THOUGHT PROCESS-BASED EDUCATION

Book #1 – Coevolution of brain and education

By Min

FIRST EDITION

PonderEd
A novel education consultant and education provider

Publisher: PonderEd Education

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About author

Tongpil Min has Ph.D. in science and had worked in science field for more than 10 years. When his son was diagnosed with high functional autism about 10 years ago, he decided to develop educational method to teach children with autism ever since. But later, he found that the educational methods he had been developing is not just for children with the autism spectrum disorder. It can be applied to anyone since the method is directly tackling the thought process of the brain. As such he decided to publish the series of the thought process-based education booklets to be used as textbooks for the learners who would like to develop their brain power.

Overview

Thought process-based education is a novel teaching and learning method developed by Min from PonderEd. Even though it deals with the same components of educational methods (questions, observation, description, data collection and analysis, writing and presentation), it is completely different from other known methods used in current education systems worldwide. While other conventional education methods focus on the results (knowledge acquired after education), thought process-based education focuses on each step of the thinking process.

In order to understand the difference more clearly, it is necessary to compare the functions and impacts of each teaching and learning method from the thinking process point of view.

1. Understanding-based education

Understanding-based education starts with learning processes based on the results from experiences. For example, if one group member ate a poisonous fruit and got sick or died, other members who witnessed will remember the consequences of eating the fruit. They may also remember the characteristic of the fruit in order to avoid it in the future. As such, individuals increase the chances of survival by understanding the consequences (e.g. death) and recognizing the knowledge (e.g. poisonous). As this learning knowledge by understanding is connected to survival, brains have naturally evolved to increase more knowledge. By realizing the consequences from direct experiences, knowledge can be stored in the brain to sustain life. Therefore, learning to know

with understanding from the experiences is part of the evolutionary processes of the brain to sustain life.

Together with understanding-based learning, there is another brain function evolved simultaneously; that is teaching. The knowledge holder who witnessed the consequences of eating poisonous fruit will attempt to deliver the knowledge to those who did not have the same experience, and this is the teaching process. This will increase the chances of survival of members in the group.

Since the chances of survival are proportional to the amount of knowledge, the human brain has evolved to increase knowledge as much as possible. This increase in knowledge has resulted in an explosion beyond the capacity of the human brain. Although immense knowledge might have brought us all the technologies we see today, the educational field is suffering from an overload of

information. There is much more to learn than the human brain can hold.

In the process of learning and teaching knowledge, the effectiveness of education will increase if the knowledge is directly connected to survival, real-life situations or learners' interests. However, if the educational system forces learners to know and understand knowledge despite their lack of interest, they may have to memorize the knowledge passively to pass through the education systems and would be overwhelmed by the amount of knowledge. In this case, the knowledge won't be retained and utilization of the knowledge cannot be expected.

This is what the understanding-based education is all about, focusing on delivering knowledge with the belief that knowledge is the most essential component to move to the top of the human society pyramid. This is widely adopted throughout education systems worldwide.

However, understanding-based education has direct negative impacts on the development of thought process for both learners and educators.

First, the understanding-based education method inhibits the learner's brain from thinking instead of promoting it. This is because the brain becomes inactivated once it is satisfied with the knowledge learned. In other words, once the brain understands or knows knowledge, the brain will be filled with emotions of satisfaction and lose interest. Then it stops thinking because there is nothing more to explore.

For example, once you learn about gravity in physics, you know the knowledge of gravity (falling) and also understand the consequences (falling apple from a tree). When you see a similar phenomenon such as a pen falling, you could express the phenomenon as 'this is the work of gravity' and may even teach others in the

same way. However, using and teaching knowledge by simply repeating the knowledge learned doesn’t require thought processes because questions, observations, and descriptions are not involved. Namely, the knowing and the using knowledge learned become unconditioned reflex of brain as in a knee-jerk reaction rather than active thought process.

The second impact on learners is that it could make learners become mentally enslaved by the knowledgeable people.

If a person would like to learn from another person who has the knowledge that he/she is looking for, the person has to pay for the learning. Likewise, if the learner upsets the knowledge holder, he/she might not provide what the learner is looking for even with higher payment. In order to learn the knowledge of interest, sometimes, the learner might have to

please and obey the knowledge holder against his/her thought.

For example, let's assume that you want to learn new fishing spots from an experienced person. You will not only need to pay for the information but also need to be careful not to upset the knowledge holder. When the fishing spot is directly related to your living, the enslavement would be greater. Even if you learned the new fishing spots from the experienced person, often your knowledge would be mostly limited to the ones you learned. In the end, the chances for the knowledge seeker to outperform the knowledge holder (the teacher) would be low.

Understanding-based education also has direct impact on educators when evaluating students' progress in school. The primary method educators use to measure students' progress is an exam. Exams show how much knowledge students gained from learning. However, an

examination alone is not enough to evaluate students' thinking skills to meet society's demand to identify thinkers. Thus, writing is added as another layer to measure how well students utilize their knowledge.

Nonetheless, just like an exam, writing cannot reflect students' capability of thinking process as expected due to similarity from knowledge limitation. This is easily observed when writings from students who know little about the topic are compared to writings of students who know more. It is common sense that the less knowledge a group of students know and understand, the higher the similarity in their writings. Even if they have more knowledge, the rate of similarity in writings cannot be expected to drop because the majority of schools use similar content in teaching and there are countless number of students learning similar subjects worldwide. Thus, it wouldn't be surprising that writings of students are similar to one another even though

their writings are original.

Evaluation is a tool for educators to develop methods in teaching to increase the educational outcomes. It can only be effectively done when students' thinking processes are visualized. However, understanding-based education can only be used to rank students based on their knowledge as stated above rather than being used for developing teaching methods.

2. Goal-oriented education

Goal (project)-driven or goal-oriented learning and teaching method is a more evolved form of education than understanding-based education due to increased memory capacity through the brain evolution. The increased memory capacity enables humans to prepare for more distant futures in more proactive ways by predicting using knowledge from past experiences. For example, increased knowledge of winter (when it starts, how long it lasts, when it ends and so on) can promote the brain to automatically set a goal of survival through the coming winter. Then, the brain starts to seek methods for survival during the winter season such as storing food.

The effectiveness of understanding-based education depends on the amount of experiences and so does goal-oriented education.

Therefore, the projects have to be relevant to

real-life cases as the processes and the results can be observed easily to attract learners' attention and interest. If the learners are not interested in the topic, they wouldn't be able to engage in the project proactively which in turn result in poor outcomes.

Setting a goal in goal-oriented education requires not only memories (knowledge) from experiences but also prediction of the future. Once a goal is set by predicting the future from knowledge, the brain starts to develop methods to achieve the goal. Thus, goal-oriented education stimulates the brain to develop thought process which is basically the methodology to find answers to the questions of interest. However, in terms of brain development for thought process, goal-oriented education would work only until the goal is achieved because there wouldn't be rooms left to explore. Thus, to have the brain develop thought process, the

pursuers have to set new goals again and again proactively. Also, goals have to be realistic so that the pursuers can see the results. This is another reason why the projects (goals) have to be related to real-life cases.

Even if the goal-oriented education could work for thought process development, only a few can benefit from it due to the emotions of success or failure. Emotional distress is another result of brain evolution.

Learners tend to be happy, energetic, and cheerful when goals are achieved and these emotions of success encourage learners to work further. However, when they fail to meet their goals, goal-oriented education causes side effects especially for students at school. The failure will make them lose energy, feel depressed and even consider themselves as losers which may force them to give up.

Given the severe competition among the students

and the vast amount of knowledge from various fields that students need to deal with, the likelihood of students achieving their own goals will not be high. In addition, grading systems could stress students even further by visualizing their achievement/failure through GPA or numbers. It is self-evident that students who suffer from these situations have low academic achievement and only a few would be successful. Furthermore, as many students spend time at school without feeling success and driven by instinct of the emotion of success, some may look for compensation in other activities like video games. Video games are designed to have levels with some challenges so that players can feel the emotions of achievements level by level. This could lead them to addiction.

Addition can be treated when they get some external help or their interest turns to other activities. The damages on self-esteem, on the

other hand, might not be easily recovered when failure continues. When someone, for example, invests time, money, and effort in fishing, he/she expects to catch fish (i.e. achieve a goal) of course. If the person keeps fishing but continues failing, he/she would consider the investment a waste. At the same time, he/she may lose confidence in himself/herself.

Similarly, if graduates from schools are not able to achieve what they were looking for, they will probably think that the time, money, and effort they have spent so far have been in vain. If the time lost is the only matter, the person might recover relatively easily. However, the real impact comes from the decision made to pursue the education from the beginning. Since the result shows that the decision was not worthful, it proves that the person had made a wrong judgement from the beginning. Making a wrong judgement reflects that the prediction was not logical or reasonable enough and the failure from

the lack of logical thinking would damage the person’s emotion so deeply. This is one of the biggest barriers to overcome.

At this point, you might already notice that all these issues are arising because education is focusing on the desired results instead of thought processes.

3. Curiosity-based thinking

Strictly speaking, curiosity-based thinking itself is not an educational method as it is not learnable or teachable through education. It is a thought process that creates new concepts by connecting existing concepts based on the questions originating from curiosity. It also requires goals but unlike goal-oriented education, the goal is simply ‘to find answers to the questions out of curiosity’ rather than seeking to achieve goals connected with real-life cases.

For example, Albert Einstein opened a new door in physics by introducing relativity theory. From the thought process point of view, the relativity theory should have been created by connecting and simulating relative relationship among concepts of ‘the speed of the light’, ‘time’, and ‘space’ starting with a question like ‘what would we see if we travel faster than the speed of the

light?’

Curiosity-based thinking is thinking outside the box and creative thinking. As seen from Einstein, he was able to create concept of relativity by breaking out of the knowledge (box) of the speed of the light, space, and time while others simply know and use the knowledge. Thus, the curiosity-based thinking is thinking process of some geniuses. Please note that the words ‘concept’ and ‘knowledge’ used in this book are not the same. The word ‘knowledge’ refers to know, understand and use as in time which we use every day. But the word ‘concept’ includes an additional function which is description of the knowledge (e.g. time comes from rotation of earth).

All humans are born with the potential to think like Einstein as seen in children asking questions out of curiosity.

But, doing curiosity-based thinking is not as easy as Einstein and some geniuses did, even if you are a person full of curiosity. In this thinking process, questions out of curiosity only work as an ignition for brain to find ways to connect two or more dots (concepts). Finding connections, so as to create new concepts, requires a series of thought processes that are composed of questions out of curiosity, observation, description, and experimentation. This method of thinking process cannot be passed on to others because it is neither teachable nor learnable. The fact that there were only a small number of geniuses in human history proves that.

Some attempts such as merging academic departments, making connections among distant subjects like STEAM (Science, Technology, Engineering, Arts, Math) or requiring students to take electives outside their major are being made to support students to develop curiosity-based

thinking in some post-secondary institutions. However, even with these trials, it is still not evident that these methods directly support the development of students' curiosity thinking as it is very rare to find Einstein like geniuses in these days. This implies that education systems can only provide an environment for students to self-develop this type of thinking. Whether a student can develop curiosity-based thinking or not depends entirely on each individual.

4. Thought process-based education

It is very difficult to find answers to questions out of curiosity like ‘why is water transparent?’ because;

1. Those questions often contain more than one concept.
2. Finding answers requires observation and description skills.

As mentioned in curiosity-based thinking, when the ‘questions out of curiosity’ are considered as a starting point of the thought process, like ignition of an engine for an automobile, observation and description are considered as the next step like fuel that makes brain continue to think.

When a question is asked, the brain will work to observe to find answers. As the brain observes and describes, more questions will be generated. Then, the chances to find the answer gradually

increase with a series of thought processes. Without systematic thought processes, the questions will just stay as questions.

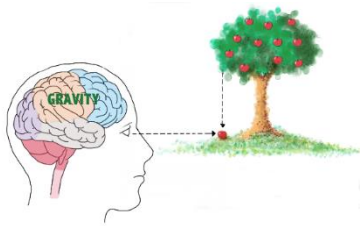
Until now there has been no particular method to educate each step of thought process, so Min from PonderEd has developed a new way of education, thought process-based education.

It is the only method that tackles the brain's thought process directly so that learners can develop thinking skills systematically. The method doesn't stop at the brain power of creating new concepts by making connections of concepts and simulating the relative relationship of concepts connected. It goes to the level of the law of causation which is one more step in the evolved thinking process from curiosity-based thinking. When one reaches to the top level, the person would be able to absorb knowledge and build concepts from others while communicating, explore unknown fields, create

new concepts and develop projects based on own curiosity, and then eventually would have brain power to think without any boundaries.

To repeat the differences, here is an example of dealing with knowledge. When there is a new concept to learn, the conventional educational methods focus on delivering knowledge. For example, when learning about gravity, students might be given with information like ‘gravity is the force that attracts an object toward the center of the earth.’ And students have to understand the knowledge with this given definition. But in thought process-based education, the approach is different. When there is a new knowledge to learn, it starts with questions like ‘what is gravity?’ then changes to the questions to observe like ‘where did I see the phenomenon related to gravity?’ Once the question is changed to observe the phenomenon, the next step is to observe and describe the observation as follows;

‘I see an apple falling from an apple tree toward the earth’ as in the figure on the right. Since the description is



personal observation, the next step is to generalize and define as follows; ‘Gravity is the force pulling (attracting) objects like an apple toward the ground (Earth).’ The resulted definitions of gravity are similar. However, when students build concepts using given knowledge via thought process, the brain has room to expand further unlike simply learning to know and understand. For example, by comparing the physical characteristic differences between an apple (small) and earth (heavier and bigger) with questions, observations, and descriptions, thought process can lead to the point

where you can create newer definition about gravity like ‘The gravity is from the mass differences of two or more objects and smaller objects are attracted toward the center of the bigger object.’

In summary, thought process-based education is to develop brain power to think further and deeper by building concepts with given knowledge while traditional education simply delivers the knowledge to understand and use. As discussed in curiosity-based thinking, Einstein was able to create relativity theory because he was able to deal knowledge like ‘time’ differently from others who simply understand and use.

The thought process is methodology. The methodology can be applied to any topics. Therefore, it is useful for everyone but it would be particularly beneficial for students regardless

their majors or adults who develop projects.

Thought process-based education training: Overview

Level 1: Observation-based building concepts and connecting concepts (Foundation of 'thinking outside the box' and 'creative thinking')

In this level, learners will develop brain power to build concept with knowledge (NOT learning knowledge) and connect to expand concepts.

Level 2: Curiosity-based concept building and connecting using topics that are observable with 5 senses (project development and research) – Training for thinking outside the box!

Starting from questions out of curiosity (e.g. 'why monkeys cannot evolve to human if evolution is really ongoing process?' Or 'why sugar is melting in water?'), learners will develop projects and carry out research to find answers by building and connecting concepts.

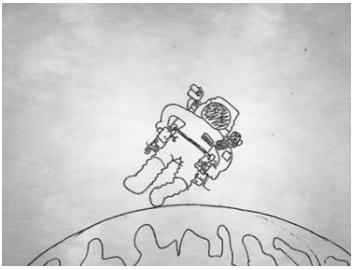
Level 3: Simulation with relativity – Training for creative thinking!

Finding answers to the questions like 'why sugar is melting in water' is relatively easy because the phenomenon is observable with eyes once the learners have gone through the levels 1 and 2. The questions like 'What would we see if we travel faster than the speed of the light?' are more difficult because the brain needs to simulate the relative relationship among the connected concepts that are difficult to detect with five senses and predict what would happen using brain. The brain power of simulation will enable the learners to predict outcomes by simulating phenomena that are difficult to observe with five senses.

Level 4: Simulation out of boundary

Up to level 3, leaners would develop thought process using the concepts that exist (e.g.

gravity, speed of the light, time, space, etc.), even though the concepts are not easily observable. The existence of concepts means that it is still based on the physical laws that we can picture in our brain with some effort. However, simulating without boundary is difficult. For instance, if you have never observed how objects are moving without gravity, it would be almost impossible to picture the phenomenon. Only when you experienced the movement free from gravitational force directly or indirectly, you would be able to picture it relatively easily.



In this level, the thought process training focuses on simulation skills out of boundary by using the law of causation to develop the brain power to think free from any restrictions. For example, high and low concepts (physical concepts as in ‘a

jet is flying high altitude’) exist only because there is gravity. And gravity exists because earth exists. These concepts are easy to understand and know, yet simulating the process is not.

Before moving to level 1 training, use the following method to check your knowledge to see if any of them were built using thought process.

The following method provided by PonderEd is for learners to check each step to confirm whether their learning is using thought process. The method is developed from the law of causation.

Method

Step 1. Choose any simplest topic (detailed method will be provided in concept building method in booklet #2) and ask questions about the definition and describe the best answer to the question from your brain.

Example

Topic: water
Question: What is water?
Description: Water forms lake.

Step 2. Generate **a set of questions** by applying the law of causation on existence.

The questions have to be paired. The rule is; Can B exist if A doesn't exist? / Can A exist if B doesn't exist?

Example

From step1, A = water and B = lake;

Would a lake exist if water doesn’t exist? / Would water exist if a lake doesn’t exist?

Step 3. Analyze

Example

Lakes cannot exist without water. So, the answer is no to the first question.
Water can exist without lakes. So, the answer to the second question is yes.

➔ If any of the answers is NO, it means that the description ‘Water is essential for the life forms’ or ‘Water forms lake’ doesn’t match to the question ‘What is water?’

If the questions and descriptions are not matching each other, it implies that your thinking process is not logical. After applying this method for different topics, and if you have higher number of mismatches, your voice might not be heard by others.

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