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Causality in Social Studies Education

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1. Introduction

Science is a scientific process which uses scientific methods to obtain information, and it studies the facts within their relations, not individually. In this regard, individual facts and objects have no scientific importance. Therefore, science aims at observing and explaining the relations between facts which seem desultory at first (Yildirim, 1998). As a consequence, it can be said that scientific information includes the cause and effect relation. The cause and effect relation can be expressed by causality concept.

2. Historical and philosophical foundations of causality

Causality is usually defined as the relation between cause and effect. There are two terms constituting the causality. These are the terms of cause and effect. Cause can be defined as a thing, a condition or a creative agent-a thing making something emerge thus without its existence it is impossible for this something to exist-that has the capability to change a thing and create a phenomenon or an event (Cevizci, 1999; Akarsu, 1998). In Latin, there are two words which mean cause. The first one is "causa" and the second one is "ratio". Although "ratio" means "mind" or "intelligence" it also means "cause" (Ozcinar, 1997). The Latin usage of this word appears to show a relation between intelligence and cause. It cannot be coincidental that "ratio" means both intelligence and cause in Latin because intelligence everyday runs different activities to answer the word cause. Human curiosity and surprise which are first directed to them and then to the nature also revealed the need for them to be able to explain and understand both themselves and the nature. This need brings various "whys (cause)" along with it, and human mind tries to answer (solve) these questions. Answering the whys, i.e. finding out the consequence, is a mental activity which is a typical example of causality itself. Consequently, causality can be expressed as a principle of reasoning.

Effect, which is the answer of cause, can be expressed in philosophy and science through the terms of impression or result. So effect can be defined as any event resulting from a certain cause, any impression stemming indissolubly from a cause, any fact found out based on a factor or any phrase succeeding a condition which expresses the phrase and a certain result (Cevizci, 1999). By this definition, the emergence of effect can emerge depends on a cause or a condition. However, it can be concluded here that effect/impression expression is a mental process since explaining an expression stating a condition requires a mental activity. Thus causality is the term for the relation between cause and effect. That is to say, causality

is the glue binding entities to each other in time (Denkel, 1996). Causal explanation also entails processes which "accord with reality" to belong to reality, namely; it entails the reality itself to be constituted of process-control (Piaget, 1982).

The fact that no common definition for causality is provided in all scopes of science, and it has been a controversial issue requires the debates to be reviewed only in general terms in order to comprehend it. Aristotle, who classified causality first, distinguished between four types as follows: the material cause (causa materialis), the efficient cause (causa efficiens), the formal cause (causa formalis) and the final cause (causa finalis) (Aristotales, 1985; Yildirim, 1997; Cevizci, 1999). Aristotle's final causality explanation also influenced the Middle Age philosophers and provided the basis for the Middle Age scholastic philosophy. Until the 16th century Aristotle's thoughts were the primary source of reference in solving a scientific problem (Berry, 2003).

Although Aristotle emphasized sense data and founded the sciences of nature by observation, depiction and classification methods, the traditional sciences relying on his thoughts lost their functionality in 17th century. However, human sciences which particularly appeal to imagination became unsatisfactory in the same way as they expressed some contradicting values with uncertain validity (Northrop, 1998). This conception began to disappear during the Renaissance while improvements achieved gave rise to modern philosophy. From the perspective of causality, the idea that the anything which happens in nature depends on a firm causality, is also an output this period (modern ages) (Reichenbach, 1998). In modern philosophy, knowledge came to the forefront, and epistemology was given priority. Arguments about the source of the knowledge introduced two different views, which are the rationalist (intellectual) and the empirical (experientialist) approaches. While rationalism accepts the intelligence as the primary and the only indispensable source of our knowledge, empiricism gives precedence to the senses and the things which can be observed directly (Ozlem, 2003).

Empiricism and rationalism are two key arguments of causality (it is also true in terms of epistemology). Yet those advocating empiricism attribute causality to experiment while those advocating rationalism attribute it to intelligence. Descartes, Leibniz and Spinoza can be remarked as the supporters of rationalism, while Locke, Hume, Hobbes and Berkeley can be remarked as the supporters of empiricism. However, Kant who was a rationalist initially and later influenced by Hume can be remarked as both a rationalist and an empiricist (Ozlem, 2003).

David Hume's and Immanuel's causality explanations constitute significant arguments, and therefore knowledge of the outlines of thereof will be helpful. Hume explained the causality concept and tried to base his explanation upon experimental conscious of causal relationships by utilizing Newton's experimental approach (Cevizci, 1999). He used the words "impressions and ideas" to explain causality, which in modern philosophy appear in the form of sensory experience and concept. He also suggested that all our knowledge derive from impressions (sensory experience) which generate an idea in our minds (Hume, 2000; Denkel, 1996).

According to him, it is not coincidental that our ideas have certain relationships and are connected to each other. He argues that there are some connectives binding our ideas in three ways, i.e. resemblance, contiguity in time or place, and cause or effect (Hume, 2000; Cevizci, 1999).

Hume also suggests that there is a reasoning not based on experiment but on the cause and effect relation which underlies our knowledge of facts. He emphasizes this knowledge emerges by seeing certain objects are constantly conjoined and experienced, or in other words; it emerges empirically (Hume, 1976). In this respect Hume describes eight criteria for cause and effect relation. These are as follows:

1. Cause and effect must be contiguous in sense of time and place.
2. Cause must occur prior to effect.
3. Cause and effect must be constantly connected with each other.
4. The same causes generate the same effects, i.e., the same effect doesn't occur unless there is the same cause. This principle is gained through experiences and mostly derives from our intellectual causality.
5. Several different facts (things) can have the same effect. This must be by the quality of the event which is common among them. However, similar causes imply similar effects; we always attribute this causality to this environment where we find or discover similarity.
6. This principle is formed on the basis of the previous principle. Several different similar effects can differ from each other at the same level or the same way. We have to consider this difference (in respect to irregularity) in causality since similar effects imply similar causes.
7. If the cause in facts increases or decreases, it is accepted as emerging from an integrated effect, or integration of several effects or different parts of the cause, i.e., the presence or absence of the cause is related with the ratio of presence or absence of effect. This necessary connection proves that a certain part, that is the effect, is the cause of the other part. When warmth and happiness (contentment) are exemplified, happiness increases as warmth increases a piece, and vice versa. Again, a certain amount is intended here.
8. A fact which emerges in any time duration and has no effect is not the only cause of the effect. Nevertheless, it must be supported by the other principles. For instance, similar causes are expected to succeed similar effects. It is must be supported by the principle of contiguity in sense of time and place. Yet, it cannot be the sheer cause.

Although Kant seems to be a supporter of rationalist epistemology, in essence, he is both a rationalist and an empiricist since he doesn't fully or absolutely agree the dogmatic views of rationalists also the views of empiricists who try to explain everything by means experiments. He is critical of both views. Thus, his thoughts about causality are both empirical and rationalist (Kant, 2004; Kant, 2006; Gunay, 2004). Kant regards the causality as the beginning of the work for classifying the thoughts (knowledge) and the center of philosophical arguments, and he suggests causality evokes particularly experiencing (Ewing, 1969).

Hume and Kant have different points of view about causality principle. In general terms, Kant is considered as rationalist (intellect), Hume as empiricist. Their causality explanations differ due to the views they represent. Causality is briefly explained here with regards to empirical and rationalist views.

Let us consider two facts which are X and Y. X stands for cause and Y stands for effect (influence, consequence). According to this; the judgment that X is the cause of Y must describe a phenomenal connection observed between X and Y. It means whenever X emerges, Y also emerges. This relation which is an observational subject is a companionship.

Asserting X is the cause of Y means Y always follows X, or X and Y always go with together. In this context causality expression has no further meaning. The relation between X and Y does not express a necessary connection or a tie. As for rationalists, while they do not deny the contribution of observation in causality, they assert observation alone is not sufficient to explain causality and they also suggest existence of something beyond observation, i.e. metaphysical explanation, is necessary. In this sense according to rationalists, causality occurs in two stages. The first stage is observation, and the second stage is necessary connection that is beyond observation. Empiricists criticize the rationalists on the grounds of their metaphysical explanations being non-scientific (Yildirim, 1998; Ozlem, 2003).

As it is understood from these explanations causality, according to empiricists, is an outcome of our experience or habits but according to the rationalists, it is a necessary connection and a result of our prior knowledge which often doesn't rely on experience. In this context, causality is a basic principle that is used in both natural sciences and social sciences (history-sociology, cultural sciences, and spiritual sciences) and also these sciences rely on this principle.

3. Causality in social sciences and social studies

Human's effort to explain and understand themselves first and then the environment they live in lies on the roots of natural and social sciences. Environment refers to natural and social neighborhood since a human being lives as a social being in the natural environment. Having two living spaces, i.e. natural and social, causes the human being to perceive, understand, set up and organize two different environments. Clarifying the nature-related activities is based on a certain systematic, and easier than those which are related with social surrounding. The order of nature is the main factor for this fact. However, the order is at the moment, and as it involves cosmologically a long period it is more usual to define and explain the events with regards to repetition and continuity which involve shorter periods in social events. Thus, it is well known that human life and social facts in antiquity were different from later times. Both human lifestyle and their scientific activities were affected by the properties of the period they lived in. In this regard the first "cause" which emerged with polytheism in antiquity was different from the "cause" seen in monotheism in later periods. However, improvements in science and technology affecting human life in different ways, even faster today, made it more difficult for society-related sciences to systematize the events and phenomena because repetition and continuity decrease in regard to time.

The philosophy of social sciences deals two forms of dualism, i.e. understanding-explaining and cause-meaning, and the scientific efficiency of social sciences will rise in line with the extent to which these two forms are able to be explained. The definition of the term "general" substantially differs in social and natural sciences, therefore the one used in social sciences should be defined first in order to understand them both. The term "general" used in natural sciences is timeless and universal which means having repetition and continuity at a high percentage (covering cosmologically a long period). However, the situation is quite different in social sciences as in most cases events do not re-occur. For instance, the events such as the Independence War of Turkey or French Revolution are unique events, and they cannot occur twice. However these events happened or remained with their inner and peculiar properties. It is not possible for them to re-occur with different properties and consequences, and they can only be comprehended by the aid of their peculiar properties.

Understanding them is only possible by knowing or taking into account all the properties of the period in question. Therefore, in social sciences the term "general" cannot be timeless and universal, which by no means rules out the use of term "general" in social sciences. General is peculiar to that period; it is in its mechanism and often occurs once (Ozlem, 2003; Fay, 2005).

Another characteristic of sciences is revealing to which extent a decisiveness occurs between rules-principles and actions. In social sciences, it is known or should be known that between the rules-principles and actions, there is not an absolute consistency but a contingent, consistency with a percentage. Therefore, there is a contingent causality in social sciences and explanations are deductive as in natural sciences. In this respect, explanations provided by social sciences, which have premises comprised of "meaning related" propositions, require understanding the action first. Thus, the explanation will require describing in which period, how and in which way the thing that is to be explained happened. Then, as the last activity "understanding-action" relation will be considered (Ozlem, 2003).

The term "general" used in social sciences and natural sciences can be described as follows (Ozlem, 2003):

General Peculiar to Social Sciences	**General Peculiar to Natural sciences**
2. It has a time limited (once) validity.	1. It is timeless; that is to say it is always valid.
3. It is artificial (made later).	2. Naturel (It is spontaneous).
4. It is related with the meaning.	3. It is related with the object.

Table 1. General in two science groups (Ozlem, 2003)

When table 1 is reviewed it can be said that social sciences are peculiar to human while natural sciences are peculiar to nature. Keep in mind that the term general related with human is contingent. Since this contingency constitutes the properties of knowledge it means that the causality concept in social sciences will be different from the causality concept in natural sciences. As a matter of fact, natural sciences have been explained through determinist causality for years. This determinist approach (a is the cause of b) was faltered with quantum physics and disappeared. Instead, a probabilistic causality understanding became dominant (instead of a is the cause b, b probably follows a). In this respect causality perception of social sciences and natural sciences seem similar but the properties of timelessness (present), spontaneity, repetition and continuity (with regard to cosmological time) of natural sciences are very limited in social sciences. What made the causality concept differentiate is that natural sciences deal with things unlike social sciences, which deal with human. Therefore, causality is probabilistic in natural sciences but it is contingent in social sciences. It cannot be said that causality concept has been accepted in the same way by the social scientists from past to present. In social sciences, causal explanations focused on the factors which engender cultures and their change, unintended results, functional relations and genealogical origins (Fay, 2005).

Causality relations in social sciences differ from bare coupling principles. According to Fay (2005); "the cause of e is c" is completely different from "c occurred and then e occurred". The fact that c occurred before e doesn't mean c caused e. However, saying that c is the cause of e means c's occurrence is a necessary or sufficient condition for e's occurrence. If e

can occur without c, or if e doesn't occur despite c's occurrence then c is not the cause of e. As it can be understood from this explanation, causal propositions state condition. It is like if c occurs so will e or if c didn't occur nor would e. But to verify such a relation it is necessary to show why e and c are correlated beyond coincidence and in this respect unlike the bare coupling principles, it should explain all the examples of a causal proposition.

It is seen that in social sciences, causal explanations are provided with genetic explanation. Genetic explanations present the explained e event as the last ring of a string of events which engender this. Therefore, such explanations are based on depiction (description) of successive phases which make e. In genetic explanations, there aren't only phases successively put together, that is to say there is not only chronological ordering. It is necessary to show that all phases produce the next phase to finish in the same way like in the aforementioned event. Here, the explanations are stated as "under the conditions of …". This is due to the fact that, in social sciences most events are often once and in genetic explanation of the event, it is stated that the event happened under the conditions of that time and the result of this happening; in other words, its consequence emerged under the conditions of that time (Fay, 2005).

There is a significant relation between causal structure of genetic explanations and their efficiency. According to Fay (2005), standard causality evaluation has been made in the context of language of necessary and sufficient conditions since Mill. Most of the social scientists deal with the concept of causality in this way. According to Mill's analysis, if c is the cause of e, c is the sufficient condition or necessary condition of e. For a causality which is dealt with in the context of necessary and sufficient condition, albeit hidden, the need to refer not only to certain c events but also to a rule which expresses an unchanging functional relation between C (independent variable), which is a class of events and E (dependent variable), which is another class of events, emerges. When Mill's causality thoughts are reviewed, it is found out that the genetic explanations in which certain causal relations are suggested are implicitly based on some general rules. Most of the social scientists do not approve reaching such general rules as there is singularity in social events and it is not explained by any general rule. However, Fay states that Mill, in his own causality explanations, asserts the existence of an absolute general rule in a causal explanation which covers the events that are dealt with.

Davidson (1970) states that causal explanations are heteronymous or homonymic (intrinsic). Homonymic (intrinsic) explanations have the same vocabulary and structure with the basic rule of the explanation. Heteronymous explanations are the explanations which require using completely different terms from its own terms in order to express the rule on which they are based (Fay, 2005).

In social sciences, causal reality has been used to explain the causality. According to this view, the cause of an e event is a basic mechanism which results in e under appropriate conditions. These underlying mechanisms have natural forces, and these forces are causally responsible for partial results. Thus seeking for the causes is not looking for general rules but for such mechanisms (Fay, 2005).

Although there is not an agreement on the causality concept, it is an indispensable concept in explaining social sciences. Causality concept in social studies, which created a study field by using the information produced by social sciences, will be explained again in the same way that social sciences use it. In this sense causality in social sciences and causality in social

studies will be in line with each other. When social information is defined as a field of study (Savage and Armstrond, 1996) comprised of humanistic and social sciences aimed at improving civic skills, it is seen that it involves social sciences such as history, geography, economics, sociology, anthropology, psychology, philosophy, politics and law. In this sense, without further detailing, it is beneficial to address the methodology of history and science of geography and their characteristics related to causality. History and science of geography will be addressed as they have respectively a larger part and more subjects in social studies.

History can be defined as a scope of science, which studies and explains the events related with human within the frame of past-present and future considering the cause-effect relations and grounding it to documents. From this point of view, it is seen that history is founded within the frame of the human being's past, grounding to documents and cause-effect relation concepts. This shows history is directly related with causality. It is also known that every science has its own terminology that is its own language. In this respect questioning the existence of causality concept in the language of history can be necessary. Hence, it will be probable to find causality if the language of history is reviewed. On that account applying to classification of the language of history by Husbands will be appropriate. Husbands categorizes the language of history into four. These are as following:

1. Historical Time Language (era, century, period, Middle Age (Middle time), modern),
2. Language of The Historical Period (cause, chronology, similarity, difference, etc.),
3. Language of Historical Depiction and Analysis (revolution, monarchy, triearchy, democracy, etc.),
4. Language of the Past (special terminology) (demesne, kadi, governor etc.) (Husbands, 1996; Dilek, 2002).

Cause, chronology, similarity and difference expressions in the language of the historical period seem to explain the methodology of history, because while explaining the events history will order (chronology) them from past to present, detect the similar and different aspects thereof and eventually will focus on their causes by depicting what kind of a relation exists between them. Explaining the causes is one of the fundamentals of science of history because according to Carr (2006), history reviews the causes. Historians also continuously need to ask "why" questions in order to reach historical truths (Uzun, 2006). Since the answers to "Whys" bring out the cause and effect, it can be necessary to explain historical events considering this fact. In this sense, the need to determine a historical event's relation with the cause and effect can also emerge. A historical event has a characteristic, that is to say; it is the effect of a former event and the cause of a subsequent event. It is explained in the following example.

Sentence 1: The Armistice of Moudros is a cease fire treaty, concluded on 30th October 1918, between the Ottoman Empire and Allies declaring the war was over.

If the sentence is analyzed; **The Armistice of Moudros** is an **effect** of World War I.

Sentence 2: After the Armistice of Moudros was signed, Mustafa Kemal and his comrades evaluated the situation and set off to Anatolia on 19th May 1919 and started the War of Independence.

If the sentence is analyzed; **The Armistice of Moudros** is the **cause** of starting the War of Independence.

A historical event appears as an effect of a former event and as a cause of a following event. It can be explained in history by causality concept. So we can say that the cause (reason) which exists in the language of history and its questioning in history paved the way for us to reach the causality concept. Therefore, historians cannot neglect the causality principle in history writing.

Voss (1998) stated the difficulty and complexity of apprehension of causality in history, particularly when it is considered in a historical aspect. This view about the complexity derives from the fact that the causes of historical events can be various, that is to say; they can be expressed in different ways.

Another difficulty of historical causality is that history has no control group like life. Events and actions take place only once. It means in order to make a particular effect, setting or detecting some situations, event or actions necessary and/or sufficient should be formed without using experiential ways (Voss, 1998). Explaining historical events and together with presenting the causality will be possible within the uniqueness of the events. After all history is idiographic with this feature.

In social studies, geography is another discipline, which has one of the largest parts with regards to its subjects. Geography, like history, is an application people have been performing for a very long time and with this feature, it is one of the oldest study fields (Gulbenkian Komisyonu, 2005; Ozguc and Tumertekin, 2000). Geography began to renew itself as a discipline substantially in German universities at the late nineteenth century. In this period, geography aimed at filling the gap between natural sciences and human sciences (Gulbenkian Komisyonu, 2005).

Geography with its simplest and the most common meaning is the introduction to the world (Doganay, 1992). Within the frame of our subject, it is possible to find causality in geography in its purpose. Doganay (1992) states that the essential purpose of geographical view accordingly the purpose of geography is; "to study the formation causes and effects of geographical phenomena…". The abovementioned study of causes and effects will lead us to the causality concept. One of the main aims, probably the most important, of geography is to study and reveal the reciprocal relations between human-environment and scientific effects of these relations on human. While doing this it is seen that the two views, i.e. determinism (environmentalist view) and possibilism (humanistic view), have been supported as the methodic approaches in geography since the late nineteenth century till today (Doganay, 1992; Ozguc and Tumertekin, 2000). They cover the causality concept with their context. According to the determinist view, natural environmental factors are dominant on human (society), therefore, while analyzing human-environment relations in geography primarily environmental factors should be focused on in the first place, but according to the opposite possibilist view human is not under the control and hegemony of environment, but the environment is under control and hegemony of humans thesis is supported. It is well known that determinism constitutes the ontological aspect of causality. In other words, it constitutes the deterministic aspect of the nature (natural environment in geography). As a matter of fact, the supporters of determinism in geography primarily accept the natural environment's influence. In this respect, geography methodologically involves the causality concept of geographical.

Various methods are used in Geography. These are rationalism (reasoning), experience (experiment), monocausal and multicausal explanations. The monocausal and multicausal explanations among these also indicate the existence of causality in geography. Although monocausal explanation has an extensive range of application in human and economic geography, it is well known that monocausal events are not common in geography. But multicausal explanations emerged on the basis that various and different factors are influential on social events' occurrence (Gungordu, 1997). Both of these explanations can be expressed through causality.

There are three principles referred to when the basic principles of geography are considered: distribution, interrelationship and dependence, and causality. Researches in geography are carried out or should be carried out considering these three basic principles. The distribution principle expresses the distribution or presence of geographical subjects in a certain field. The interrelationship and dependence principle proposes that all facts and phenomena which are subjects of geography are related with another event or phenomenon. The third principle is causality and can be expressed as everything has a cause (Doganay, 1993).

Causality concept which is a requisite for scientific knowledge has a significant place in social sciences, consequently in social studies. As it is explained above, social studies getting information from many sciences, that is to say, benefiting from many disciplines, integrating this information in an interdisciplinary way emerged the necessity that the information, which constitutes the social studies, should be generated scientifically and have scientific consistency. Social studies curricula which will be created in this sense must be prepared considering this feature. Hence, it can be said that in social studies content curricula, especially that was prepared as a product of constructivism in United States of America, New Zealand, Israel, Canada, Switzerland, Australia and Turkey, has this property.

4. Development of causality in children

When the studies about the development of causality in children are reviewed (De Avila ve Struthers, 1967; Berzonsky, 1971; Fuson, 1976; Stepans and Kuehn, 1985; Schlottmann, 1999; Spiliotopoulou, 2001; Charles, 2003; Inagaki, Hatano and Inagaki, 2006 et al.) it is seen that they are based on the studies made by Piaget. Piaget, (1969) in his work "The Child's Conception of Physical Causality" under the chapter which he named "Causality and Child" states that causality has 17 types in children. The 17 causality types which were determined by Piaget about the development of children's causality concept take place in three main stages. Two of them are precausality while the third stage is real causality. Those causality types are shown in Table 2.

1. Psychological Causality or Causality about Motivation/Stimulation (Psychological Causality/Motivation Type): It is the most primitive type of causality and the most continual of other causality types. Psychological causality is in the precausality stage. In his explanations, a child uses psychological expressions and expressions based on motivation. "God or people send us dreams because we did what we should have done." (Piaget, 1969), "The nightmares are sent to us because we are bad." and "Tomorrow it will rains because someone wants us to be ill." (Charles, 2003). These kinds of sentences are examples for children's such explanations. Piaget thinks that this way of thinking continues for a very long time.

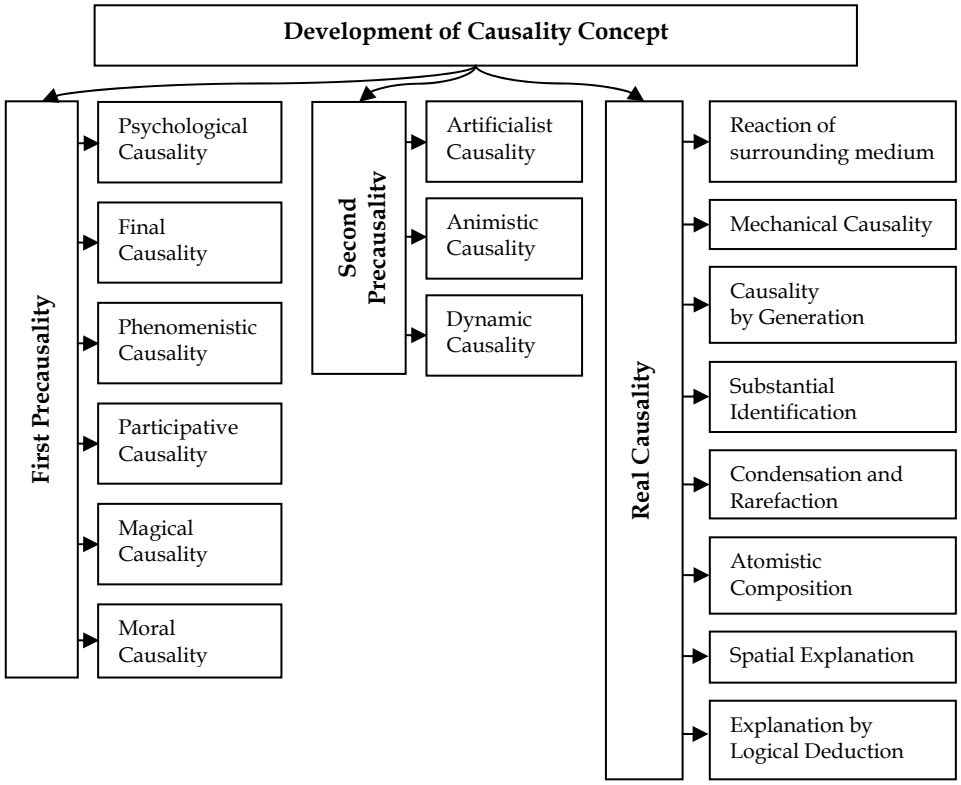

Table 2. Development of causality concept (Piaget, 1969)

2. Consequentalism/Final Causality (Finalism): This type of causality is a successor of the former, and they overlap. However, over time it is separated from the previous one. Children behave thinking that there is an explanation for everything. They make their explanations definite simply by the force of finalism. The sentences "Ducks have web feet to swim better." (Piaget, 1969), "The river flows because it runs to the sea." (Charles, 2003) are examples for children's such explanations.
3. Phenomenisic Causality: This type of causality addresses a relationship between two phenomena to explain events and these phenomena are not related with life at all except their contiguity. In other words, contiguity in time between two phenomena is in such a way that one is mentioned as the cause or the effect of the other (Piaget, 1969).
4. Participative Causality: This type of causality is seen more often than the previous ones, but it disappears after 5-6 years of age. This type's principle is being successive: It is designed between two objects which have similarity or closeness relationship. In this design, the thing which enables them to become above a distance from each other is thought to be common or the source of emerging is accepted as one thing, that is to say, becoming of the first enables the other to become. The following sentence can be mentioned as an example for children's this type of explanations "The air or shadow in a room stem from the air or shadow out of the room" (Piaget, 1969).

5. Magical Causality: This type of causality is comprised of many features of the participative causality. Gestures, thoughts or touchable objects are assigned or associated with impression, and much participation established between these objects emerges. Thus, some words have influence on some objects. Roots of participative causality are related with some instances of logical structures. But participative and magical causalities are more related with psychological causality. The child's own desires are not influential on himself, but they are seen as conditions in his all reality thoughts. In other words, signs of reality are general and this reality is the result of most objects' first complexity between itself and external world. This implies the primitive psychological causality (Piaget, 1969). The following sentence can be an example for children's this type of explanations "Rude words make a person rude." (Charles, 2003).
6. Moral Causality: This type of causality is closely related with the abovementioned causalities. The child explains the presence of any behavior or attribute referred to for requirements, but these are always related to morality, i.e. the view that "things happen because they have to" comes to the foreground: "The clouds must be moved for the night", "People must go to bed in order to sleep", "The ships have to swim, otherwise they can't use anything", etc. (Piaget, 1969).
7. Artificialist Causality: In this type of causality, psychological causality or pre-causality is described in neither sole moral nor physical terms. The descriptions state that both substance and conscious do not play any role in life. The event and object are described first, and then men's activities are designed as objects. In other terms, the descriptions are made through objects and humans' acts (Piaget, 1969).
8. Animistic Causality: In this type of causality, an existing character or form is described by an inherent biological tendency, which is both alive and conscious. Animistic causality defines artificialist causality (Piaget, 1969).
9. Dynamic Causality: In this type of causality, while the vitality of objects belonging to previous period is appropriately eliminated, inherent strengths of activities and behaviors of objects still remain. Thus, there happens a mandatory primitive intellectual confusion with the life itself. Consequentialism lives longer than pre-causality while dynamic causality lives longer than vitality (Piaget, 1969).
10. Reaction of the Surrounding Medium: This is the type of causality where the child for the first time comes up with realistic physical explanations. The movements of objects are described physically, though in a primitive way. There are traces of dynamic causality but no magic, stimulus, intention or mystery in such descriptions (Piaget, 1969).
11. Mechanical Causality: This type of causality emerges in 7-8 years-old children. For children, who previously thought that any movement was driven by two types of forces (internal and external), the internal (the force of the object itself) and the other force gradually turn into a less needed internal force. At this point, the explanation is a mechanic one. Examples of children's such explanations are as follows: "The wind pushes the clouds, pedals power the bicycle" (Piaget, 1969), "A bicycle moves because it has pedals" (Charles, 2003).
12. Causality by Generation: In this type of causality, explanations for movement demonstrate that mechanic causality loses its significance and that explanations for how objects are actually produced are more easily accepted. Explanations through causality

by generation are not independent from previous types of causality (Piaget, 1969). Examples of children's such explanations include "The sun was taken out from a cloud; the clouds are made up of smokes" (Charles, 2003).

13. Substantial Identification: This type is similar to the abovementioned generation type of causality. Children think that objects are not made of other things but come into existence through phases such as burning and melting/boiling. Substantial identification is often seen in 8–10 years-old children (Piaget, 1969). Examples of children's such explanations include "There are many small clouds side-by-side in the sky" (Charles, 2003).
14. Condensation and Rarefaction: This type is characterized by condensation and depressurization (rarefaction) schemes. There are explanations over the substances that form the basic attributes of objects. For example, stone is hard due to the properties of the substances that comprise it, i.e. stone was comprised through the condensation and combination of its components and therefore, it is hard. Some examples of children include "Water is light because it is 'thin' or 'fluid/liquid'", "Wood and stone are heavy because they are 'big', 'thick' and 'full'" (Piaget, 1969).
15. Atomistic Composition: So far, it was thought that objects were formed through condensation or rarefaction of source substances. This process continues inevitably until they are conceived as sooner or later products of particles connected with loose or tight bounds. The child's conclusion on how stones are formed is as follows: "Stones consist of little, tiny stones which are formed by particles on the earth." In other terms, small pieces are joined together and form objects (Piaget, 1969).
16. Spatial Explanation: This type of causality is seen in children over 9-10 years old. And children use advanced forms in their explanations (Piaget, 1969).
17. Explanation by Logical Deduction: This type of causality contains explanations representing the principle of sufficient reason. Principle of logical deduction includes all mechanic, spatial, atomistic, etc. explanations. Therefore, this period covers 10–11 years and onwards (Piaget, 1969).

The concept of causality develops through overlapped and sequential processes. Piaget determined seventeen types of causality in this development and divided these seventeen types of causality into three main stages. He called the first two as precausality while he called the last one as real causality. He stated that the last stage is reached by 11-12 years-old children. According to Piaget (2007a), there are types of causality as well as types and grades of awareness. In cases where the child acts as if he knows that "one thing is caused by another" or that something caused another; we come across with a primitive type of causal relationship or the functional equivalent of causality even when children are not aware of causality. Later, when the same child becomes aware of the relationship in question, this awareness may emerge in several different types -i.e. spirited, artificialist, finalism, mechanic and dynamic, etc.- as it fits to the needs and interests of that moment. Therefore, the succession of these types never occurs in a definitive stage order. The relationship types used by the adults and the wise are also temporary as the types used before by the child and the primitive.

5. Instructional elements of causality

In order to explain the causality term and determine the development levels of students, identifying the context of this term and forming other main terms may be needed. Causality

can be defined as the cause and effect relation between the event, phenomenon and objects. Cause defines event, phenomenon and object's being, as to effect it defines the result, effect that this being presents (emerges). In this context, when it is instructionally viewed causality falls into two parts: Determining the causes and finding out the effects. Determining the causes may refer to deduction, finding out the effects may refer to induction. This may require the collocation of deduction and induction, which is hypothetical-deduction. However, Aristotales (1989) viewed scientific explanation relying on causality. He formed a connection between causality and scientific explanation, thus there existences a relation between process, scientific process skills and causality. Scientific process skills are, in general terms, discussed in three categories. These categories and sub-categories are as follows:

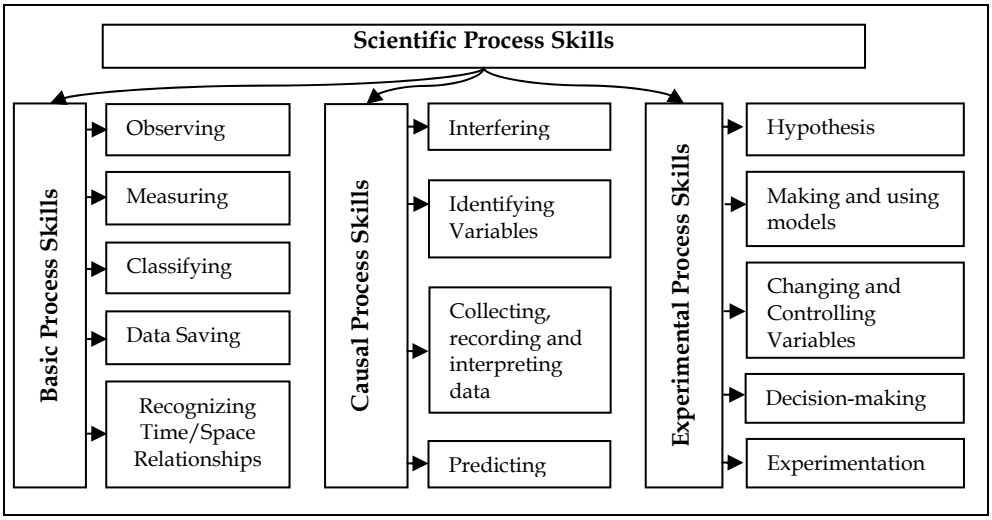

Table 3. Scientific process skills (Cilenti, 1985; Ayas et al., 1997; Turgut et al., 1997; Akdeniz, 2005)

Scientific process skills consist of basic process skills, causal process skills and experimental process skills. Among these skills, the classification skill, relating skill and deduction skill are the skills that can be directly used to determine the education and development of causality concept. However, all scientific process skills are closely related to causality. In this respect, when both scientific process skills and hypothetic-deductive reasoning are considered together, the educational components of the concept of causality can be determined as shown below:

The educational components of the causality concept are as follows:

1. Defining,
2. Relating,
3. Sorting,
4. Classification,
5. Change and Continuity,
6. Determining the Causes (Deduction),
7. Reasoning (Induction).

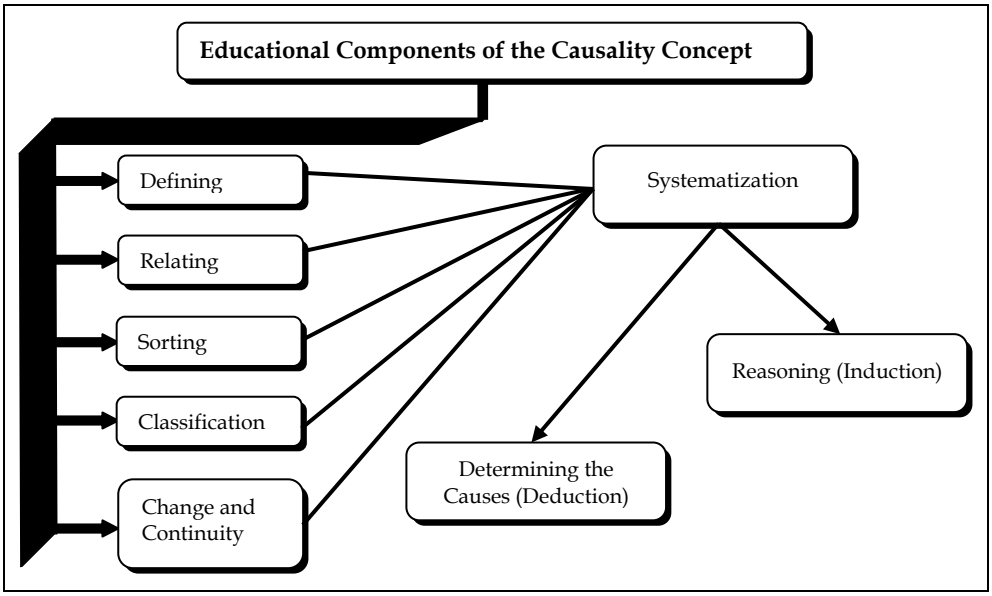

Table 4. Educational components of the causality concept (Tay, 2007; Tay, 2011)

These concepts have their specific properties, yet they complete each other. While the first four of abovementioned skills comprise the main factors in understanding and forming causality, the change and continuity element surrounds these four concepts and thus the concept of causality. A good comprehension of the causality concept could be achieved by systematizing these four elements along with change and continuity, determining causes in some cases through this systematization, deducing the outcomes in some cases and promoting both of them in some cases. In this respect, children should be provided with these skills in order to enable them to develop, improve and utilize the concept of causality. These skills are described briefly in the following sections.

5.1 Defining

The scientific method is defined as both an action-based (phenomenal) and mental (descriptive) process which encompasses the ways to describe and explain the universe (Ozlem, 2003). Accordingly, the existence of scientific knowledge is made possible by defining this knowledge. The defining process reveals the existence of knowledge, and once the knowledge is defined, it can be included into the group(s) it belongs to. Defining operationally is important (Cilenti, 1985). As a matter of fact, the ability to draw-up operational definitions, which is one of the scientific process skills, indicates that. In this respect, since the ability to draw-up operational definitions represents the ways to observe and measure any given variable, defining process is the first step in determining the causal relationship between two objects, phenomena and events. Whether the definition is operational or not is an important property as it affects the meaning of that definition. When the defining process is carried out in general terms but not in operational terms, this might

lead to formation of wrong causal relationships. For instance, if we consider capitulation in general terms, we cannot establish a correct relationship between the capitulations given to the French by the Ottoman Empire and what it intended to achieve. For that reason, definitions should be operational.

Defining start with the children's "to….." words towards the ages of 5 or six. For example, the sentence "a table to write on" can be exemplified. The eye catching point in the sentence is that the definition is operational (Piaget, 2004). Children begin to make first logical defining when they 7-8 years-old and they will not have the ability to make surrounding definitions until they are 11-12 years-old.

5.2 Relating (resemblance, analogy)

Relation is the connection which the newly getting formed thought assumes it has found between two new thoughts, two beings or two facts; by this thought these beings or the facts can closely resemble, influence each other, although there is not a perceivable causal participation.

Environment has a significant influence on the development of child's relation thought. Hence at the beginning stage, the baby's life cannot be thought apart from the mother's life. The baby's basic requests and needs end up with the mother's or the indirect environment's response. The extension of the baby's each crying is an activity of the mother-father and even his desires which are never mentioned are always foreseen. Briefly, although the small child cannot distinguish exactly his own activities from the external activities, in this sense, there is a sheer continuity between the mother-father's lives and personal activity. This continuity influences the development of relation thought in child (Piaget, 2005). Children begin to understand many of the concrete and abstract relations at the preschool stage. While concrete relations can be perceived through the senses, the abstract relations should be designed in thought. In other words, connecting will be possible as much as the abstract relations are concretized. In connecting activities of preschool children concretization should be benefited from, since at this stage they are bad at establishing the cause and effect relations (Gander and Gardiner, 2004).

The child begins to understand the relations between the concrete objects and conditions as he begins to see better in which way the people and ideas are similar and different. This fact is the first necessary step for the child to understand and create these concepts, and make generalizations with these concepts (Karadeniz, 2002).

According to Hume, our ideas being in relation and connected to each other in certain ways is not coincidental. Hume states that there are some connective bonds which tie our ideas to each other in some certain aspects. According to this, these ideas connect to each other when they have some certain properties. These properties are three according to Hume: similarity, continuity in time or place and cause-effect relation.

According to Claparède the likening conscious in child (that is understanding the similarity between two objects) emerges long after the differentiating conscious (that is after understanding the differences between two objects). It means that children use similarity without deep thinking. Therefore, development of similarity conscious requires becoming

conscious. Becoming conscious comes true when there is inconsistency (Piaget, 2007b). In this context and therefore, it may be better to develop the relation skills by inconsistency, in other terms by differences.

According to the child's mental development, the child's relating ability in intuitive stage has a way of sensing which derives from evaluating all perceptional qualities of designed collection without needing to examine the relation between the objects (Piaget, 2004) therefore it is sublevel. In concrete operational stage the child establishes valid relations between the objects he observes, in formal operational stage his relating skill completes its development and becomes able to do the relating without considering whether concrete or abstract (Charles, 2003).

5.3 Ordering

The ability of arranging a set of elements according a certain relation is ordering. Piaget called this conceptual ability as "seriation". This ability starts developing at preschool stage, the child's ordering ability of objects according to weight, size or other quantitative properties develops and matures at concrete operational stage and fully develops at formal operational stage (Gander and Gardiner, 2004; Karadeniz, 2002). Ordering ability is one of the scientific thinking abilities according to (Akt. Arslan and Tertemiz, 2004).

Ordering ability includes ordering the events, facts and objects with respect to a property determined among these. When it is viewed in context of causality presenting the causality between two events might be closely related with the order of the events. Here, this ordering is usually related with before event and after event. For example, to present the existence of the causal relationship between two events which took place in history, it is needed to know which happened before and which happened later. In the same way in geographical events, it is also needed.

5.4 Classification

It is the process of grouping the objects, facts or events in respect to their relations with each other and properties determined as results of observation. Doing a good classification depends on having observed the properties of objects, facts and events and their relations with each other well (Cilenti, 1985).

Classification that is one of the skills in basic process categories of scientific process skills is an induction (generalization). Our brain gradually organizes the information by grouping, according to similarities or differences, all the living or nonliving; concrete or abstract concepts which we perceive by our organs or have through our mental skills. To distinguish between the concepts by comparing we need to have distinctive information about them. In this sense, it requires specifying the borders of concepts and identifying them considering their basic distinctive properties. Neglecting this property of identification might cause incorrect concepts, in other words, misconceptions (Erbas and others., 2005). Doing the identification properly is the prior condition of doing a proper classification.

There are two elements in an efficient classification process. One of them is the power of learning the figures; it requires considering all related perceptual properties of a group of

objects, knowing the meanings of the words and keeping them in mind. The other one is the power of organizing the perceptions; it requires using the logical principles in grouping process. According to Piaget, learning the figures gains importance in developing concepts. According to Vygotsky, these two powers are always in an interaction. Knowledge about the meanings of the words reflects the power of organizing the information related with the objects. The information is managed by the classification power. In other words, a person who is deficient in the perceptions related with the objects cannot classify efficiently. An individual whose power of selecting and applying certain principles lacks is unsuccessful in an inefficient classification, even if he has substantial perceptions about the objects (Karadeniz, 2002).

In intuitive stage, classification skill improves from the deficient grouping state towards an efficient grouping skill in accordance with the child's mental development, in concrete and formal operational stage this skill improves with its all aspects and becomes able to test, make explanations conforming to the logical law and make regressions (Charles, 2003). Skill of grouping the objects according to a certain common feature can be stated as classification. According to Ginsburg and Opper (1965), children in concrete operational stage can classify according to many levels of conceptual hierarchy as long as the objects are concrete and not imaginary (Akt. Gander and Gardiner, 2004).

5.5 Change and continuity

Positive or negative conditions which the events, facts or objects had over time can be called as change. As for continuity, it means events, facts and objects protecting their existence in the course of time in other words, it means their continuity. Change and continuity can be the condition or continuity of events, facts and objects in the course of time. When it is viewed from the point of causality, establishing the causal relation correctly between the two things can require knowing the conditions and continuity of the two things in the course of time. Thus, children's ability of establishing causal relations is closely related with this change or continuity perception or skills development. According to Sunal (1981), the starting point of change concept is the differences. First, the differences should be introduced to the children and these differences should be observed by the children. According to him, change cannot be identified unless they are observed. Three categories are important for change. These are observation, discussion and recording (Sunal, 1981). Schlotmann (1999), states that there is a natural connection between continuity and children's understanding the causality. This indicates continuity concept is a significant in understanding the causality.

5.6 Identifying the causes (deduction)

The Child performs very little reasoning and it is performed especially on rare and special instances because of the difficulties in being aware of own thoughts. He finds all kinds of deductions, as generalization and effect, difficult. He puts successive judgments side by side instead of connecting them. Thus, there is no internal pressure or necessity on his thoughts. Even when the child starts making generalizations and deductions he remains unfamiliar with the formal deduction because of failing in getting out of personal beliefs and reasoning on a hypothesis put forward by others (Piaget, 2007b).

Before the ages 7-8 even until the ages 11-12 at which deduction completely rises, the whole structure of the child's reasoning is as following: The child reasons on individual or special instances and doesn't look for whether there is a contradiction between these. These individual or special instances constitute the conscious experiences which are not reflectional yet (Piaget, 2007b).

5.7 Concluding

The method which goes to the common from the single, special one and reaches general propositions from facts one after another is called induction (Akarsu, 1998). Induction might mean reaching a conclusion, because there is reaching to a whole, in other words, to a conclusion from facts one after another. In this regard, reaching a conclusion includes effect (influence, consequence) which is one of the two main categories of the causality concept.

In children, induction or deduction take place in the stage of "explanations conforming logical law". The explanations in this stage increase in most of the children about at the ages of eleven-twelve. That is to say in children, logical thinking includes induction (generalizations and observations are made) and deduction (results obtained through the process of reaching a conclusion by comparing) (Charles, 2003).

6. Conclusion

The relation between cause and effect is the most general definition of causality. Empiricists regard causality as an outcome of our experience or habits, but according to rationalists, it is a necessary connection and a result of our priori knowledge which is often independent of experience. In this context, causality, used in both sciences, is one of the basic principles that nature-related and social sciences are based on.

In social sciences, there is a contingent and percentile consistency between rules, principles and actions, not an absolute consistency. Hence, in social sciences all the descriptions should be made considering that there is a contingent consistency. In an educational curriculum, the information produced by social sciences is instructed through mono disciplinary, multidisciplinary or interdisciplinary approaches. Conceiving a cause and effect relation is one of the skills that the students are supposed to attain in social sciences lesson which is constituted on the basis of multi-disciplinary and interdisciplinary approaches. Having the students to attain this skill may require dealing with causality educationally. In educational point of view, causality comprises the skills of defining, relating, sorting, classifying, change and continuity, determining the causes, and reasoning. Students' development stages and accordingly their mental development level are important in teaching these skills. Properties of children's intuitive, concrete and formal operational stages should be taken into consideration when teaching the causality concept and related skills, until they reach the logical thinking stage.

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