives and constructs in a educational settings.

FIGURE 3
KNOWLEDGE GENERATION PROCESS AND CHEMICAL FACTORY PROCESS ANALOGY



FTMP Process Framework

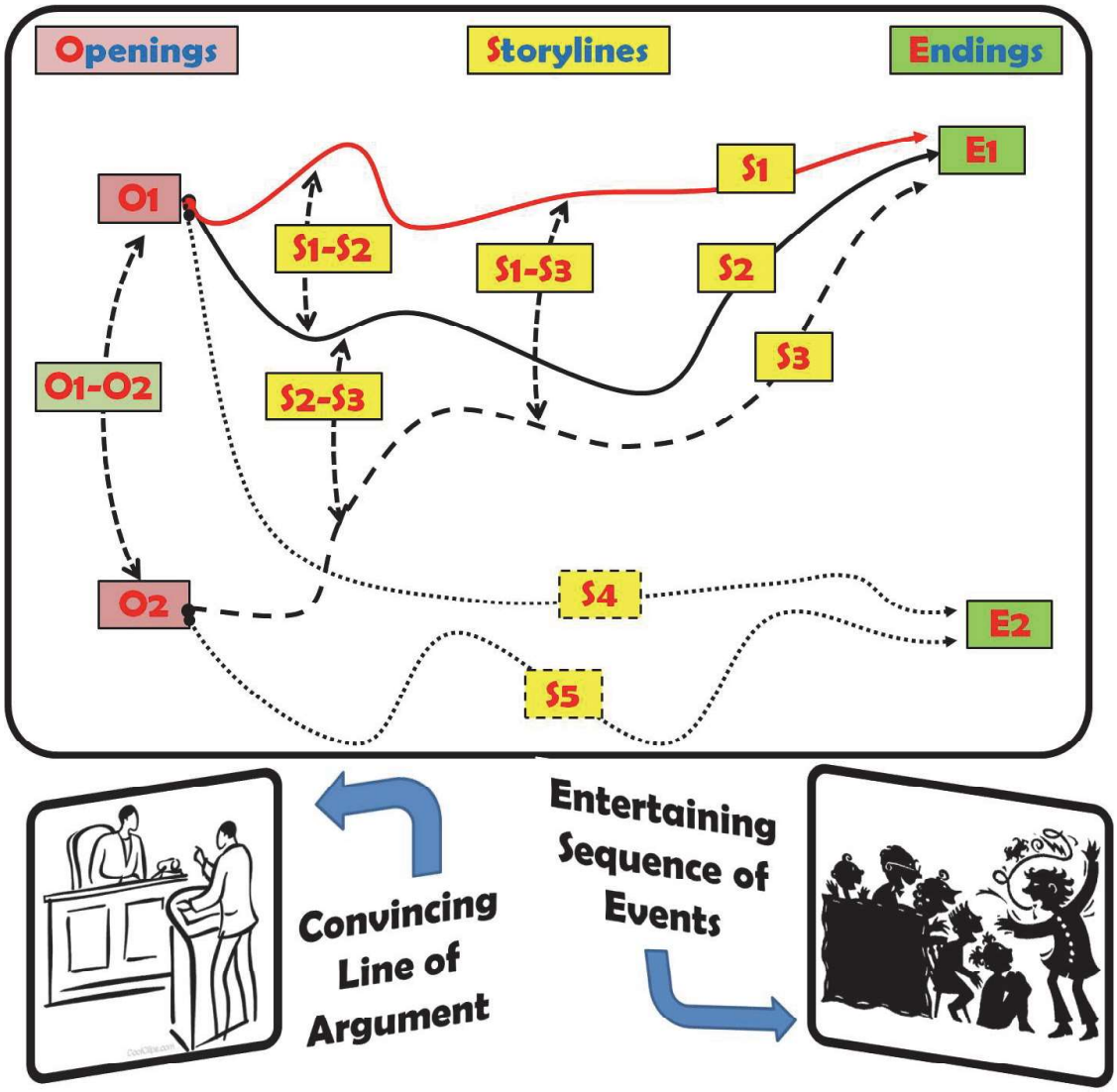
In analogy with a chemical factory, TTA solution is seen as a knowledge production factory, see Figure 3. A chemical factory has structures in which processes and tools are constructed to result in producing a certain chemical product. Similarly, TTA solution has frameworks that are built to accommodate tools and models and produce new knowledge. This process analogy greatly helped in constructing the widest framework for accommodating TTA solution constructs which is FTMP Process Framework, as illustrated in Figure 3. FTMP stands for TTA Framework, Tools, Models and Products as the essential components of TTA solution process. The other constructed frameworks will be covered in TTA solution process section.

Entertaining and Convincing Narration

As illustrated in Figure 4, every story or court pleading has an opening that finally gets to an ending after going through a number of actions, events, evidences, findings, …etc. The art in writing a story or a pleading is not only in choosing the proper opening and ending, but mainly in innovatively devise the storyline or the line of argument.

The five published TTA solution papers (Aliedeh, M. A., 2015 a, b, c, 2016 and 2017) and this paper are considered a practical example of new style of article writing that is called TTA-Based Enhanced Writing. One of the most important feature of TTA-Based Enhanced writing is its entertaining story telling writing style in addition to the clear and convincing line of argument that is employed in presenting content. In writing this paper that aims to put TTA solution in integrative form, the author will keep sticking with TTA-Based Enhanced article features by making it an entertaining reading experience with a convincing argument.

FIGURE 4
WRITING AN ARTICLE IN AN ENTERTAINING AND CONVINCING STYLE.



The Roadmap of Integrative TTA Solution

As lively represented in this paper, TTA based enhanced writing is characterized by showing the big picture through drawing road maps. Seeing the big picture of the story through writing an outline of the article story will be highly beneficial for the reader, as graphically illustrated in Figure 5. Based on the drawn visual road map, this paper will cover TTA Solution integrative story in three parts: (1) TTA Solution Justification (Line of Argument), (2) TTA Solution Process, and (3) TTA Solution Products. The first part will introduce the background supporting argument on how the overburdening and pressing global and local problems are greatly in need for the new innovative TTA Reform Approach. Next, the TTA process part will introduce an integrative and functional TTA solution using a devised nested and integrative frameworks. Finally, Building an integrative TTA Solution construct will pave the road towards producing a real TTA-Based products.

FIGURE 5
OUTLINE OF TTA SOLUTION STORY

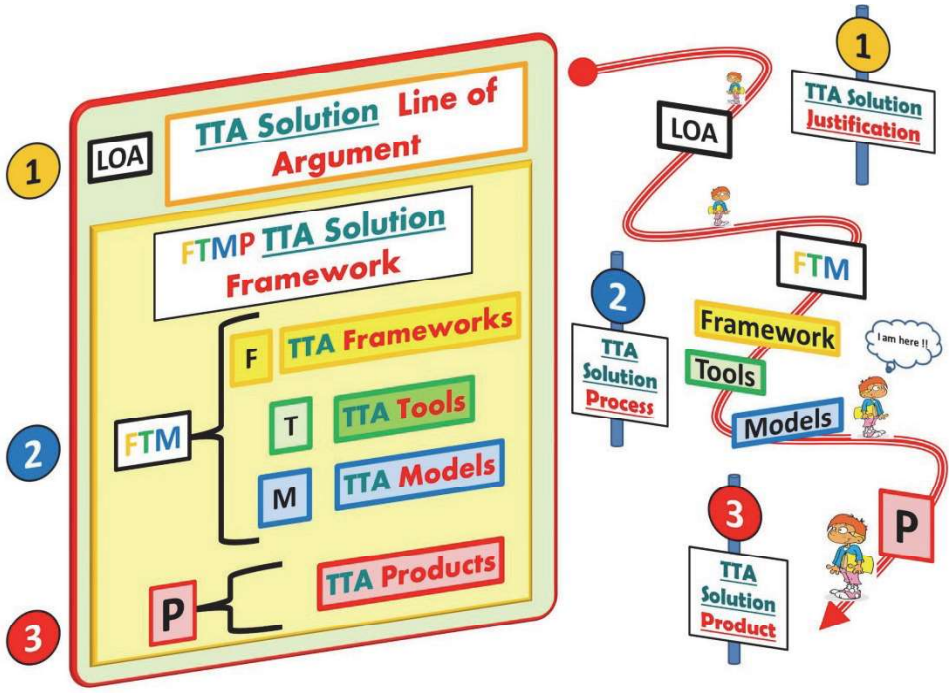
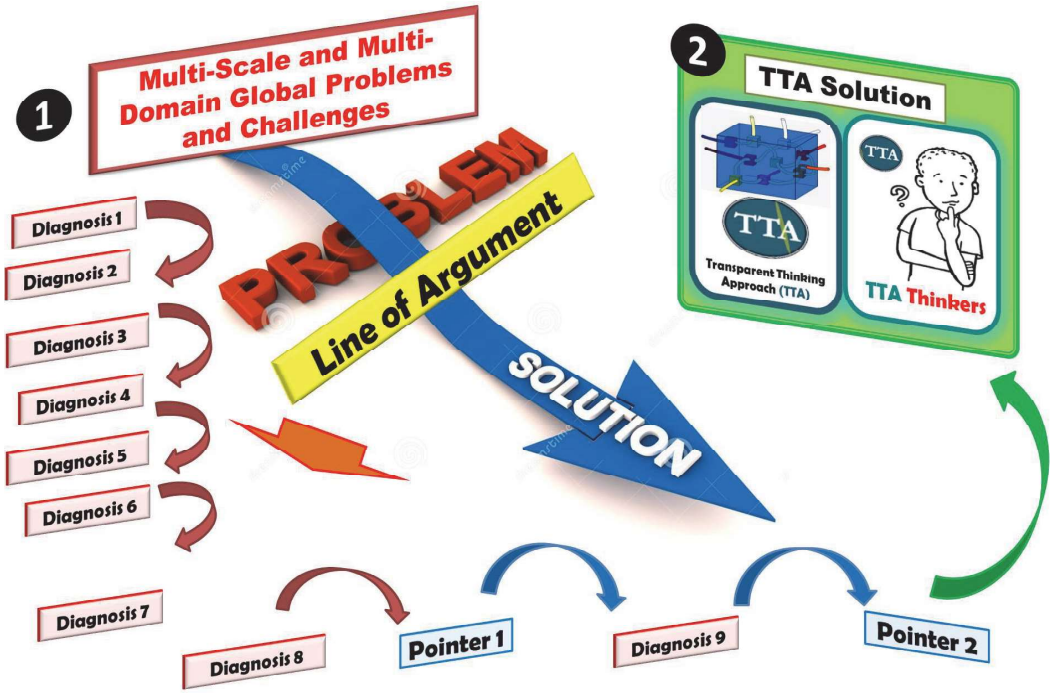


FIGURE 6
OUTLINE OF THE TTA SOLUTION LINE OF ARGUMENT



Analogically, building a factory is initiated by market analysis and feasibility study to justify the construction of this new factory, then design and construction of the factory is accomplished and finally start-up process and pilot production is performed to check the performance of the constructed framework and tools. The factory, at this point, is ready to get into operation.

TTA SOLUTION LINE OF ARGUMENT

Outline of TTA Solution Line of argument

In order to reveal the hidden justifications for adopting **TTA** as a solution for our overwhelming and overburdening problems, a line of argument will be presented that starts from problems and ends in TTA solution while passing through a route of diagnostics and pointers. As the reader pass from one diagnosis or pointer to the other, the argument route will guide him/her to the destination goal which is deeply feeling the need for a new thinking-based reform approach.

One-Legged Civilization (Diagnosis 1)

"I fear the day that technology will surpass our human interaction. The world will have a generation of idiots." Albert Einstein

Our world is heavily burdened by a large number of problems (Poverty, Civil Wars, Health Problems, Ethnic and Racial Cleansing, Nuclear Proliferation, Chemical Weapons,…etc.) that require our collective action to be solved. On the other hand, New Technologies, Sky Scrapers, Airplanes, Huge Ships, Fancy Cars, Luxury Boats, Magical Resorts, Space Shuttles are built and introduced in our life. The most important and basic question that arises is how humans are able to produce all these sophisticated technologies, while they are failing to offer food, shelter, security, and democracy to millions of people around the world. Our civilization is "one legged" and frequently fall as it moves on. Why humans who succeeded in the technical side bluntly fail in the social and human side ? This lack of transfer of experience, skill and knowledge between domains is creating a discrepancy that may ends in whole system collapse. Humanity has to fix the other leg in order to be able to move on steadily. This can be attained by changing our current way of thinking to enable us to easily maneuver between fields, domains, problems, cultures, ethnicities, technologies, … while searching for solution.

Blinded Education (Diagnosis 2)

One legged Civilization is caused by blindness that usually infects our conventional educational systems. As illustrated in Figure 7, blinders are usually used for horses and donkeys to help them focus in doing their jobs and not to be distracted by any external distractions. Knowledge fields should not be blinded or fragmented from each other as usually done in real educational settings. This fragmentation of knowledge should be temporary as a part of the analysis process then it should be turned back to the real connected mode by synthesis. Blinded fields of knowledge is hindering the transfer of insights and solutions. There is a great need to alleviate this blindness by establishing a new way of thinking that promote connectedness by eliminating blinders.

Non-Sticking Education (Diagnosis 3)

Culture is considered as an incubator of thinking. One of the old wedding traditions in a few middle east countries (Jordan, Syria and Lebanon) is to give the bride and groom a piece of dough at the end of their wedding ceremony and before entering their house to stick it on their house entrance, as illustrated in Figure 8. Both of them try hard to push their piece of dough on the wall to make it sticks. People who practice this tradition think that the longer this piece of dough stays stuck on the wall, the longer their marriage relation stays. The concept of dough sticking in wedding is borrowed to be connected with the concept of "sticking" or retention of knowledge in our minds. Making connection between knowledge

retention and dough sticking will help us to "stick" both concept together in order to retain them for long time, as shown in Figure 8.

FIGURE 7
EDUCATIONAL SYSTEM'S BLINDNESS (ALIEDEH, M. A. 2015A)

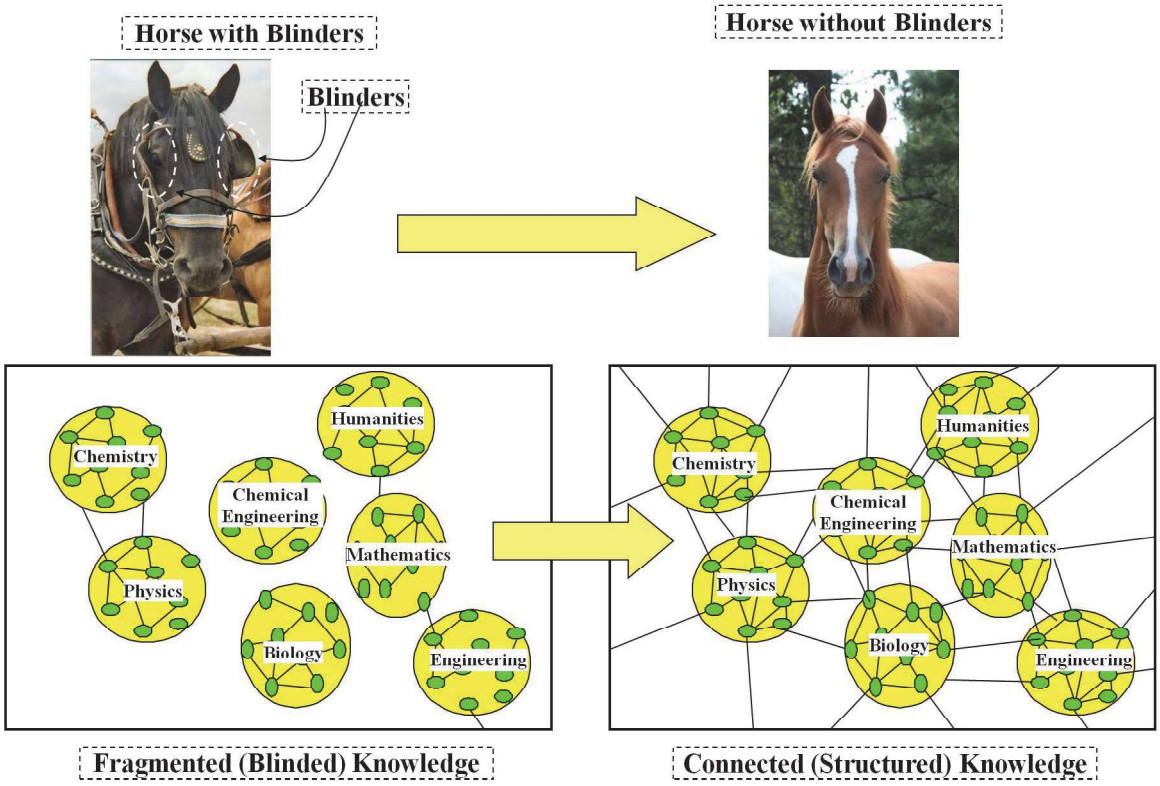
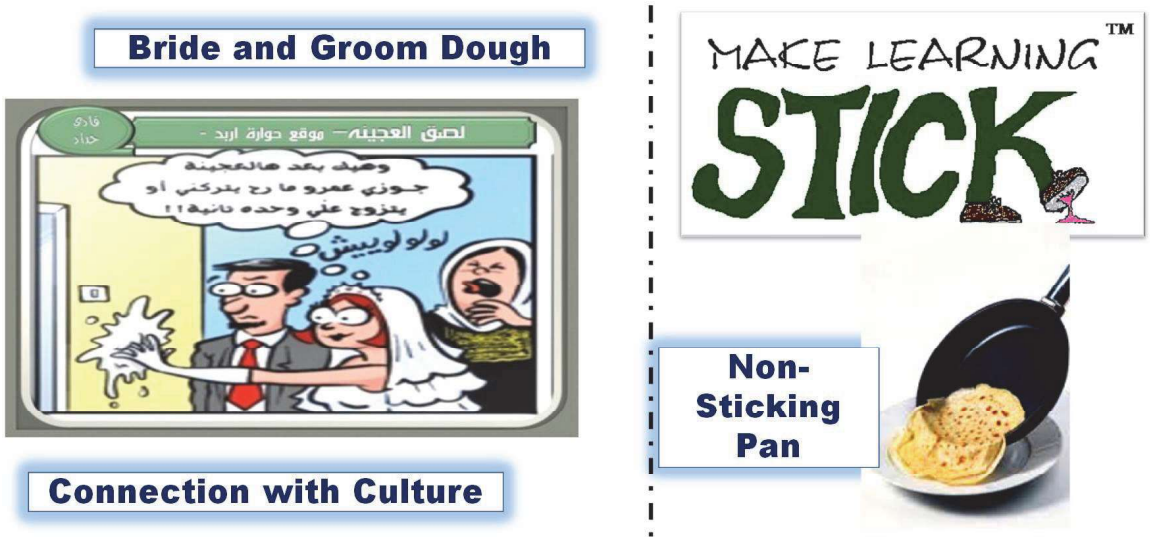


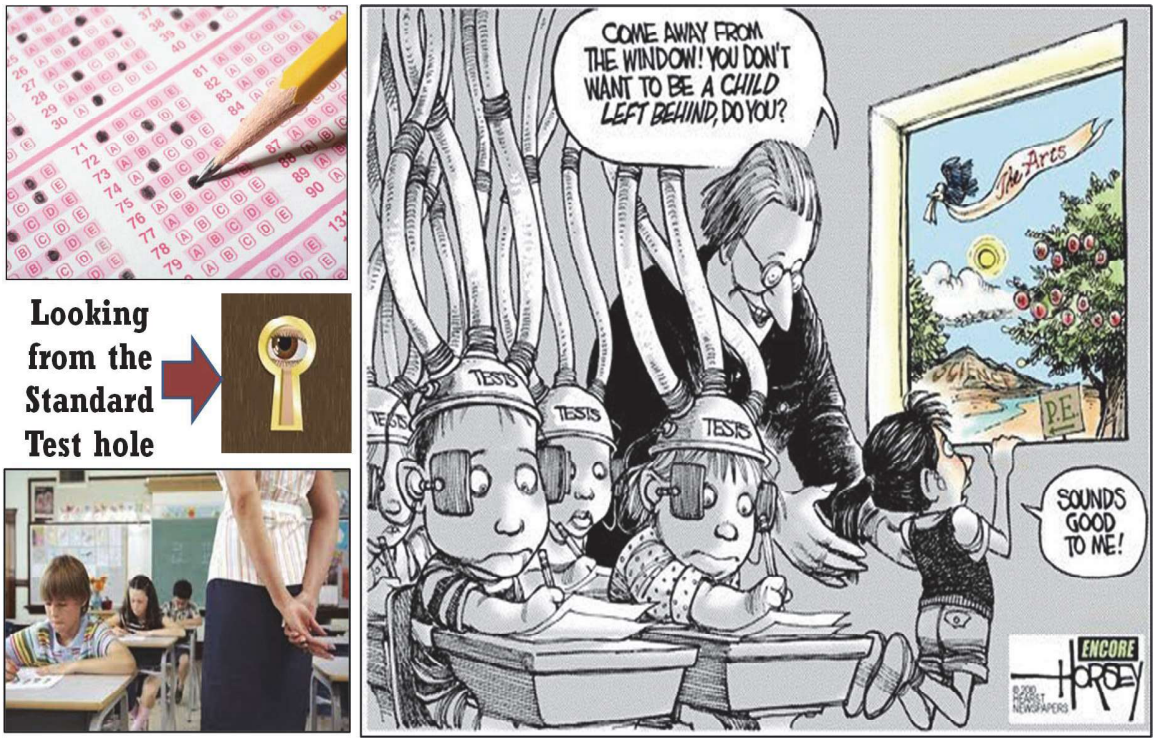
FIGURE 8
MAKING LEARNING STICKS AND BRIDE AND GROOM DOUGH



Most people from my generation still remember from their childhood the advertisements that introduced to the market the non-sticking pans and how easy is its washing when compared to the old aluminum pans, as shown in Figure 8 This analogy is employed here to create a new term of a "non-sticking" mind. Employing sense of humor here is very efficient in making ideas stick together and sticks in our mind. In a comic way, you will understand that we are in need for a "sticking mind" not "non-sticking one".

Cultural and humor connections will help the learner to understand fully the concept of "make learning stick". Knowledge retention problem in education is one of the major problems and it is time to develop a new way of thinking that "makes learning stick".

FIGURE 9
LOOKING FROM THE STANDARD TEST'S KEYHOLE (HORSEY, D., 2004)



Looking from a Keyhole (Diagnosis 4)

Our schools should be the places where learners open their eyes to our real life in our communities and not to isolate us from our surrounding like a prison. This isolation comes as a result of looking to educational practices from a keyhole or limited vision. One of the most important keyhole practices is the exaggeration in using standard tests as an assessment tool. In Figure 9, Cartoon artist David Horsey uses the tubes and helmets to symbolize and mock how the teachers and schools would feed the students information in order to pass standardized tests. It emphasizes how the education system is based around passing tests rather than learning. Real life is mostly a practical implementation of direct experience more that doing standard test setting with blinders and ventilation caps as comically illustrated in Figure 9. A new way of thinking is needed that can avoid looking from keyhole and can help to extend our vision to see the full horizon.

Looking Below the Tips of the Icebergs (Diagnosis 5)

Global development challenges and educational problems are protruding everywhere in our life continuum in similar way to icebergs in oceans, as illustrated in Figure 10 (a) and (b). What is seen from these problems are just the tips. These problems are dynamic and interactive. A new way of thinking is needed to help the thinker get deep and understand how these "icebergs" or problems are connected and dynamically interacted. This deep "diving" or search will help to gain more insights about how these problems is connected? and how they can be tackled?

FIGURE 10
LOOKING DEEP BELOW THE ICEBERGS AND EDUCATION AS THE CORE OF THE NESTED DEVELOPMENT SYSTEMS (ALIEDEH, M. A. , 2005A)

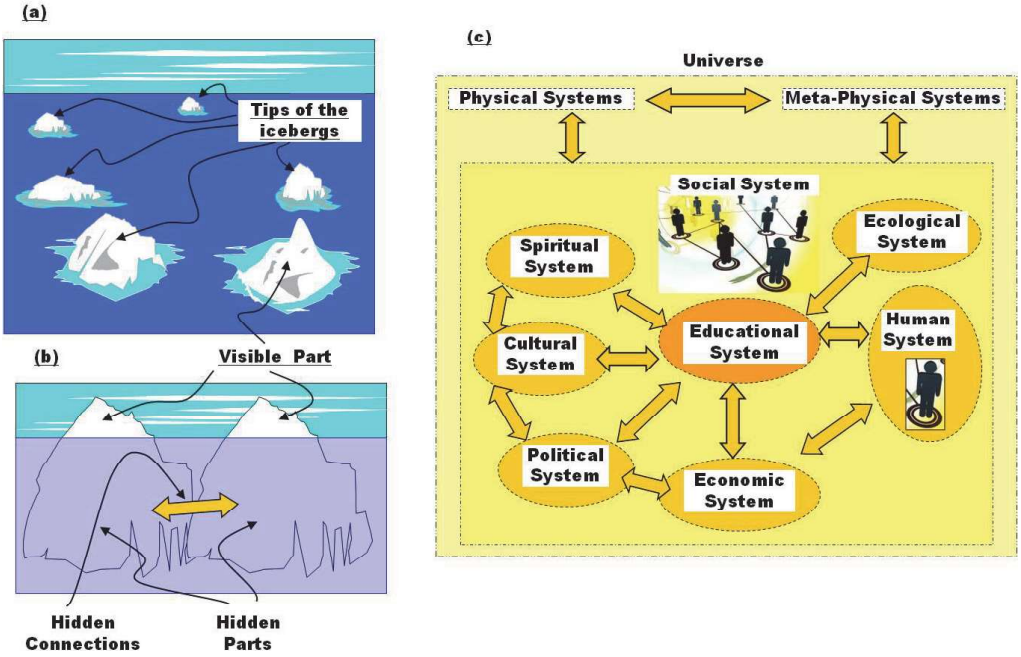
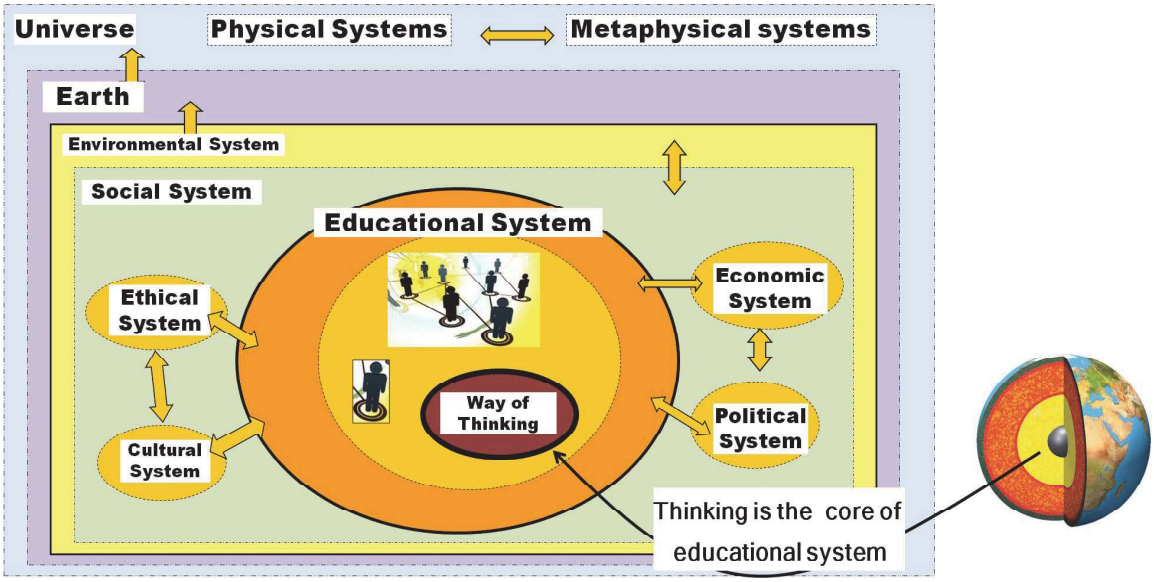


FIGURE 11
THINKING AS THE CORE OF THE EDUCATIONAL CORE (ALIEDEH, M. A. , 2005A).



Education as the core of development (Diagnosis 6)

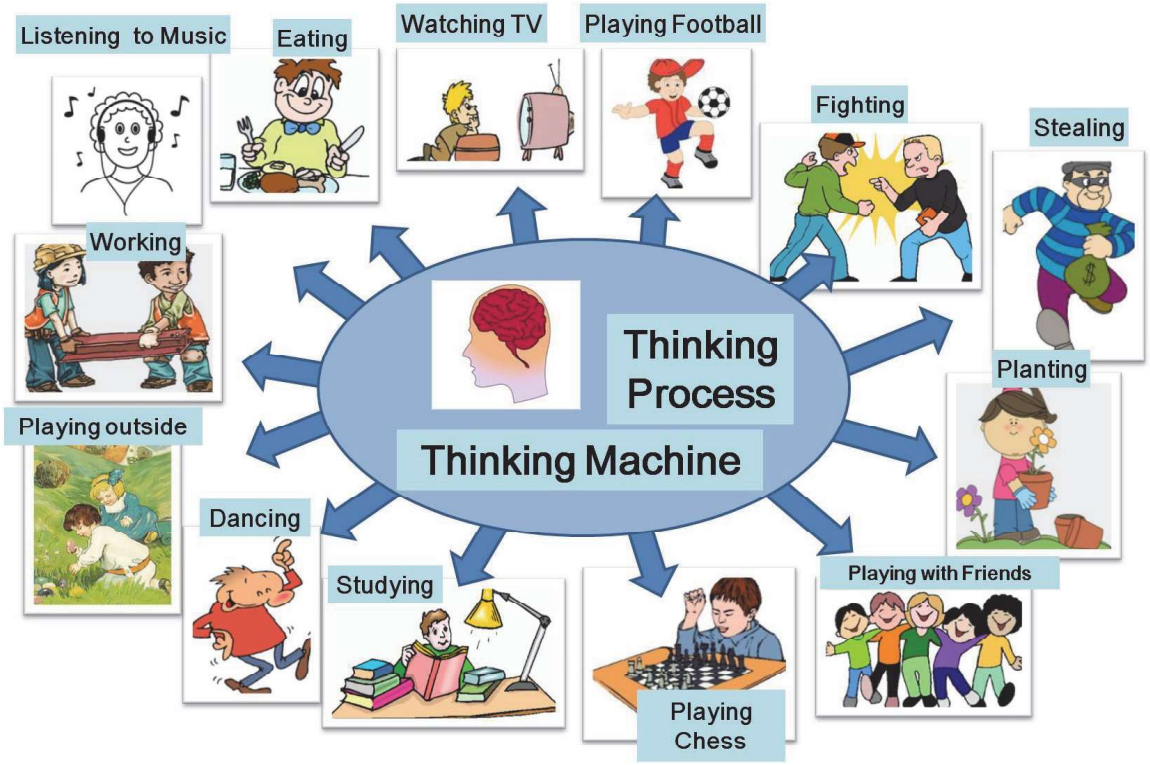
Global development systems are nested and dynamically interacted with each other, as illustrated in Figure 10 (c). Educational system occupy the core part of these nested systems and directly or indirectly interact with almost all other systems. To be able solve a problem in any domain, the educational system should be to an extent involved as an essential component of this solution. Therefore, educational system is positioned at the core of development systems continuum, as illustrated in Figure 10 (c) (Aliedeh, M. A., 2005a).

Thinking as the Core of Education (Diagnosis 7)

"Education is not the learning of facts, but the training of minds to think." Albert Einstein

Looking deep in the educational system structures will result in finding that thinking is the hidden repeating process that intermingles all its structures. As illustrated in Figure 11, our universe is made up of many nested systems and education is at its core. Inside this educational core there is another core which is thinking. Education is the core of development and thinking is the core of this educational core (Aliedeh, M. A., 2005a).

FIGURE 12
THINKING IS ESSENCE OF OUR LIFE (ALIEDEH, M. A. , 2005A)



The Need for a new Thinking Framework

As concluded before, thinking is the central process that controls our life in this universe and humans are mainly characterized by this important trait. As illustrated in Figure 12, almost all our activities in this universe is a result of our thinking process. Working, playing, listening to music, fighting, watching TV, studying, dancing, stealing, planting, …etc. are some of huge list of activities that is based on our ability to think (Aliedeh, M. A. , 2005a)..

> *"Changing the way we think does not automatically contribute in the solution of various problems, challenges, crises we face. But creating a new thinking framework will help in formulating a new perspective for these problems and in visioning a prospective solution" (Cabrera, D., 2008)*

Derek Cabrera stated clearly that while seeking to solve our accumulated problems, we should be careful not to jump to conclusion that creating a change in our way of thinking is the magical solution that can solve all these problems. Developing a new framework of thinking is the proper way to deal with these problems. Building a framework of thinking will result in developing new perspectives, tools and constructs that will create insights for solving these problems. Therefore, Building an integrative thinking framework is the essence of TTA solution.

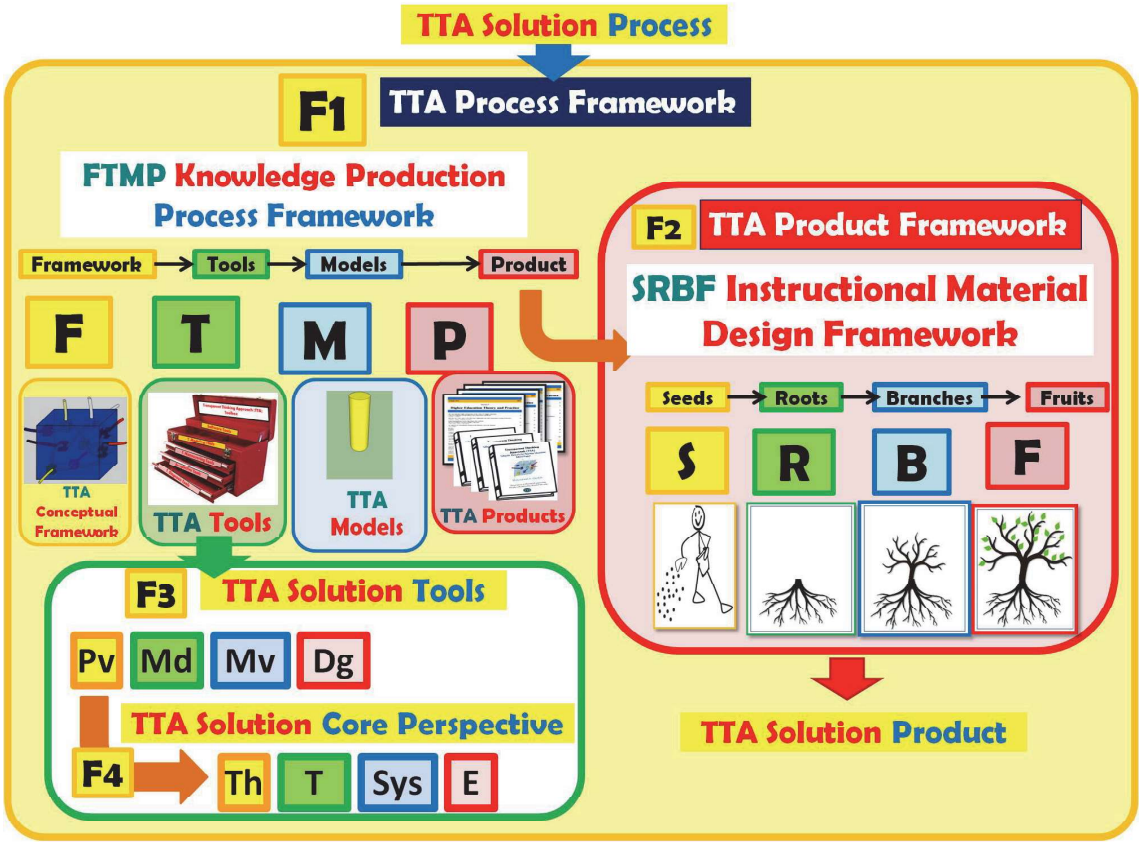
TTA SOLUTION PROCESS

Four Nested TTA Solution Framework

TTA solution is mainly structured around four integrated and nested frameworks: (1) FTMP Process Framework, (2) SRBF Product Framework, (3) TTA Tools Framework and (4) TTA Core Perspective Framework, as illustrated in Figure 13. The FTMP Process Framework is the parent one that accommodates the other three frameworks. The TTA Core Perspective Framework is embedded in TTA

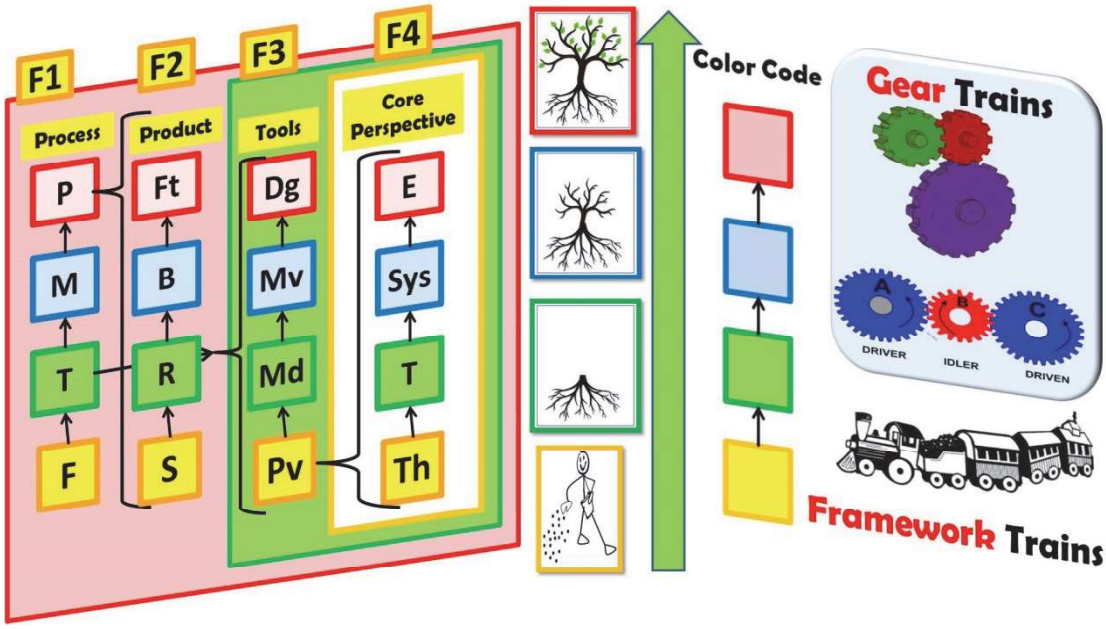
Tools framework. The functional relationship between the four TTA Solution frameworks is clearly illustrated in Figure 13 and Figure 14, and it will be clarified throughout the paper.

FIGURE 13
FOUR NESTED TTA SOLUTION FRAMEWORKS



Each of the four frameworks is characterized by being made of four steps that constitute a growth pattern from seeds, roots, branches till it gets to fruits, see Figure 14. This growth pattern is color coded by four color (Yellow, Green, Blue and Red) to help the thinker visually feel the pattern. The construction of these four frameworks is revealing an instrumentality pattern between the components of each framework and a functional relationships between all the four frameworks. As illustrated in Figure 13 and Figure 14, functional relationships between framework is clearly considered as an instrumentality pattern. Trains of gears are taken as an analogy representing the instrumentality pattern that shows how each gear works to serve the next gear or groups of gears in a harmonic interaction that result in a collective performance.

FIGURE 14
GROWTH AND INSTRUMENTALITY OF TTA FRAMEWORKS



A visual image of the four TTA frameworks is drawn on the TTA Solution Continuum to show the relative position of each framework and how they evolved to serve each other, as shown in Figure 15. The first three domains in TTA Solution Continuum (Process, Tools and Product) is structured based on FTMP Process Framework. SRBF Framework is included in the product domain. TTA Tools Framework is included in the tools domain. Finally the generic transparent Framework is included in the process domain as a part of the core conceptual framework, see Figure 15.

FTMP framework is considered as an incubator that accommodate the other three TTA Solution frameworks (SRBF, TTA Tools and Core Perspective). These frameworks will be covered in more details in next sections.

TTA Generic Tools Framework (F3)

"We become what we behold. We shape our tools, and thereafter our tools shape us." Marshall McLuhan

"Tools are half repairman" Jordanian Traditional Saying

Visiting a car repair workshop to fix our cars will make us realize the importance of tools. The knowhow and skills of the workshop's mechanic or electrician is important, but this experience fails when the appropriate tools are not available, see Figure 16. TTA Tools framework is mainly structured around four important generic thinking toolsets: (1) TTA Perspective Toolset, (2) TTA Modeling Toolset, (3) TTA Maneuvering Toolset and (4) TTA Diagnosis Toolset. All these toolsets are grouped in one toolbox that is called "Generic TTA Toolbox", see Figure 16.

FIGURE 15
VISUAL IMAGE OF TTA SOLUTION FRAMEWORKS

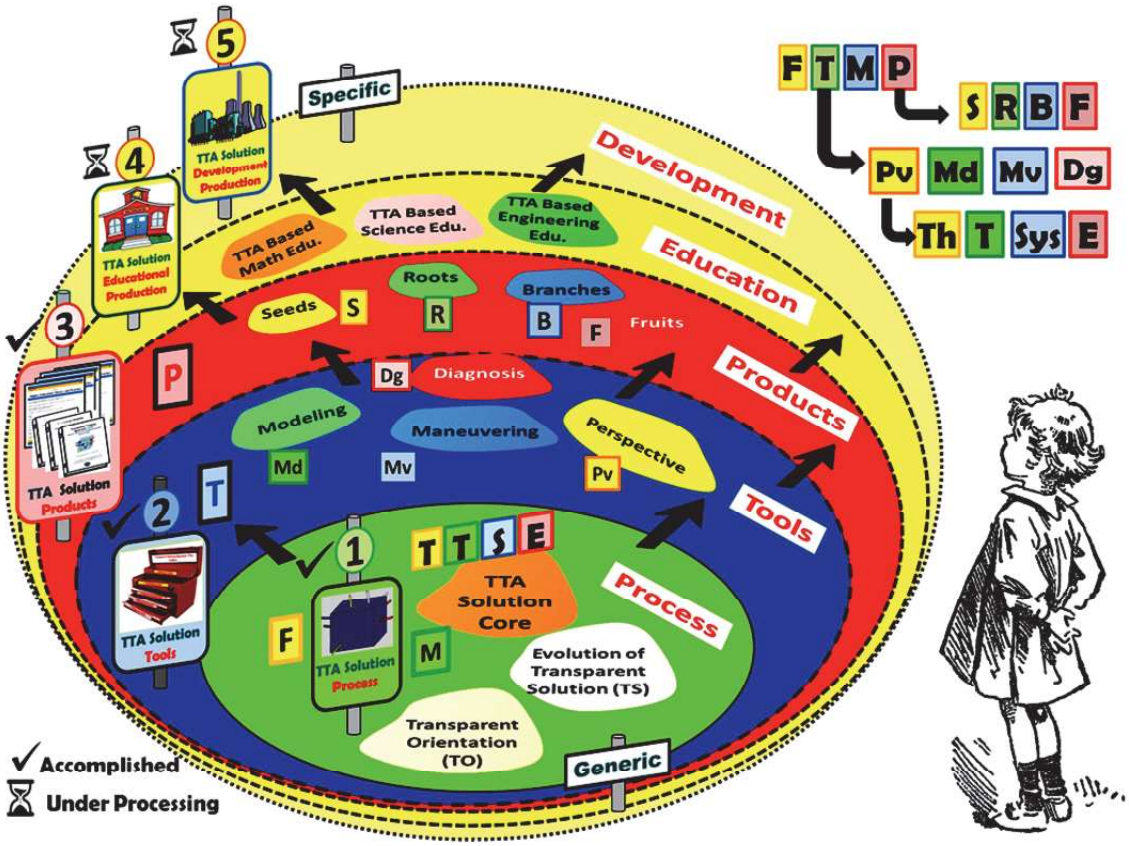
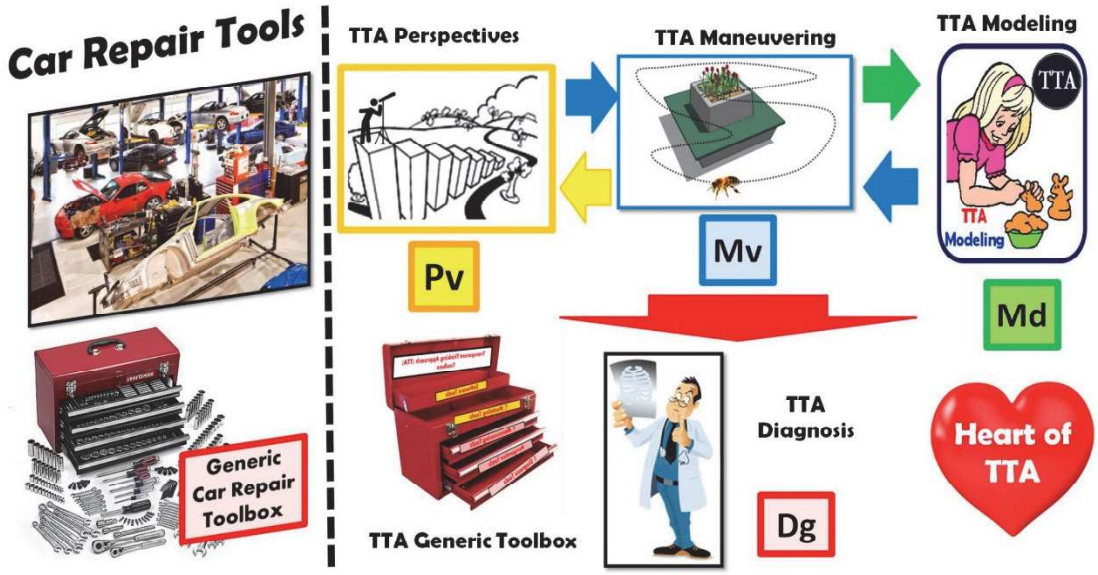


FIGURE 16
GENERIC CAR REPAIR TOOLBOX AND TTA GENERIC TOOLBOX



TTA Generic Thinking Toolbox

The four generic tools (Perspectives, Modeling, Maneuverings and Diagnosis) of the TTA Generic Toolbox are building a new type of thinking which is called TTA Generic Thinking and can be concisely defined as:

> *"TTA Generic Thinking is the diagnostic thinking abilities of the TTA Thinker that result from maneuverings between perspectives and models"*

Based on the above definition, it is noticed that these four generic thinking toolsets are instrumental and mutually interactive, as illustrated in Figure 16. TTA thinker is in need to use multiple perspectives which is result in representing his/her views that is seen for these perspectives into multiple models. TTA thinker has the ability to maneuver between different perspectives and models. This maneuvering ability enables him/her to diagnose the case under study and get more insights that may lead to a solution, as shown in Figure 16. As mentioned before, this very important group of generic thinking tools is organized in a Generic Thinking Toolbox. This toolbox considered the heart of TTA solution.

FIGURE 17
TTA THINKER DIVING IN LIFE CONTINUUM

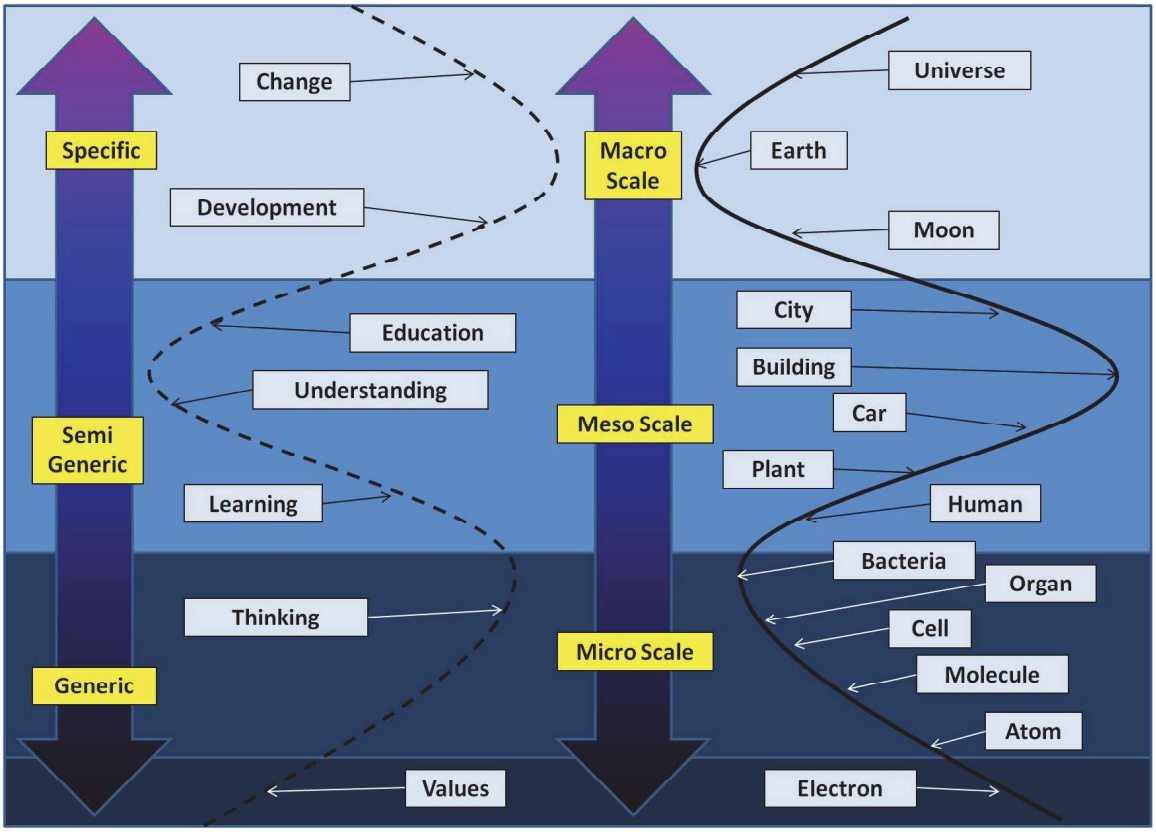
TTA Perspectives Toolset

The Discovery of Transparent Perspective

While searching for solution for our problem, the TTA thinker dived in life continuum looking for a deeper understanding for the causes and the nature of these problems, see Figure 17. While the "diver" or TTA thinker is searching in the first three layers (change, development and Education), he/she realized

that these domains are not accommodating the solution of our problems and it lies deeper in the continuum, see Figure 17. When thinking layer is searched for a solution, It was found that the defect in our way of thinking is causing all these accumulated problems. Also, TTA thinker discovered that thinking layer is engrained in a deeper value layer in which a transparency core and instrumental vale reside in. Therefore, the solution that we are looking for is transparency value-engrained and thinking-based reform approach.

FIGURE 18
DIVING TO THE GENERIC MICRO SCALE (VALUE LEVEL) (ALIEDEH. M. A., 2016)



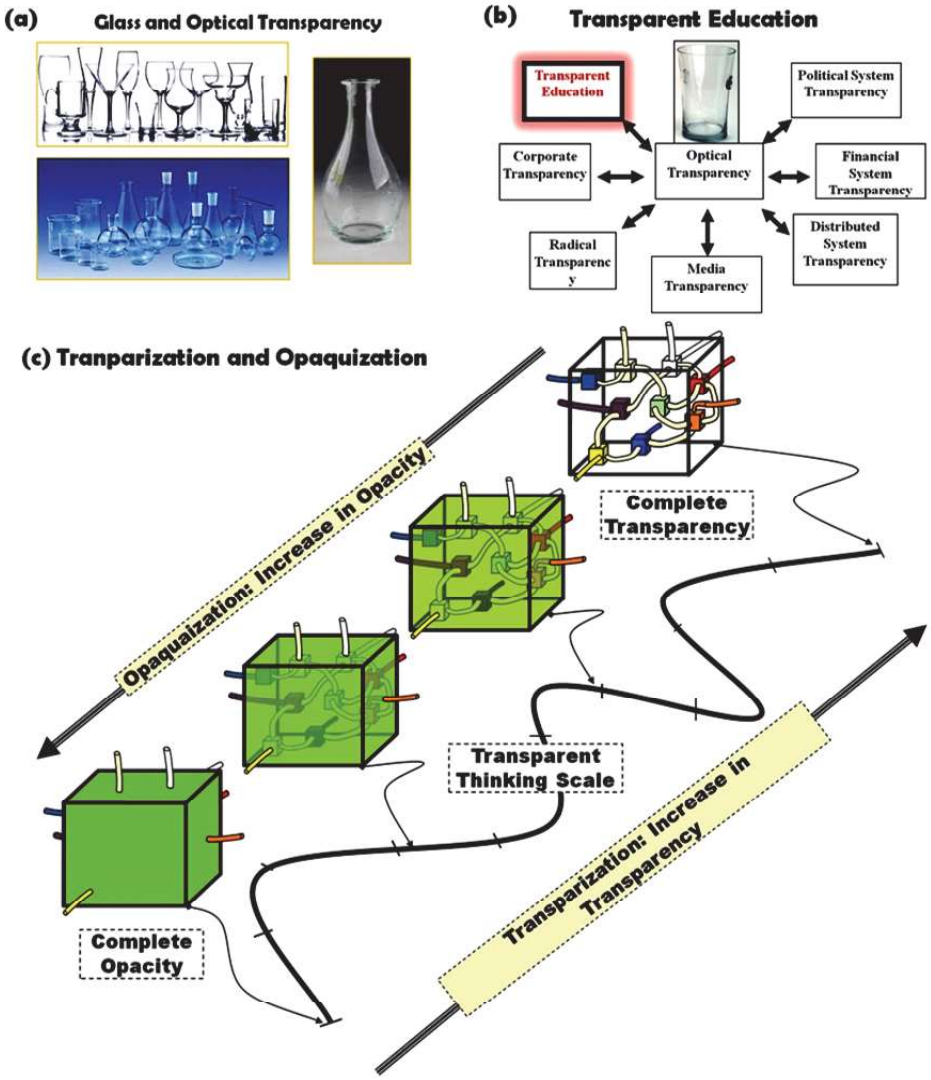
Diving to the Generic Micro Scale (Value Level)

The previously described transparent perspective diving discovery journey enables the thinker to get from the macro scale (change level) to the micro scale (value level), as illustrated in Figure 18. As a part of our physical experience, A similar diving is done in the physical domain from our huge universe at the macro scale to electrons and atoms at the micro scale. When the atomic level is reached, these atomic components becomes generic. Generic in the physical sense means that atoms components are the same whatever the material you are dealing with; whether the material is a protein in human tissue or cellulose in plant tissue or hypochlorite in a household bleacher, all of these are made of the same atomic components. Analogically, reaching the transparency value level in the life continuum will enable the TTA thinker to devise a generic core perspective that can be applied in all fields (Education, politics, Economy, Finance, Sociology …etc.). This will help the TTA thinker to easily maneuver between domains and fields as will be explained later in details. Transparency as a generic core value will play this important role in maneuvering between different domains and fields as will be explained in next sections

Transparization and Opaquization

Glass is the most prominent example of optical transparency. Optical transparency helped in shaping glass to develop optical instruments like magnifying glasses, microscopes, telescopes, binoculars to zoom in and out of close and distant physical objects. These optical instruments in our physical world helped to extend transparency concept to the theoretical and intellectual domains (Media Corporation, Radical, Political …Transparency) as illustrated in Figure 19 (a) and (b). To help in deeply feel transparency concept, a black box, is employed to clarify a two important new terms which are transparization and opaquization, see Figure 19 (c). Transparization is the process of making an entity (physical or hypothetical) more transparent and opaquization is doing the opposite by making an entity more opaque (Aliedeh, M. A. 2015a).

FIGURE 19
TRANSPARENT THINKING PERSPECTIVE AS THE CORE OF TTA SOLUTION

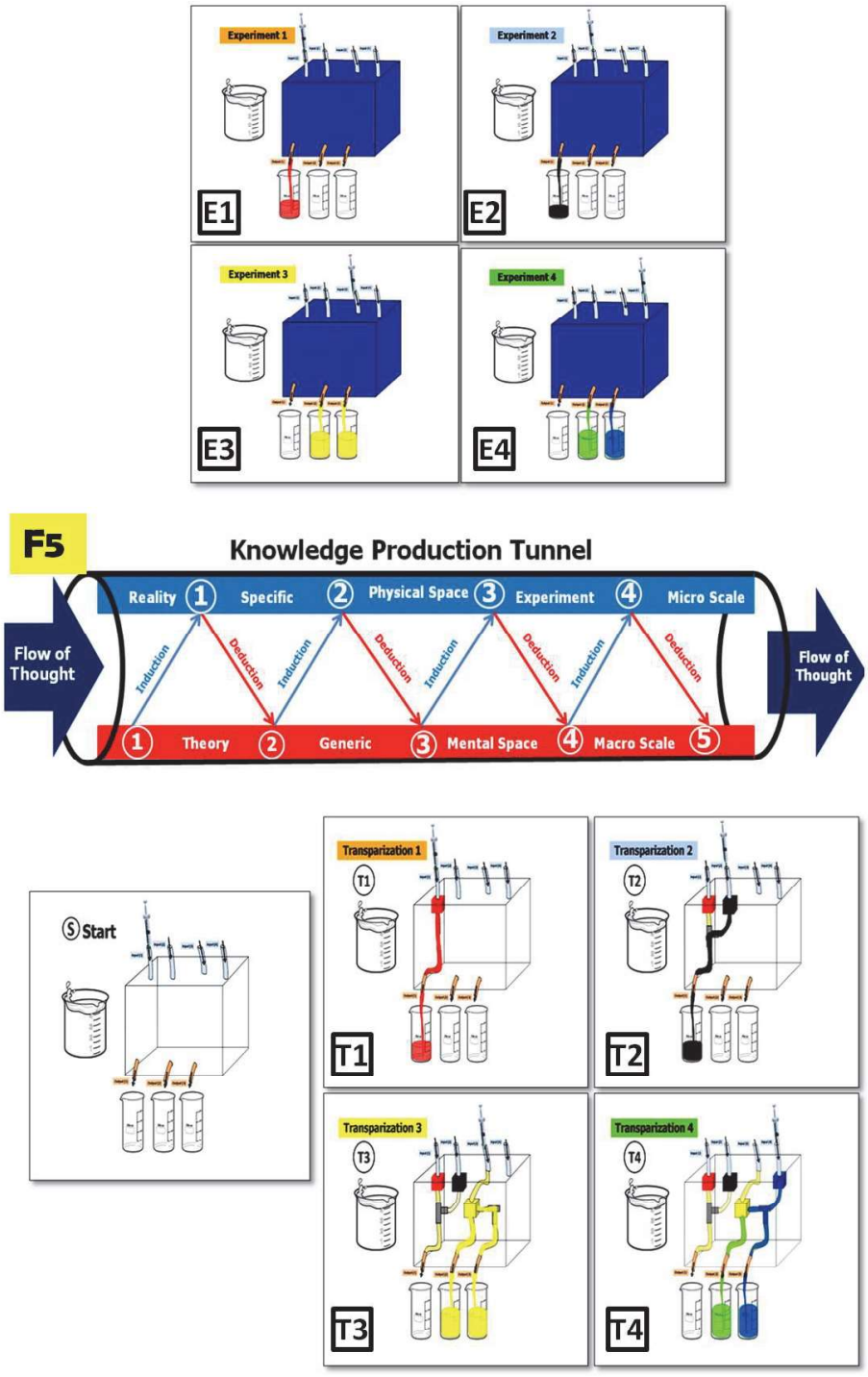


Knowledge Production Tunnel Framework (F5)

Black box experiment is a very important practical experience that can help learner to fully understand the important concept of transparization. As illustrated in Figure 20, a black box is built in which there is a hidden process that contains four compartments that is filled with different colors and

connected in a certain arrangement between four input and three outputs. All the black box details is hidden except the four inputs and the three outputs. A learner is asked to discover the color compartments process arrangement by conducting a number of experiments that are based on injecting water in the inputs and observing what goes out of the outputs.

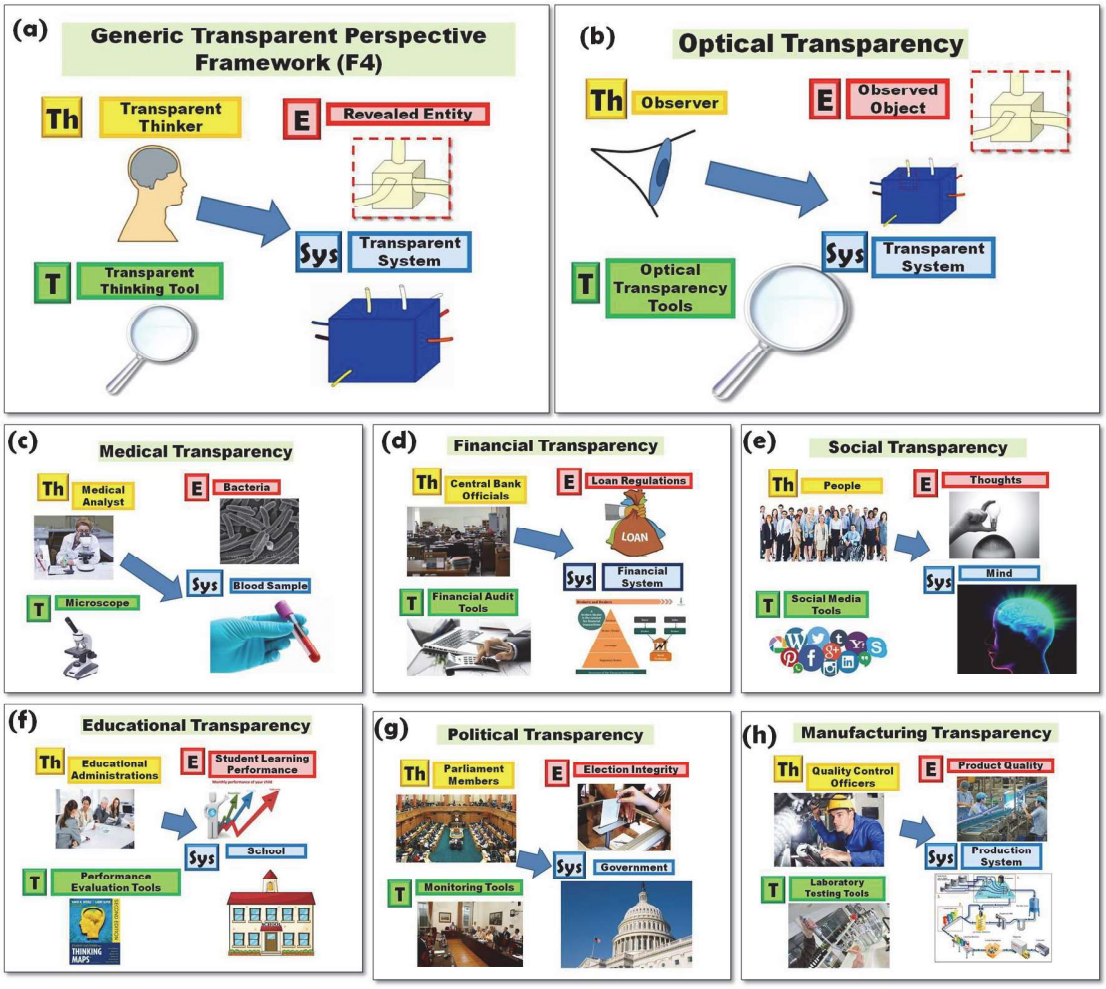
FIGURE 20
BLACK BOX EXPERIMENT AND THE USE OF TTA KNOWLEDGE PRODUCTION TUNNEL



.

The learner started the transparization process or the black box discovery process by conducting the first experiment in which he/she injected water using syringe in the first input to discover that a red colored water is dripping out of the 1st output (Figure 20, E1). The learner job after conducting the first experiment is to build a mental image of what he/she thinks is hidden inside the box. The learner can conclude that there is a connection between the first input and the first output that passed through a red colored compartment (see Figure 20, T1).

FIGURE 21
TRANSPARENT THINKING PERSPECTIVE FRAMEWORK (F4)



The learner will now be ready to experiment with the second input (Figure 20, E2) to find that injecting water in the second input results in dripping black colored water from the first output. Transparization of the second experiment will result in concluding that the second input passes through a black color filled compartment before joining the first output channel (see Figure 20, T2).

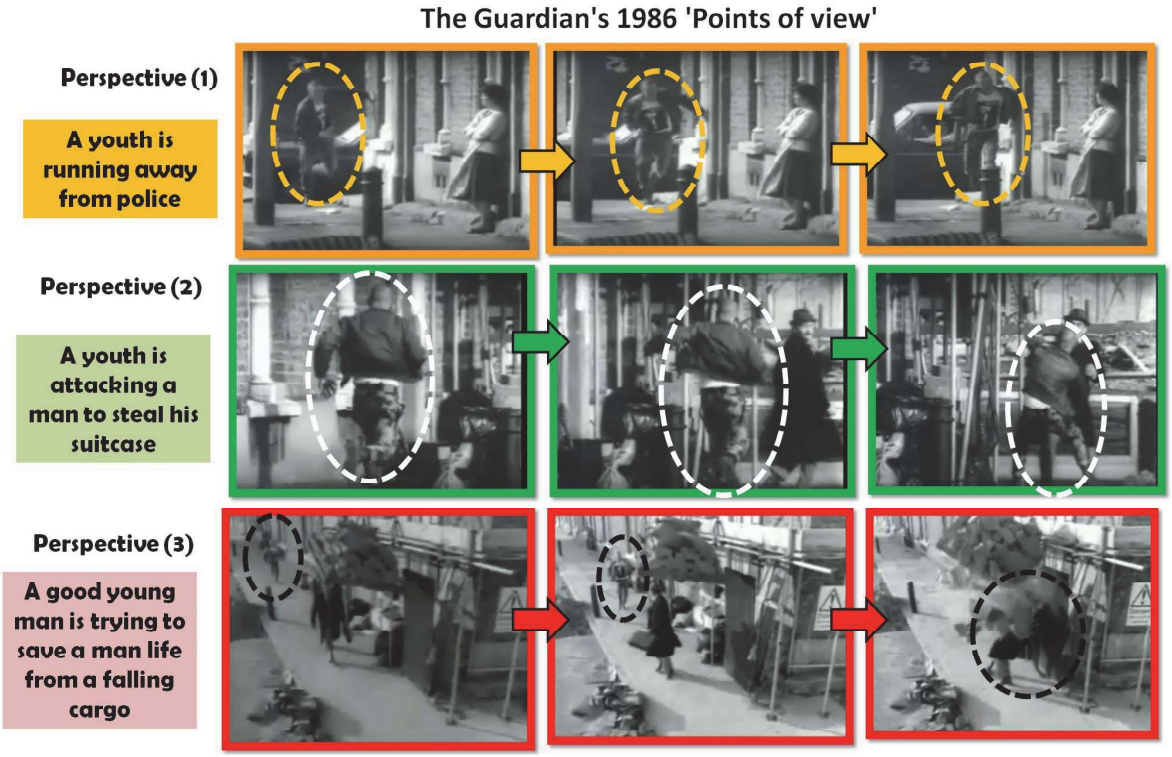
The transparization process continuous by conducting the third experiment on third input (Figure 20, E3) to find that yellow colored water is dripping out of the second and the third output. The third experiment can be explained by a channel goes out of the third input and passed through a yellow color filled compartment before being split into two channels that are connected with the second and third outputs (see Figure 20, T3).

The mental image of what is going inside the black box is almost done, but the learner still in need to experiment with the fourth input (Figure 20, E4). The fourth experiment (Figure 20, E4) revealed that as water is injected in the fourth input, a yellow colored water drips out of the second output and green water

drips out of the third output. The transparization mental effort is harder when you deal with two outputs with different colors. The fourth experiment can be explained by a channel gets out of the fourth input and passes through blue color filled compartment and then split into two stream; one goes directly to the third output ; the other stream connect with the yellow compartment before getting out through the second output (see Figure 20, T4). Now the whole mental image of the process hidden inside the black box is discovered which result in being a transparent box.

The above black box experiment will deeply show to the learner that everything around us starts by being a black box and with mental and experimental transparization efforts the learner can make these black boxes transparent to different levels. Humans succeeded in transparizing huge number of black boxes (concepts, phenomena, problems, systems …etc.) throughout their long road of civilization but they still have more transparization job to do.

FIGURE 22
THE GUARDIAN'S 1986 "POINTS OF VIEW" ADVERT



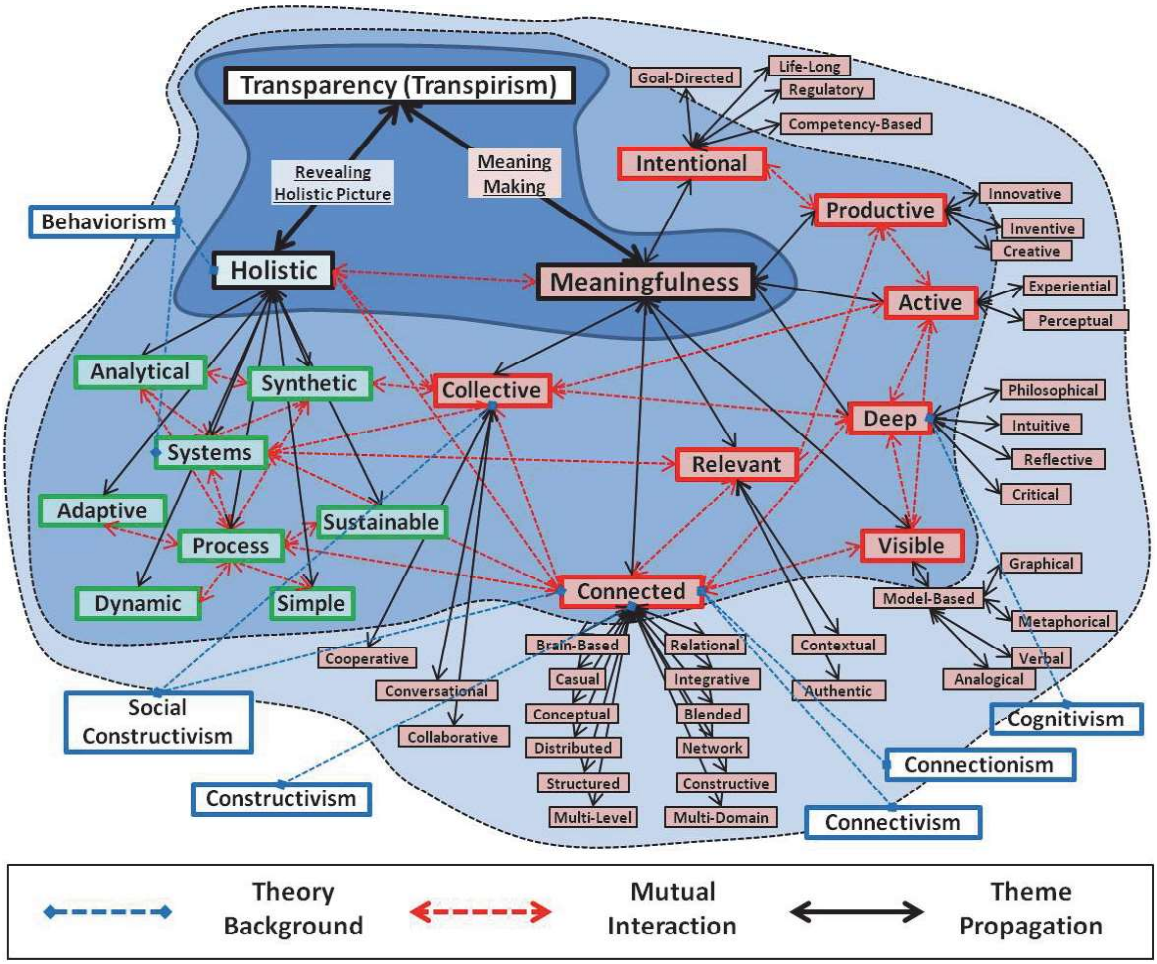
Transparent Thinking Perspective Framework (F4)

Knowledge Production Tunnel Framework (F5), described in previous section, paved the road to look generically to knowledge production process in terms of transparization process that can be described in black box discovery process shown in previous section. In this generic transparent perspective, four generic components are identified for any research or knowledge production process: (1) Thinker (Th), (2) Tool (T), (3) System (Sys) and (4) Entity (E). Entity is a term used to stand for anything whether its physical, hypothetical or theoretical. The Thinker (Th) is the person or group of persons who try to study an Entity (E) in a certain System (Sys) using certain Tool (T), as illustrated in Figure 21 (a). Optical transparency can be seen from the this generic perspective framework as observer (Th) looking for an observed object (E) in a system (Sys) using optical instruments (T), see Figure 21 (b).

As shown in Figure 21 (c) to (h), Transparent Perspective can be easily extended to other domains such as medical, financial, social, social, educational, political, manufacturing, …etc. In medical field, a

medical technician (Th) can be searching for a certain bacteria (E) in blood sample (Sys) using a microscope (T). Similarly in Manufacturing field, a quality control officer (Th) can be testing a quality criteria (E) in production system (Sys) using a laboratory testing tools (T).

FIGURE 23
THE GROWING NETWORK OF TTA PERSPECTIVES (ALIEDEH, M. A., 2017)



The Importance of Perspective

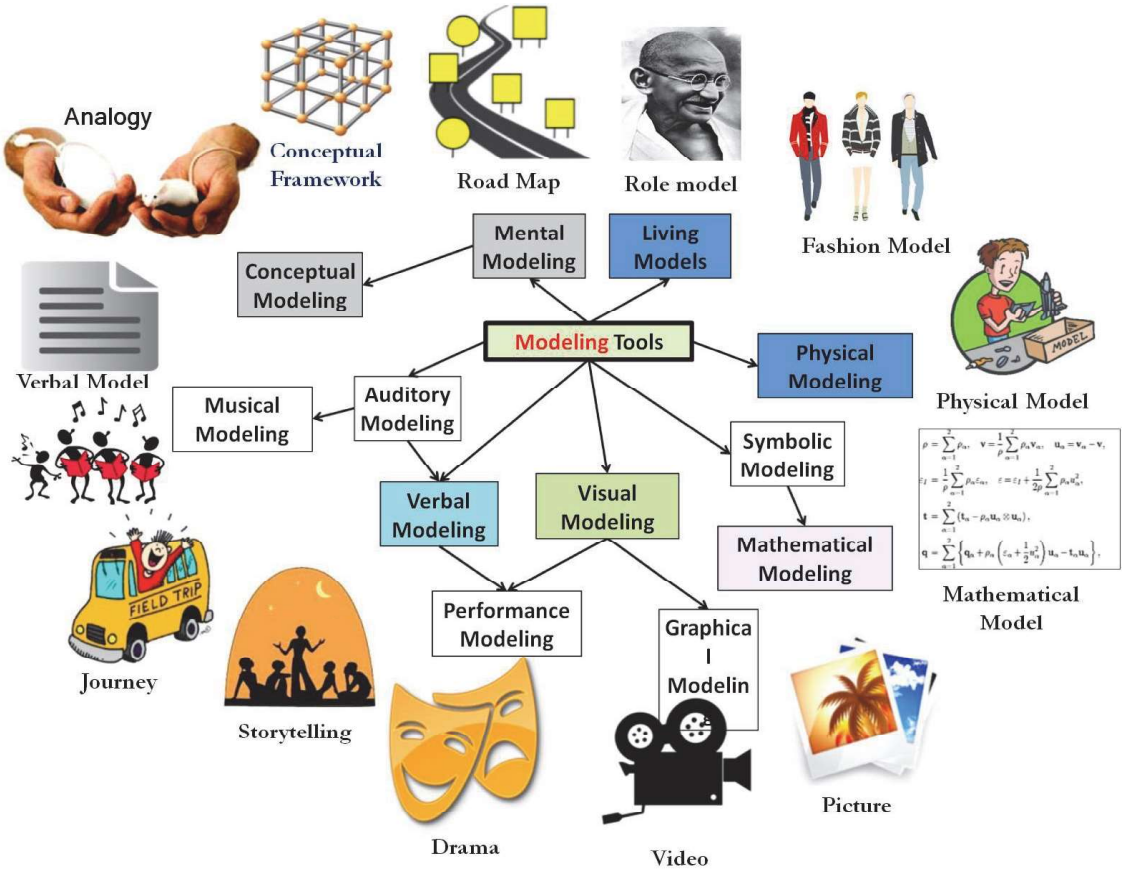
The 'points of view' advert, from the year 1986, is one of the most iconic Guardian TV adverts [GNM Education Center]. As illustrated in Figure 22, this advert is shooting an event from three perspectives: (1) a youth running down a street seemingly away from police, (2) A youth is about to attack a businessman to steal his suitcase, (3) A youth is trying to save man from bricks falling from a building site. The premise being that readers should see all the points of view to get the whole picture. This advert shows effectively how seeing from different perspectives will help to construct the big picture that may result in more insights. In the same direction, TTA solution succeeded in growing numerous perspectives out of the Transparent Perspective Seed as will be shown in the following section.

The Growth of Transparent Perspective Toolset

Transparent Thinking Perspective grows to transparize life by making meaning and creating holistic picture, see Figure 23. Meaning making is the essence of our life and meaningfulness germinate to create meaning through intentionality, productivity, activeness, visibility, connectedness, relevancy and

collectiveness. In addition to meaning making, transparency grows to reveal structure and behavior through creating numerous holistic perspectives. Holistic picture is transparized through analysis, synthesis, process, sustainability, dynamicity, adaptiveness, simplicity and systems perspectives. Meaning and holistic picture work in harmony to draw the big picture of transparency. These germinated 16 sub perspectives are capable to grow further to end up in a 42 more sub perspectives, as illustrated in Figure 23. These 42 different perspectives mutually interact to create harmonic and consistent whole. These different perspectives interact to meet all the old and current learning theories in their perspectives.

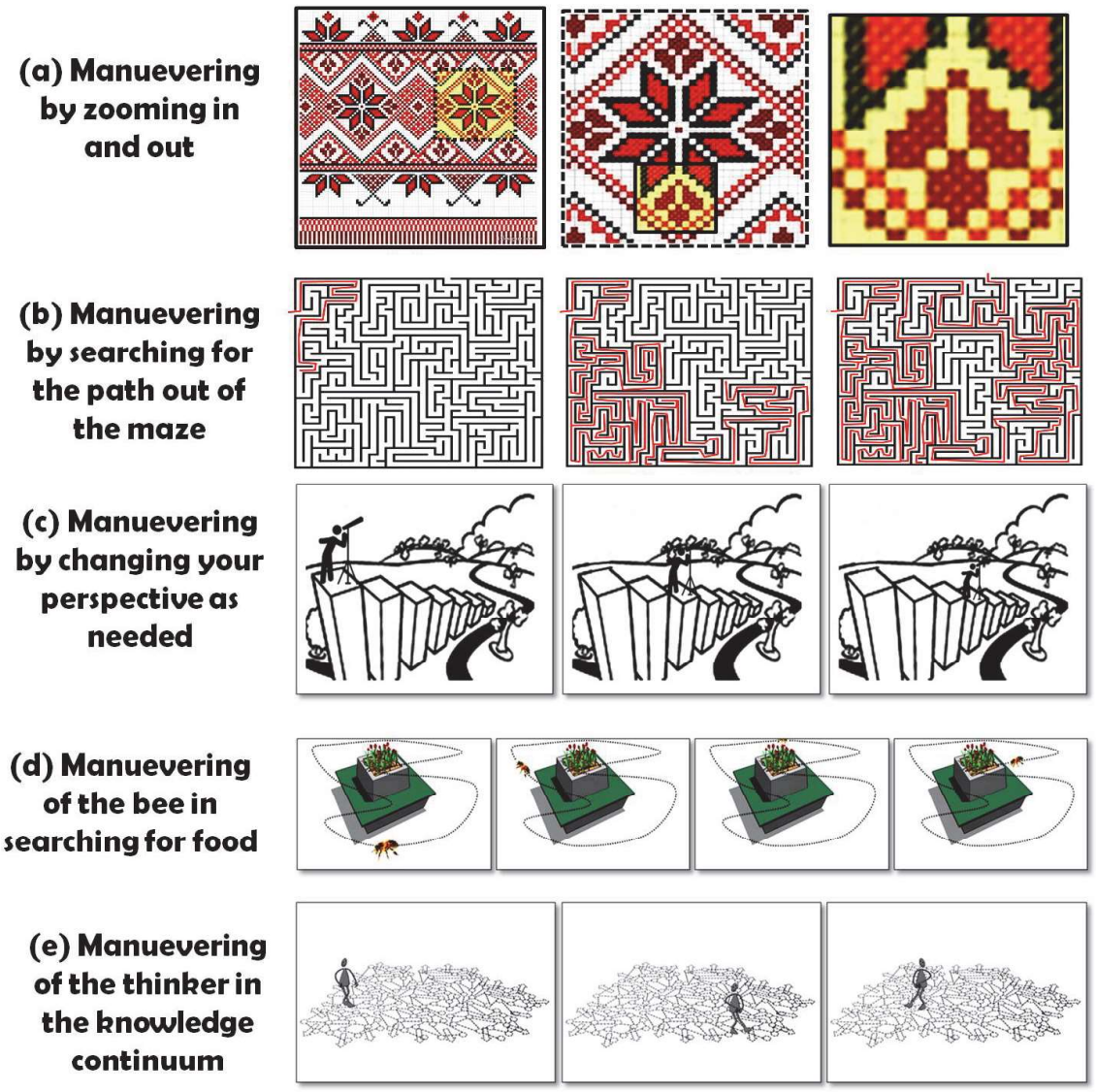
FIGURE 24
TTA MODELING TOOLSET (ALIEDEH, M. A., 2016)



TTA Modeling Toolset

For each thinking perspective, TTA thinker should be able to represent what he/she views out of this perspective in a form of a model. Modeling as a form of representation is intimately connected with thinking perspectives. The ability of the TTA thinker to maneuver between perspectives necessitates grasping the ability to maneuver between different modeling tools. TTA solution looks to modeling tools holistically as shown in Figure 24. Numerous modeling tools are already developed and can be classified as: living, mental, physical, auditory, visual, verbal, symbolic and graphical. Models for example can be a fashion model, model car, road map, analogy, person, mathematical equation, drama, music, video, graphics …etc. The graphical modeling examples in this paper and the five papers published before are a living example of the practical implementation of models.

FIGURE 25
EXTENDED CONCEPT OF MANEUVERING RESULT IN TTA MODELING TOOLSET



TTA Maneuvering Toolset

Maneuvering in its original use can be defined as the careful and skillful movement. It is used to describe the skillful movement of airplanes or the planned movement of troops. In TTA solution, maneuvering extended in meaning to include many planned and skillful change. Under the new extended definition, maneuvering can be in the form of changing scale of focus or level of details by zooming in and out of a picture, a map, or a topic under study, as illustrated in Figure 25 (a). Maneuvering can be used to describe; skillful movement to pass a maze; skillful change in perspective based on dynamic requirement; skillful movement of a bee in the fields while looking for food; Changing your position in the knowledge continuum while searching for new insights, as shown in Figure 25 (b) to (d).

FIGURE 26
BREAKING ALL BARRIERS BY EMPLOYING TTA MODELING TOOLSET (ALIEDEH, M. A., 2015)

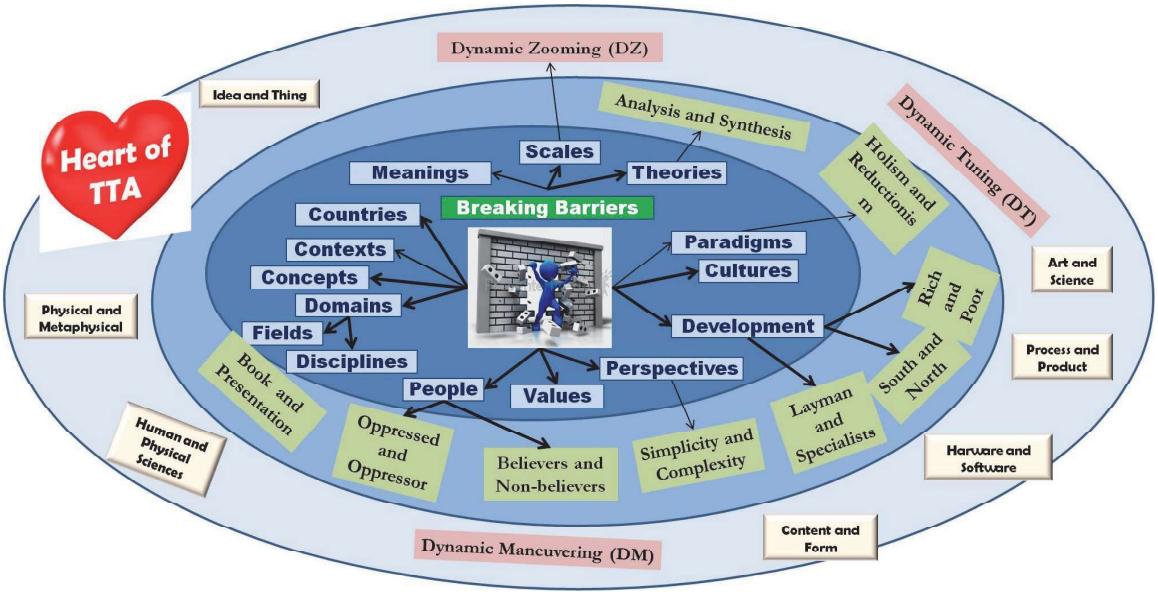
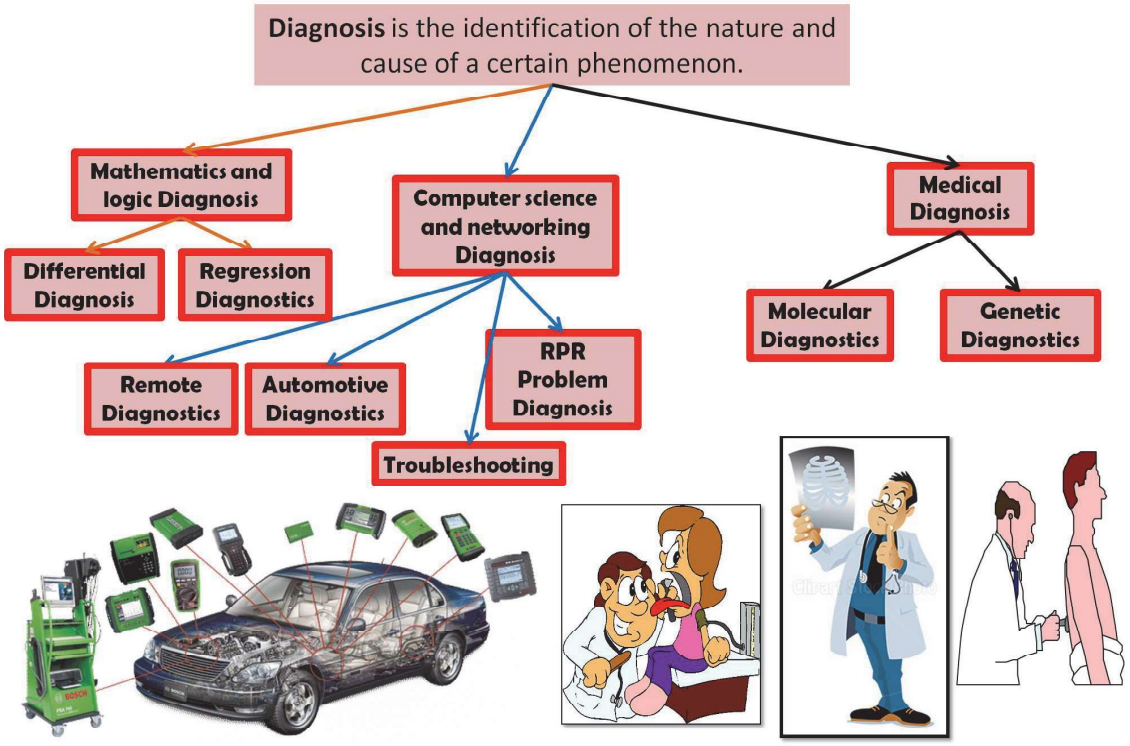


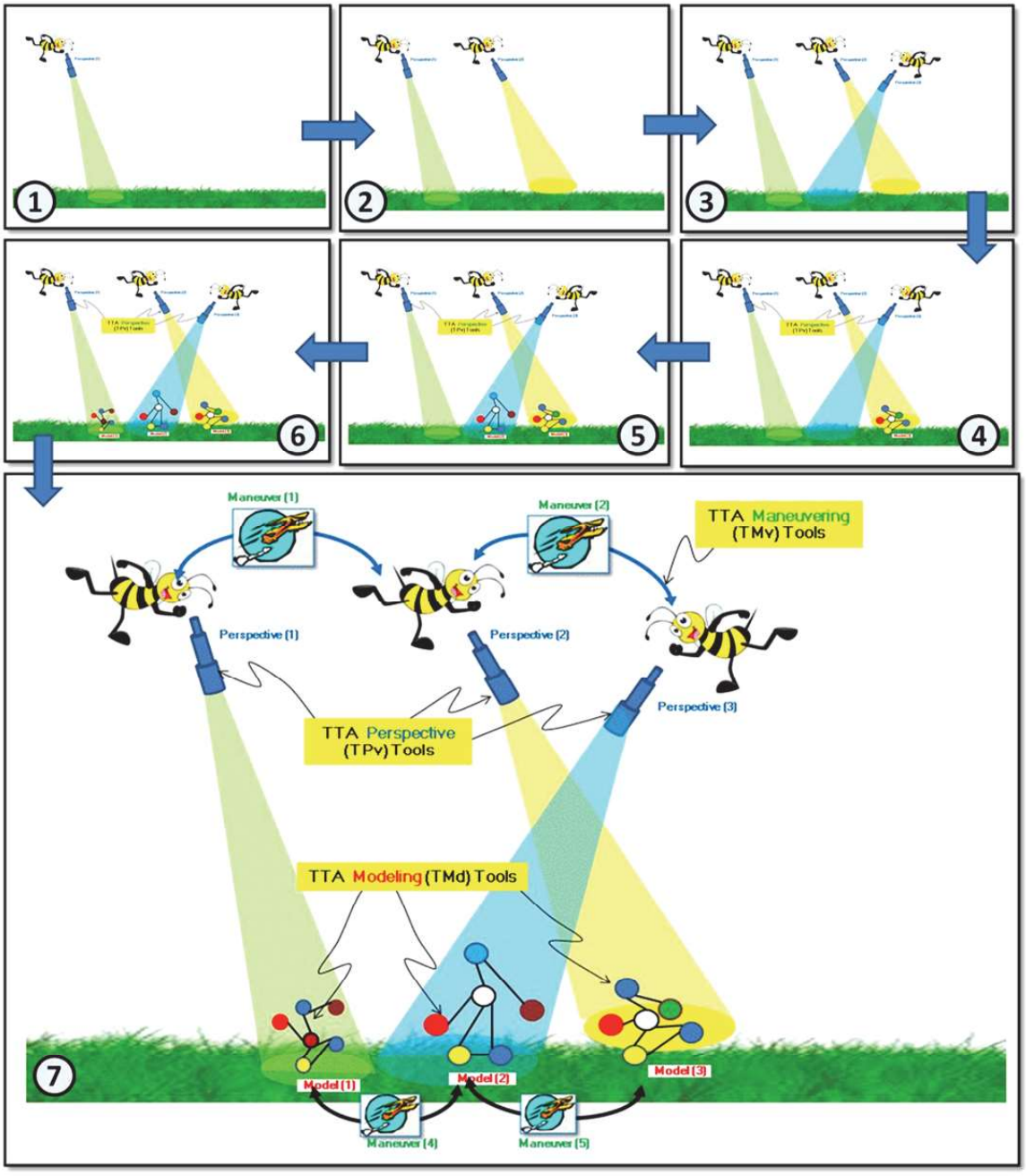
FIGURE 27
TTA DIAGNOSIS TOOLSET



The above widely TTA extended definition of maneuvering result in breaking all barriers that hinder dynamic movement or change, as shown in Figure 26. TTA thinker can maneuver between scales,

meanings, perspectives, models, definitions, domains, disciplines, fields, cultures, theories …etc. TTA maneuvering enable the thinker to freely and skillfully move anywhere either physically or hypothetically. TTA maneuvering tools are at the heart of TTA generic tools.

FIGURE 28
HARMONIC AND COLLECTIVE IMPLEMENTATION OF TTA GENERIC TOOLS



TTA Diagnosis Toolset

Diagnosis is defined as the identification of the nature and causes of a certain phenomena. It is mostly used in the medical field to describe the process of studying a medical case to identify the disease or

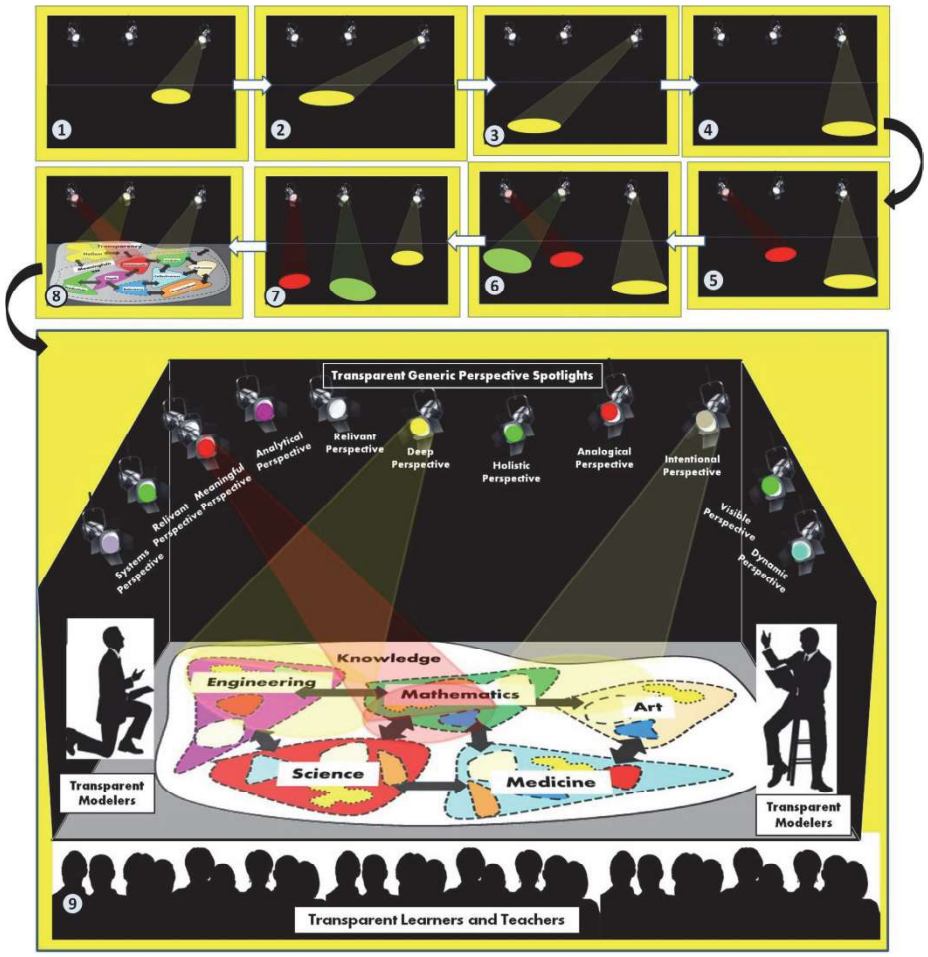
condition that explains a person's symptoms and signs. Diagnosis is used in many fields such as electronics and instruments troubleshooting, car repair, mathematics and logic, see Figure 27.

TTA diagnosis is defined as the process of maneuvering between numerous thinking perspectives and modeling tools to study a certain entity in a system and identifying its nature, structure and behavior. It is a generic definition of diagnosis in which a system and an entity can be anything whether it is physical, hypothetical or theoretical. TTA diagnosis is the fruit of the harmonic and collective implementation of perspectives, modeling and maneuvering.

Harmonic and Collective TTA Tools Implementation

The four Generic TTA Tools (Perspectives, Models, Maneuverings and Diagnosis) interact in a harmonic and interactive way. To simplify and clarify the harmonic collective performance of TTA tools, the following analogy is used which symbolizes TTA thinker by a bee, see Figure 28 (Slide 1 to 7). The bee is shown flying and carrying a monocular that is used to get a perspective (Slide1). The bee can maneuver between different perspectives as shown in sides 1 to 3. The thinker (Bee in this analogy) is in need to represent what he sees from each different perspective by a certain model (Slides 4 to 6). As the thinker is able to maneuver between perspectives, he/she should maneuver between models (Slide 7). This created scenario is a simple illustration of the harmonic and collective functioning of TTA tools.

FIGURE 29
TTA KNOWLEDGE PRODUCTION THEATER



TTA Knowledge Production Theater

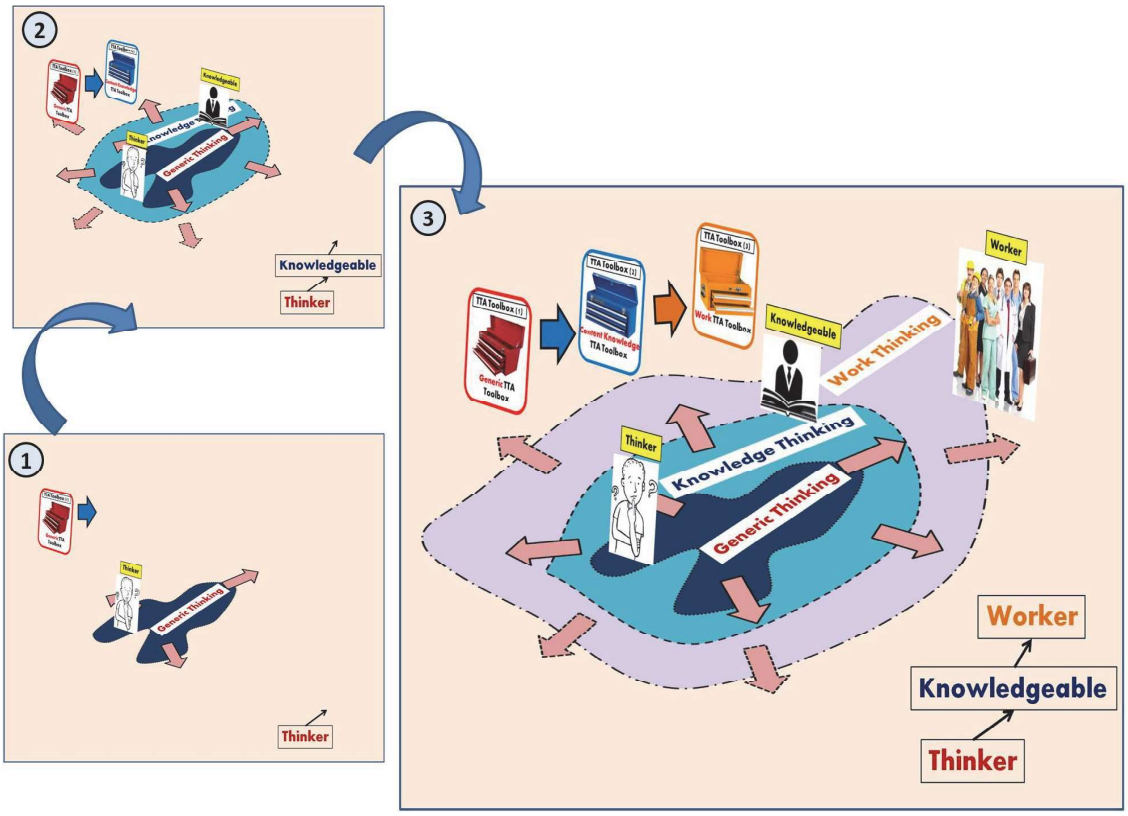
To understand how TTA tools collectively perform, another effective analogy is employed here in the form of a theater. Theater is usually a place that is used to display performing arts shows. In this analogy, the theater will be employed as a place to produce knowledge, as shown in Figure 29 (Slides 1 to 9). Each spotlight of the theater is representing a perspective that can be moved (maneuvered) to attack different knowledge domain (Slides 1 to 4).

Maneuvering between spotlights is similar to maneuvering between perspectives (Slides 4 to 7). Spotlights (perspectives) can be can be maneuvered by changing the angle of attack to highlight different spot areas in the knowledge continuum on the stage or by switching between different spotlights to employ different perspectives (Slides 1 to 9). The spot area on the stage will be the place where different models are employed in different knowledge domains (Slide 9). Knowledge production is performed on the stage by maneuvering between different spotlights and their angle of attack and then reflecting this in different forms of models which will result in a new diagnosis or insights as a form of new knowledge.

Diffusion of TTA Solution Tools

TTA generic tools occupy the heart of TTA solution. Its generic nature will enable the TTA thinker to put thinking process into knowledge production in all domains and fields. TTA thinker can take step further and put knowledge into work production, see Figure 30. Getting from generic thinking to knowledge and work production will be accompanied by developing a two new Knowledge and Work Production Toolboxes which will be an added value to previously developed TTA constructs and tools.

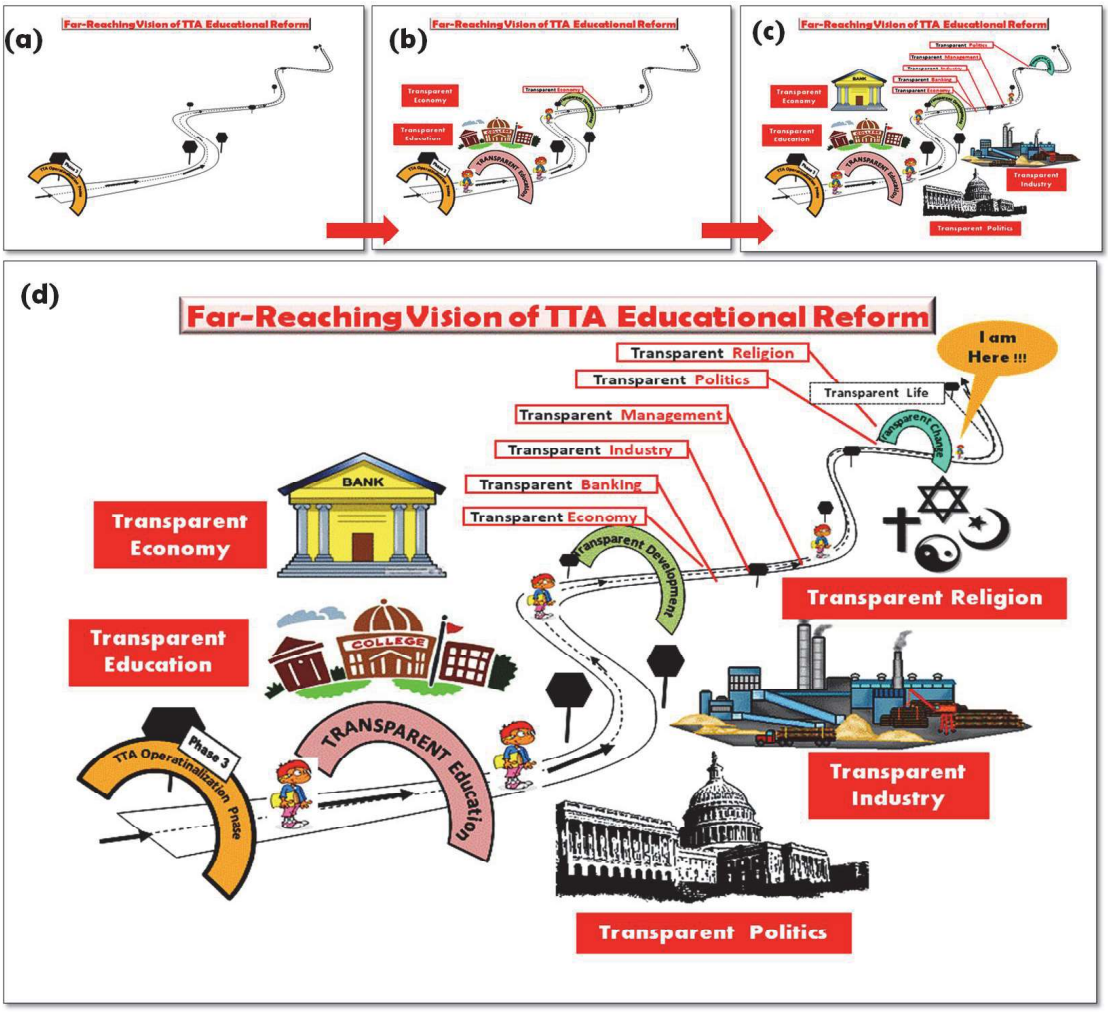
FIGURE 30
TTA DIFFUSION FROM THINKING TO WORK



TTA Solution Far Reaching Diffusion

TTA Solution is a micro scale, value engrained and thinking based reform approach that is inherently generic in nature. The generic nature of TTA solution, that is represented by its maneuvering tools, enables it to break all barriers between fields, scales, theories, disciplines, cultures, concepts, models …etc. TTA solution can be easily employed in education and this paper is paving the road for putting it in educational production, see Figure 31 (Slide a and b). TTA solution is expected in the med term future to be established as a Development Reform Approach (Slides c and d). It is a big dream, but "1000 mile journey start by a single step". TTA solution made a big stride in designing, constructing, starting-up the TTA production process, but a lot of hard work is lying ahead because it is a revolutionary reform approach that will change the world.

FIGURE 31
TTA DIFFUSION IN ALL FIELDS



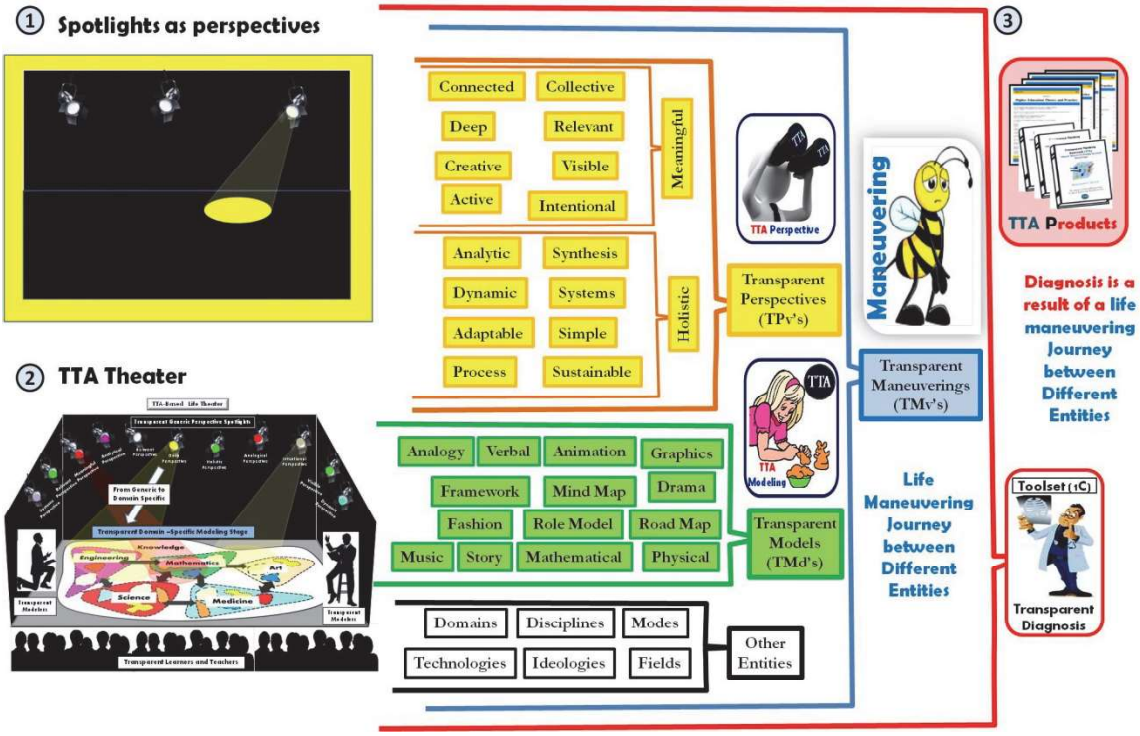
TTA SOLUTION PRODUCT

Making TTA Product by TTA Tools

For every process of change there are products. TTA solution frameworks, models and tools, described in previous sections, are expected to give TTA products. TTA products are simply the result of putting TTA Generic Tools into production, as shown in Figure 32. TTA products are the results of TTA

Diagnosis which is simply a maneuvering between multiple perspectives, models, domains, disciplines, ideologies, technologies …etc. This production is accomplished in TTA theater, see Figure 32.

FIGURE 32
MAKING TTA PRODUCTS BY TTA TOOLS



Evolution of TTA-Based Enhanced Products

The unique and distinguished feature of TTA solution is that it grows out of simple core value which is transparency and consequently its constructs evolved in a connected and structured matter like a tree. As you notice in Figure 1, the concepts of growth and diffusion are included to simply clarify this important hidden process that underlies TTA solution constructs development.

As shown in Figure 2, four types of instructional products are developed (totally or partially): (1) TTA-Based Enhanced Articles (Five articles published and this article is the sixth in TTA series), (2) TTA-Based Enhanced Teaching Learning Sequence (TLS) (Solution Concentration TLS is produced and validated in the fifth paper and presented in PowerPoint presentation form), (3) TTA-Based Enhanced EBook (In process to be published).

TTA Based Enhanced Articles

In addition to this paper, the five published papers (Aliedeh, M. A., 2015 a, b, c, 2016 and 2017) introduced a new educational articles writing style by presenting it as a living example. TTA-Based enhanced article writing style is characterized by:

1. Making a *paradigm shift* in writing from graphics serving text to text serving graphics. Namely, Graphical modeling is given a superior position to verbal modeling in the age of motion and static picture.
2. The five TTA published papers are summed up to 141 pages with more than 104 figures with a figure per page ratio of approximately 73 figures per 100 pages. If you review a regular volume of the same journal (Journal of Higher Education Theory and Practice) you will find the ratio is approximately 6 figures per 100 pages.

3. These numbers show that TTA-Based Enhanced Articles are highly enriched with graphical modeling, while traditional educational articles are mainly dependant on verbal modeling. TTA writing is looking to visible communication in terms of graphics as the main tool and verbal communication as a subordinate.
4. Employing the TTA extended modeling tools to serve the presented concepts such as storytelling, road maps, knowledge mapping, static graphics, shots of moving picture, color coding, analogy, physical modeling, drama, cartoons, and comics.
5. Creating an entertaining storyline and a convincing line of argument of the article supported by graphical outlines and road maps.
6. The graphical modeling at first glance may seem hard to understand but as the reader dig deeper into these graphics, he/she will notice how high is the added value of using graphical modeling.
7. All of the above features will result in innovative combination of simplicity and depth. Simplicity is adding more depth to the presented concepts and constructs.

TTA Based Enhanced Electronic Teaching Learning Sequence (TLS)

Nested Structure of TTA Based Instructional Material

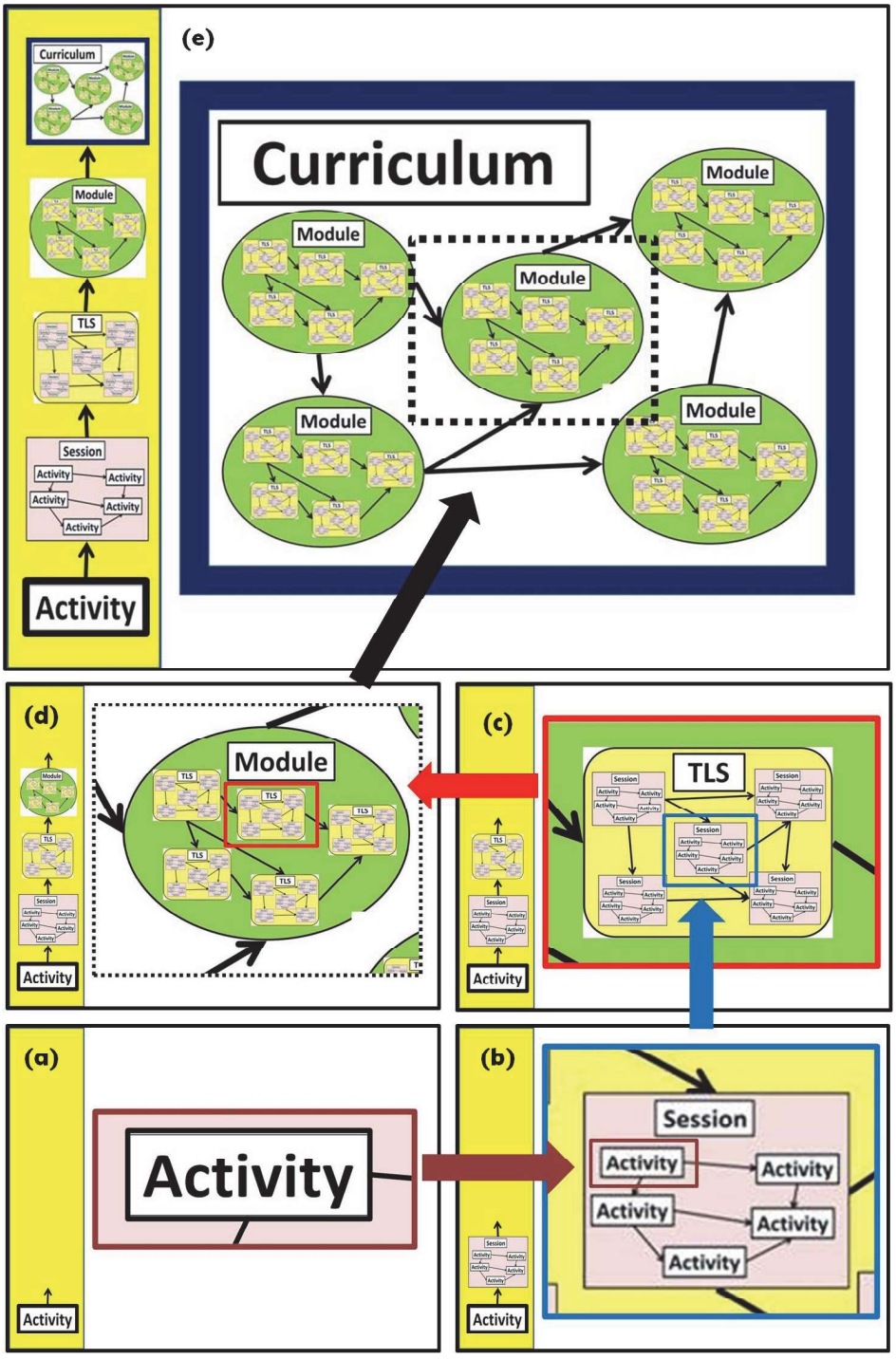
The TTA-based instructional material is built based on a multi-level and nested structure, as illustrated in Figure 33. The smallest element in this structure is a single activity that can be grouped with a group of other activities to create a learning session. A group of learning sessions can be grouped to create a teaching learning sequence (TLS) which in turn can be grouped to create a module. A number of modules is what made a curriculum. This hierarchical structure is helpful in showing the integrative structure of TTA instructional material.

Designing, producing, delivering and validating an experiential module or a curriculum is time and effort consuming due to their big size. On the other hand, using experiential activity or learning session is not appropriate due to their small sizes. TLS is the proper size in the instructional material scale that can be appropriately used to validate a newly developed Instructional Material. Aliedeh, M. A., 2017, designed, produced and validated a solution concentration TLS as a first pilot production of TTA-Based instructional material. SRBF TTA Product Framework is implemented in designing the solution concentration TLS. How SRBF framework is implemented in solution concentration TLS will be briefly described in the following sections (Aliedeh, M. A., 2017).

SRBF Product Framework (F2)

The last and the most important framework that is constructed as a part of TTA solution is SRBF Product Framework, see Figure 34. It is a direct implementation of the growth theme in the production of instructional materials. The practical example that will be described below will clearly show how the growth theme is so effective in guiding the instructional material design and production.

FIGURE 33
NESTED STRUCTURE OF TTA-BASED INSTRUCTIONAL MATERIAL



Storyline "Plot" of Solution Concentration TLS

The conversion between different forms of solution concentration definitions (Molarity, Molality, Mass Fraction, Mole Fraction and Parts Per Million (ppm)) is one of the most important basic topics in Introductory Chemistry and Chemical Engineering courses. Aliedeh, M. A., 2017, introduced this topic to chemical engineering students by building a TTA-based TLS electronic instructional material. The

challenge of building TTA-based Instructional Material is daunting due to the deep and major transformation that traditional content knowledge undergoes. The transformation process is accomplished in four interconnected major steps: (1) Analysis (Chunking) by putting scrambled whole into pieces, (2) Synthesis or Structuring: creating a knowledge map, and (3) Maneuvering: building a visual image of the storyline, and (4) Designing: implementing your route choices based on SRBF framework, as illustrated in Figure 34.

FIGURE 34
SRBF PRODUCTS FRAMEWORK (ALIEDEH, M. A., 2017)

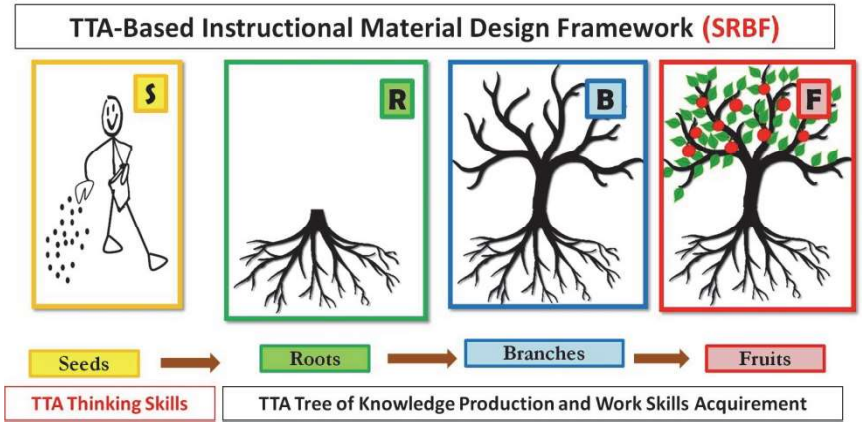
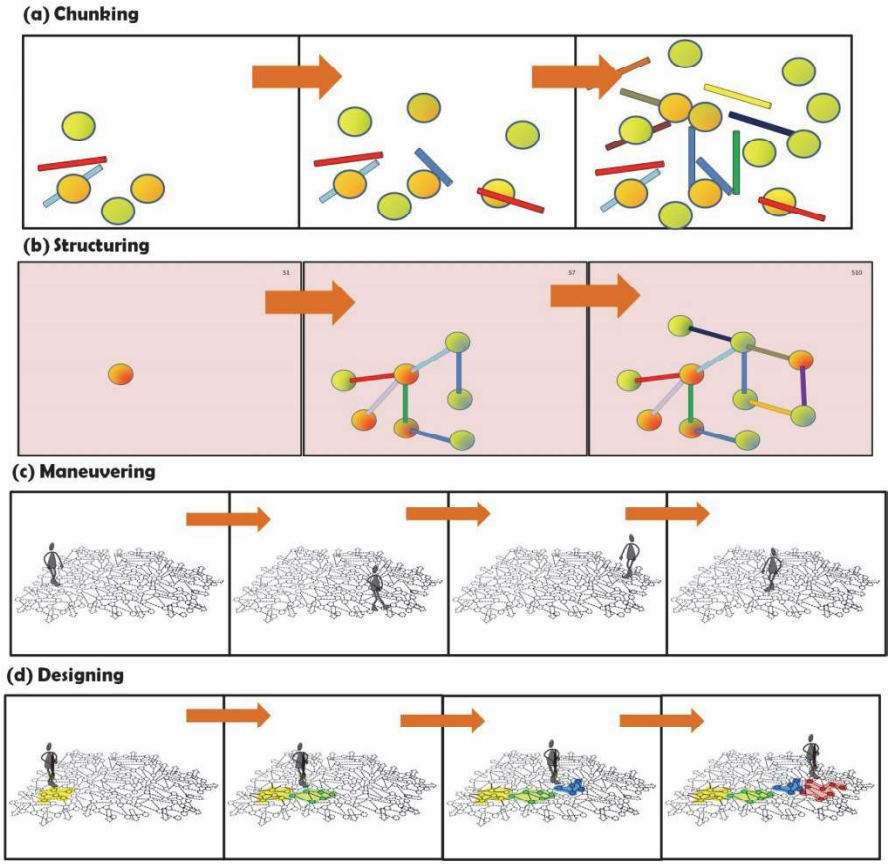
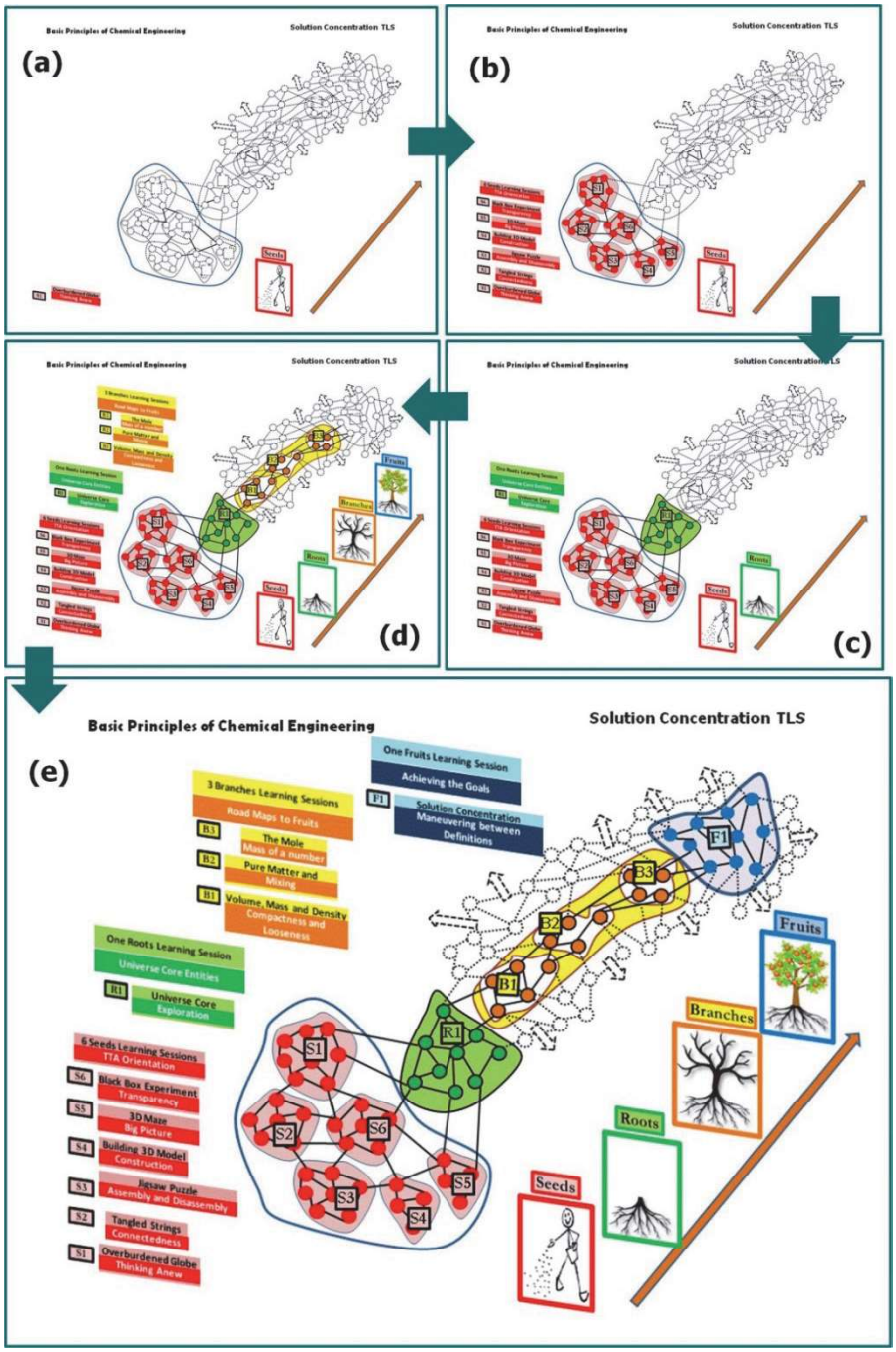


FIGURE 35
TTA-BASED INSTRUCTIONAL MATERIAL TRANSFORMATION PROCESSES



The first transformation step is chunking and it is responsible for fragmenting the targeted content knowledge into small pieces or "chunks", namely getting chunking into the micro scale. Then, the designer has to structure these pieces together (synthesis) to make bigger and bigger structures. This is accomplished in a similar way to the nested structure of the instructional material which is clarified in Figure 33. Then, TTA designer has to maneuver over the knowledge terrains in order to build a vision of the storyline. The fourth and most important step is to transform this vision into a real product, as illustrated in Figure 35.

FIGURE 36
SRBF PRODUCTS FRAMEWORK APPLIED TO SOLUTION CONCENTRATION TLS
(ALIEDEH, M. A., 2017)



Solution Concentration TLS Design

Solution concentration TLS is designed based on SRBF framework as shown in Figure 36. The gradual growth of the story from seeds to fruits is shown in five slides in Figure 36 (a) to (e). This animated presentation will confirm the flow, growth, diffusion of the story from session to the other in the whole TLS structure. As shown slide (e) of Figure 36, Solution concentration TLS design contains: (a) six seeds sessions (S1 to S6), (b) 1 roots session (R1), (c) 3 branches sessions (B1 to B3) and (d) 1 fruits session (F1).

FIGURE 37
SAMPLE SOLUTION CONCENTRATION ELECTRONIC TLS (POWERPOINT FORM)
(ALIEDEH, M. A., 2017)

Seeds sessions aims to introduce the learner to TTA thinking through emphasizing the need to think a new (S1), showing the importance of connectedness by tangled strings (S2), practicing assembly and disassembly through jigsaw puzzle (S3), highlighting the importance of construction by building a 3D model (S4), highlighting the importance of big picture by 3D mazes (S5), and understanding transparency through black experiment shown explained before in this paper (S6).

Roots session (R1) main purpose is to introduce the core universe entities that are considered the starting point for any one needs to go into a knowledge journey. These introduced activities will work as the reference locus for any knowledge traveler to go back to it once he/she feels lost.

Branches three sessions (B1 to B3) aids to bridge the gap between the targeted fruit session knowledge and the core universe entities in the roots session. The first session reviewed the volume, mass and density; the second covered pure and mixed materials and the third discussed the mole concept.

After introducing to the main themes of TTA thinking (S1 to S6), understanding core universe entities (R1) and reviewing volume, mass, density, matter classification, and mole concepts (B1-B3), the learner

will be ready to get introduced by fruits session that aims to cover solution concentration conversion (F1). Sample slides from the PowerPoint presentation of solution concentration TLS is shown in Figure 37 (one sample from each stage). To get a more detailed picture of this designed, delivered and validated Solution Concentration TLS, you can read carefully Aliedeh, M. A., 2017 paper. In this paper, the main enhanced features of this Solution Concentration Electronic TLS will be reviewed as a practical example.

The Enhanced Features of Solution Concentration TLS

The Enhanced features of the Solution Concentration TLS are as follows:

1. *SRBF framework* is employed to accommodate different TLS sessions and activities.
2. *TTA* instructional material has hierarchical (activities, learning session, TLS, module and curriculum)
3. TTA is a thinking based reform approach, therefore the learner is expected to shift to this new way of thinking as a part of understanding TTA-based Enhanced Instructional Material. *Seeds Activities* is allocated to cover this part.
4. Employing the *TTA extended modeling tools* to serve the presented concepts such as storytelling, road maps, knowledge mapping, static graphics, shots of moving picture, color coding, analogy, physical modeling, drama, cartoons, and comics.
5. *Graphical modeling* is given a superior position to verbal modeling. TLS design is looking to visible communication in terms of graphics as the main tool and verbal communication as a subordinate. Videos, graphics and animations are employed.
6. Creating an *entertaining storyline* and a *convincing line of argument* of the TLS supported by graphical outlines and road maps.
7. Analogical graphical models are frequently employed as a practical maneuvering between domains and fields.

TTA instructional Product is Approaching a Generic Form

TTA succeeded in offering a two new products: Enhanced Article and Enhanced Electronic TLS. Both of these products are an implementation of TTA process and tools. TTA generic tools (perspectives, modeling, maneuvering and diagnosis) heavily contributed in enhancing these two forms of instructional materials. Because of the limitations of printed article especially for including motion picture and animation, TTA developer (Aliedeh, M. A.) is planning to present a new product which is called an Enhanced Electronic Article (EArticle), see Figure 38. EArticle will be capable of accommodating static and motion pictures, animations, and any type of interactive graphic in addition to the other TTA enhanced features mentioned above.

The ability to produced Enhanced Electronic TLS with all these integrative features is encouraging to scale-up the successful experience and present an Enhanced EBook, as illustrated in Figure 38. Because TTA is inherently generic approach, a generic form of Enhanced Electronic Instructional Material is approached in which all barriers between forms of instructional materials is diminishing. This new instructional material will accommodate the new TTA features and can be tailored to suit every form (Article, Book, Website, Blog, Brochure …etc.). Maneuvering as the "secret" tool of TTA will make this a reality in the future.

FIGURE 38
VISUAL MAPPING FOR THE EVOLUTION OF TTA INSTRUCTIONAL PRODUCTS

CONCLUSION: INVITATION FOR COLLABORATION

TTA solution succeeded in building an integrative framework of thinking that fruited a thinking process (frameworks and models), thinking tools (Generic Thinking Toolbox) and Pilot thinking products (Enhanced Article and Enhanced Electronic TLS). By this declaration, TTA Knowledge Production Factory is ready to go into educational production. Now, the factory is ready to be put in operation after long and daunting job of feasibility studies and market analysis, process and tools design and construction, start-up and pilot production (Chemical Factory Analogy). As TTA is inherently generic at the seeds level and it is inherently specific at the fruits level. TTA factory is already put in educational operation and in the future, it is expected to see TTA economical, political, and social operations or in generic form development operations. TTA solution has a big dream to change the world and to make this big dream a reality there is a need for collaboration. This paper is an invitation for interested scholars and specialist for collaboration.

REFERENCES

Aliedeh, M. A. (2015a). Call from the south for Transparent Higher Education (THE) Part 1: Transparent Thinking Approach (TTA) Core Conceptual Framework, Journal of Higher Education Theory and Practice, 15(5), 103-130.

Aliedeh, M. A. (2015b). Call from the south for transparent higher education (THE) Part 2: Extended Transparent Thinking Approach (TTA) Conceptual Framework, Journal of Higher Education Theory and Practice, 15(6), 113-140.

Aliedeh, M. A. (2015c). Call from the south for transparent higher education (THE) Part 3: Expanded Transparent Thinking Approach (TTA) Conceptual Framework and its Applications in Math, Science, and Engineering Education, Journal of Higher Education Theory and Practice, 15(7), 121-142.

Aliedeh, M. A. (2016). Customizing Transparent Thinking Approach (TTA) by Building and Implementing TTA Toolboxes: Paving the Road for TTA Operationlization Phase, Journal of Higher Education Theory and Practice, 16(5), 80-108.

Aliedeh, M. A. (2017). "Tasting the Fruits" of Transparent Thinking Approach (TTA) by Developing and Validating a TTA-Based Solution Concentration Teaching-Learning Sequence (TLS): The "Kick-Off" of TTA Operationalization Phase, Journal of Higher Education Theory and Practice, 17(3), 11-44.

Cabrera, D., (2008), System Thinking, Evaluation and Program Planning, 31, p 299-310.

GNM Education Center, "Guardian and Observer advertising: teaching resource from GNM archive", https://www.theguardian.com/gnmeducationcentre/gallery/guardian-and-observer-advertising-teaching-resource-from-gnm-archive

Horsey, David, "No Child Lift Behind" Political Cartoon, originally published on March 5, 2004. http://www.seattlepi.com/davidhorsey/slideshow/David-Horsey-cartoons-March-2004-14739/photo-978866.php