Chapter 7
Social Learning Theory—Albert Bandura

Anwar Rumjaun and Fawzia Narod

We human beings are social beings. We come into the world as the result of others' actions. We survive here in dependence on others. Whether we like it or not, there is hardly a moment of our lives when we do not benefit from others' activities. For this reason, it is hardly surprising that most of our happiness arises in the context of our relationships with others.
—Dalai Lama XIV.

Introduction

From the above quote, it is evident that interactions with others play an important role in our lives as social beings. As early as the conception of a being (the formation of zygote) in the mother's body, the zygote is dependent on the mother for growth and development to become a full-fledged baby. Even the initial informal learning of toddlers and pre-school children start through their interactions with others like identifying their body parts, their parents, and siblings. It is thus not surprising that researchers trying to understand about learning have put forward theories which are based upon learners' interactions with other people—teachers, peers, parents, and siblings among others.

Such theories include the Vygotsky's Social Development theory, also called Vygotsky's Sociocultural theory, (Chen, 2015; John-Steiner & Mahn, 1996; McDevitt & Ormrod, 2002; Ormrod, 2008), and the Bandura's Social Learning Theory (Jarvis, Holford, & Griffin, 2003), among others. According to Vygotsky's theory, cognitive development is dependent on the child's social and cultural environments and as such interactions with others impact learning and cognition as would be elaborated in Chap. 19.

A. Rumjaun (✉) · F. Narod
Department of Science Education, Mauritius Institute of Education, Moka, Mauritius
e-mail: a.rumjaun@mie.ac.mu

F. Narod
e-mail: f.narod@mie.ac.mu

B. Akpan and T. Kennedy (eds.), *Science Education in Theory and Practice*,
Springer Texts in Education, https://doi.org/10.1007/978-3-030-43620-9_7

On the other hand, Bandura's Social Learning Theory postulates that people learn from each other through observation and modeling. His theory is often referred to as a junction or bridge between cognitive and behaviorist theories (McLeod, 2016). According to his theory, learning is based on a social behavioral approach—people learn from others (social element) by observing and modeling their behavior (behaviorist approach), but Bandura also brings into picture cognitive processes to explain learning. He proposes observational learning as opposed to direct imitation: people learn by observing others' behavior, but their cognitive processes or internal mental states will determine whether they will "imitate" the behavior or not (Boundless Psychology, 2016).

This chapter seeks to document SLT in its historical and educational perspectives. It also discusses the importance of the theory and its relevance in relation to current educational debates and reforms occurring worldwide. Drawing from current practices, the chapter furthermore emphasizes the relevance of the theory in supporting the teaching and learning of science and analyses to what extent the twenty-first-century science curriculum reconciles itself with SLT (Bandura, 1977). Some ideas and examples of science teaching and learning using SLT will also be provided. Finally, the chapter seeks to provide a critical lens of embedding SLT in science classes including the issues and challenges thereof.

Historical Perspective of the Social Learning Theory

The origin of the Social Learning Theory can be traced back to the work of Miller and Dollard (1941; Culatta, 2015; Huitt & Monetti, 2008), who made an attempt "to develop a theory that would encompass psychodynamic theory, learning theory, and the influence of sociocultural factors" (Kelland, 2015). Using the Hull's stimulus-response theory of learning, Miller and Dollard (1941) postulated that motivation and need could lead people to learn particular behaviors through observations and imitations; this is positively reinforced through social interactions (Kelland, 2015). Later, Rotter stretched the behaviorist theories and studied personality as an interaction between the individual and the environment (Kelland, 2015); this was viewed as the first step to cognitive approaches to learning. Rotter's work thus hinted that learning is also dependent on cognitive factors (Willard, 2015). In addition, Chomsky (1959) believed that the stimulus-response behaviorist theories alone were not sufficient to explain language acquisition, invoking some "unknown cognitive mechanism" to help people acquire language. The works of both Rotter and Chomsky were thus the first attempts to show that behaviorist approaches were not strong enough to explain learning; they believed that cognitive factors also played a role in people's learning (Kelland, 2015; Kihlstrom, 2014; Stone, 1998; Wikipedia, 2017).

Dollard and Miller based themselves on the Hullian Theory (Kelland, 2015) and Rotter made an attempt to explain learning from "generalized expectancies of reinforcement and internal/ external locus of control (self-initiated change versus change influenced by others)" by examining cognitive social learning (Kelland, 2015; Stone, 1998). However, only Bandura was able to establish social learning as a theory stepping away from the long-acclaimed behaviorist approaches (Kihlstrom, 2014). Even though Bandura placed great focus on cognitive aspects, he was of the view that cognitive development alone could not explain behavioral changes and believed that people can learn by watching and observing others (referred to as "observational learning" or "modeling"; Huitt & Monetti, 2008; Kelland, 2015). Indeed, by analyzing the ways in which people function cognitively on their social experiences and the influences of the latter on behavior and development, Bandura put forward his Social Learning Theory. This theory was a pioneering one in that it was the first one to include "modeling" or "vicarious learning" as a form of social learning (Kelland, 2015). The origin of his theory was also based on his famous Bobo doll study which clearly highlighted the importance of modeling on behavior. This study showed that children who watched a film showing adults mistreating and aggressive toward a Bobo doll, displayed similar aggressive behavior with the Bobo doll when placed in a room with toys including the doll (Huitt & Monetti, 2008). Nevertheless, though Bandura acknowledged the importance of modeling and reinforcement in learning social skills, he also reported children's predisposition to imitate others of higher prestige or status (e.g., parents, teachers, and national figures). According to Fontana (1995), Bandura's theories are referred to as social learning theories because "they suggest that social contact in itself produces learning."

Essential Features of the Social Learning Theory—Observational Learning and Modeling

Let us now focus on the educational perspective of Bandura's Social Learning Theory and its applications. Two important aspects of the Social Learning Theory include observational learning and modeling (also called vicarious learning; Edinyang, 2016; Kelland, 2015). As far as observational learning is concerned, it does not limit itself to observing a *live model* (another person displaying or acting the behavior), but it can also involve a "verbal instructional" model (descriptions and explanations of the behavior) or a" symbolic" model (children observing characters demonstrating the behavior in books, films, television or other media; Kelland, 2015). The term modeling in the Social Learning Theory can either imply the model demonstrating the behavior for the learner or the learner observing and imitating the displayed behavior (Ormrod, 2008). Distinction has also been made between the terms "imitation" and "modeling" in the SLT (Edinyang, 2016). The ability of the learner to reproduce or replicate the behavior which has been observed again and again is referred to as imitation, while modeling is a more complex process involving four important steps to ensure effective observational learning according to SLT. The four steps in the modeling process comprise attention, retention, reproduction (also referred to as production by some authors) and motivation as illustrated in Fig. 7.1. If any one of these steps is missing, observational learning and modeling will not take place.

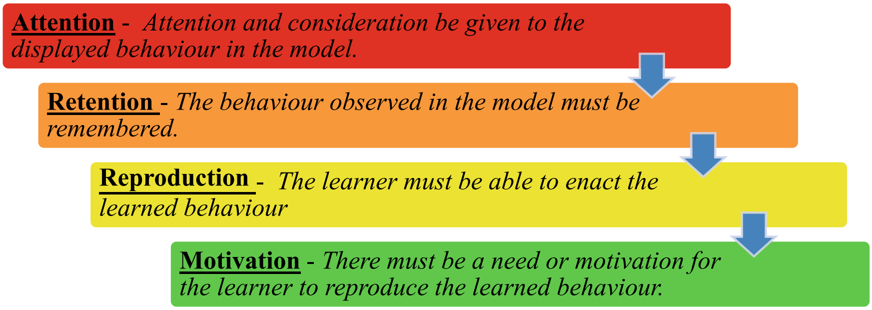

Fig. 7.1 Observational learning and the modeling process

The learner must pay attention to the model for observational learning to take place. Observing a model without any particular attention is unlikely to result in learning. Further, the information must be stored and remembered (retention). This implies that when required, the learner must be able to retrieve the information and re-enact or reproduce the observed and learned behavior (reproduction). Last but not least, to complete the modeling process the need for reproducing the observed and learned behavior must be felt by the learner. In other words, there must be a stimulus or a reason (motivation) for the learner to reproduce the observed behavior. The motivation can be in the form of reinforcement or punishment. Thus, this motivational aspect of the SLT is regarded as the most important factor that would drive the learner to perform the learned behavior. Sternberg and Williams (2009) have reported three types of reinforcement, namely:

(i) direct reinforcement which involves rewarding the person for enacting or modeling the learned behavior.
(ii) vicarious reinforcement occurs when the learners are motivated by observing the model being rewarded on displaying the behavior.
(iii) self-reinforcement which implies the learners rewarding themselves for enacting the learned behavior.

The latter type of reinforcement is reported to encourage "self-regulation".

Implications of the Social Learning Theory on Science Education

As highlighted earlier in this chapter, Bandura's Social Learning Theory stresses a lot on cognitive concepts and is considered a bridge between behaviorist and cognitive approaches to learning. Indeed, Bandura believes that modeling will not occur without the learners engaging themselves cognitively by paying attention to the model or without an incentive. With this first leap toward cognitivism, the Social Learning Theory has important implications on science education as elaborated below.

Different definitions have been attributed to science; nevertheless, most of them lay emphasis on "observation" as an important aspect of science. For example, according to the English Oxford living dictionaries (2017), science is defined as "The intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment." In addition, learning science is reported to be essential to prepare twenty-first-century learners into responsible citizens who would not only be capable of understanding their world but would also function effectively in the science-driven world both at the personal and professional levels (Science Education for Responsible Citizenship, 2015; Ministry of Education, 2008). In view of the above, it can be seen that science acknowledges the importance of observation to gain knowledge and understanding and that science education has an important contribution in preparing learners for their roles as social beings. On the other hand, Bandura's Social Learning Theory puts forward that children can acquire and enact behaviors from hierarchically important individuals (models) in society through observation and modelling. Thus, in such a learning scenario as presented by Bandura, it is only natural to expect that his theory would have interesting and positive implications on science education. In view of the above, the SLT is expected to contribute positively to learners both in terms of science learning and in preparing them as twenty-first-century citizens. First, engaging learners in observation of their natural environment and its components as from the early years can be instrumental in arousing interest in the learning of science and in developing the right attitude toward the environment. This would, in turn, enhance conceptual understanding of science as an increase in interest will impact positively on student motivation and learning. Second, increased interest in science and enhanced conceptual understanding would promote awareness and understanding of the applications of science in real-life situations thereby preparing learners to perform effectively as twenty-first-century citizens.

Given that learning science involves the acquisition and development of necessary inquiry skills and processes, it is thus important for science educators to ensure that they display these skills correctly during the science lessons. Furthermore, practical work is an integral part of science and requires the proper and safe handling of various apparatus and measuring instruments by learners. It cannot be denied then that SLT can play a crucial role in science learning as it lays emphasis on learning through observation and modeling by learning. Indeed, continually observing and paying attention to how science educators and/or more abled peers display these skills correctly would enable learners to embrace (retain) and enact (reproduce) them as and when required (motivation) in line with the SLT. Science educators should thus aim at being "worthy" models for their learners by virtue of their role and also by virtue of their hierarchical position as Bandura asserts that children are more likely to observe and imbibe behaviors exhibited by individuals who are higher in status than themselves.

Problem-solving skills are considered to be essential for all citizens of the modern and increasingly complex scientifically-driven world. Thus, development of problem-solving skills among our learners is imperative to prepare them for their role as future responsible citizens (Mukhopadhyay, 2013; Wismath, Orr, & Zhong, 2014).

Though various definitions have been attributed to problem-solving, it is generally acknowledged that problem-solving is a process that involves several clearly-defined steps to be followed in the right order (Facione, 2007). It is often asked how science educators can promote the development of problem-solving skills among learners (Wismath, Orr, & Zhong, 2014), given skills cannot be taught directly. In this context, Bandura's Social Learning Theory can have positive implications for helping science educators to promote the development of problem-solving skills among their learners. Applying the Social Learning Theory, science educators need to present students with problem-solving situations—the Educators then clearly work out the steps to solve the problems in the classrooms. In so doing, Educators would be "modeling" the desired behavior for solving problems and thus helping students to learn and replicate the behavior as and when required. Furthermore, Educators can also model the correct problem-solving behavior by making use of problem-solving as an instructional method. Being regularly exposed to such problem-solving behavior as displayed by science educators would allow students to observe, retain and re-enact their roles as problem-solvers when motivated as claimed by Bandura's Social Learning Theory. As far as problem-solving is concerned, the SLT can be applied both in the cases of solving mathematical problems in science and in proposing solutions for science-related real-life problems such as global warming and the provision of pure safe water. Science educators need to clearly model out how they work the mathematical problems or how they carry out the step-wise procedures to propose solutions to science-related problems so that students can develop such problem-solving skills through observation, retention, and reproduction.

At this stage, it needs to be highlighted that we have considered science educators as ***"live models"*** to discuss the implications of the Social Learning Theory on science education. However, we would also like to argue here that both ***"verbal instructional models"*** and ***"symbolic models"*** are equally pertinent to science education. As highlighted above, verbal instructional models include people who explain and describe the desired behavior—they do not actually perform the behavior. Science educators therefore also represent verbal instructional models when they actually explain concepts, skills, and attitudes pertaining to science. In the same line of thought, science educators also act as verbal instructional models to help learners recognize when to invoke these concepts, skills, and attitudes, how to apply and reproduce them correctly in the event of an appropriate stimulus (motivation).

Symbolic models can also have positive implications on science education. Let us now consider some ways in which symbolic models can be applied in science education as postulated by the Social Learning Theory. Symbolic models include fictitious or real characters in textbooks, novels, movies, cartoons, television programs or other media sources displaying certain types of behaviors that can be observed and modeled. Encouraging children to read about the lives and discoveries of renowned scientists (symbolic models) can enhance their interest in science and support the acquisition of the right disposition (in terms of attitudes and skills) toward science. Attributes that can be observed and modeled from the renowned scientists (as symbolic models) include curiosity, persistence; fair testing, observation, hypothesizing, hypothesis-testing, accuracy, and precision among others. Other ways in which symbolic models can be applied in science education include relevant videos of practical work being carried out. Educators can make use of ICT to project appropriate videos with symbolic models carrying out practical work, properly handling apparatus. Symbolic models can also be in the form of resource persons sharing their science-related career experiences with students. Most interestingly, symbolic models can also involve people in different situations (from movies, cartoons, case studies, true stories, events in the newspapers among others) demonstrating the right kinds of attitudes or behaviors that are in line with the aims of science education.

In view of the above discussions, it is evident that the Social Learning Theory can support the teaching and learning of science and have interesting implications on science education. Nevertheless, to ensure that the Social Learning Theory helps in achieving the aims and objectives of science education, it is important for the Educators to expose learners to the right types of models (whether live, verbal instructional or symbolic models) and provide the correct incentive to focus their attention to the desired behaviors, skills, and attitudes. In the next two sections, we elaborate more on embedding the Social Learning Theory in science teaching and learning.

Social Learning Theory Versus Socio-Constructivist Theory in Relation to Science Education

In this section, we would like to contrast the Social Theory with the Socio-constructivist Theory as proposed by Vygotsky (Amineh & Asl, 2015). Both of these theories claim that learning can occur as a result of interactions with others, in other words as a social process. Nevertheless, there is a huge disparity between the two theories in terms of student involvement in the learning process. The Socio-constructivist Theory claims that learners construct knowledge or develop understanding when they actively work and interact with others (peers or teachers in the classroom), for example by being involved collaboratively in activities or by asking questions and sharing ideas and discussing. This allows learning to take place as students can "make better sense of information and events" (Ormrod, 2008) when they actively work with others. Thus, Socio-constructivists view knowledge-construction and learning as a social process that is based on active interactions with others. The Socio-constructivist Theory will be more elaborated and discussed in detail in Chap. 18.

On the other hand, the Social Learning Theory is sometimes criticized in that it views learning as a passive process that is based on the observation of models (Laliberte, 2005). However, it can also be argued that passive observation of models will not lead to learning unless the learner focuses "active" attention on the desired behavior of the model(s) to be able to retain and remember the behavior. Furthermore, according to the Social Learning Theory, the learner must also be able to recognize a relevant or an appropriate stimulus to be "actively" motivated to display the learned behavior. As an ending note to this section, it can also be highlighted that learners can be encouraged to discuss about the observed behavior(s) in the models (live, verbal instructional or symbolic) during science teaching and learning. This would not only promote social interactions in line with the Socio-constructivist views but also render learning of the desired behaviors more meaningful.

Embedding Social Learning Theory in Science Teaching and Learning

Knowledge in science is built upon basic science concepts learnt during early childhood. Through science activities, concepts are developed and cognitive development is supported. In that way students learn about events and things in their surrounding and daily life through performance and experience, their observation skills are improved, they become more sensitive to the environment and their problem-solving skills are boosted (Saçkes et al., 2011). It is interesting to relate concept acquisition and concept development in science to Bandura's social learning theory which includes four stages in observational learning which are described in the sections which follow.

Attention

Observers cannot learn unless they pay attention to what's happening around them. This process is influenced by characteristics of the model, such as how much one likes or identifies with the model, and by characteristics of the observer, such as the observer's expectations or level of emotional arousal.

Retention/Memory

Observers must not only recognize the observed behavior but also remember it at some later time. This process depends on the observer's ability to code or structure the information in an easily remembered form or to mentally or physically rehearse the model's actions.

Initiation/Motor

Observers must be physically and/intellectually capable of producing the act. In many cases, the observer possesses the necessary responses. But sometimes, reproducing the model's actions may involve skills which the observer has not yet acquired.

Motivation

This relates to both extrinsic and intrinsic factors. The extrinsic includes the model observed and the extent to which the model has been capturing the attention and elicit the engagement of learners. Intrinsic relates to the perception and interest of students toward the tasks or activities being put in place.

How do the above stages relate to science teaching and learning? This section will consider typical lessons in science and will make a correlation with the four stages of Bandura's social learning theory.

Science teaching and learning is a dynamic activity where teachers and pupils are engaged in a process of constructing new knowledge or concepts. However, teaching students about science means more than teaching scientific concepts. There are three dimensions of science that are all important, namely, science content, science processes, and science attitudes.

Science Content

This dimension of science includes the scientific knowledge and the scientific concepts to be learnt. It is the dimension of science that most people first think about, and it is certainly very important.

Science Processes

The science processes include skills that scientists use in the process of doing science. Thus, science processes are also referred to as "doing science". It means that science is about asking questions and finding answers to questions, these are actually the same skills that we all use in our daily lives as we try to figure out everyday questions. When we teach students to use these skills in science, we are also teaching them skills that they will use in the future in every area of their lives. One of the main science skills which we promote among learners "doing science" is to make decisions on data and evidence. This skill is very fundamental in this century since UNESCO is encouraging and supporting education systems to make provisions for developing informed decision-making skills among their school youth in their national curriculum.

Science Attitudes

The third dimension of science focuses on the characteristic attitudes and dispositions of science. These include such things as being curious and imaginative, as well as being enthusiastic about asking questions and solving problems. To sum up, it can be argued that to ensure acquisition and development of science-related concepts, the environment that the child interacts with should be enriched in a way allowing the acquisition and development of science-related concepts (Greenfield et al., 2009; Oğuz, 2007).

Characteristics of Science Teaching and Learning from a Social Learning Theory Perspective

The ability to make good observations is essential to the development of other science process skills: communicating, classifying, measuring, inferring, and predicting. The simplest observations, made using only the senses, are qualitative observations.

Qualitative observation is the driving element in Social Learning Theory. The first step in this theory is attention capture. Unless there is focused observation, there will not be attention capture. This first stage in Social Learning Theory, attention capture, is also the first step in an active learning situation. For example, in an inquiry and problem-solving-based learning, the first step is to present the learners with a relevant context whereby they have to explore and formulate ideas. These ideas are then used to engage the learners in seeking information. This search for information could be either a documentary search or an investigation by experiment within laboratory set up or investigation out of the classroom such as fieldwork or surveys.

Scientific investigations form an integral part of science education and involve a number of steps or activities such as asking questions, hypothesizing, planning and carrying out experiments, collecting data and making conclusions (Hackling, 2005). In other words, implementing scientific investigations in science lessons allow learners to work like scientists. Engaged in this type of teaching and learning, learners feel like they are wearing the hat of a typical scientist. They are made to enact the behavior and model out the work of a real scientist. They will have to explore an event, a phenomenon or an object which will lead them to ask questions and generate hypotheses. In this way, learners with the help of the teacher will conduct investigation, collect data, analyze and interpret the same to make inferences.

The importance of modeling to promote understanding of science has earlier been reported by various authors (Jonassen & Strobel, 2006). Models can be used

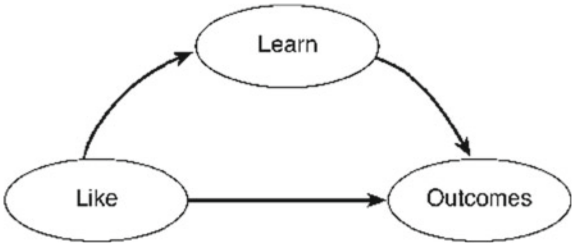

Fig. 7.2 Increased engagement and enhanced performance. *Source* Blunsdon, Reed, McNeil, and McEachern, (2003)

to explain a concept and are used as a tool for student interactions and they are perceived by teachers as physical representations. Such types of models are more likely to be physical objects that can help learners to better visualize concepts or phenomena. These physical models can be used to explain a concept to students, or as a way for students to explain a concept to themselves or each other. In addition, computer simulations or animations may also be used to model science concepts or phenomena. However, these models contrast with Bandura's models which display desirable behavior, skills or attitudes pertaining to science while the former is used to represent science concepts or phenomena.

It has been reported that students are more likely to "engage with a problem" if it is based on something or an issue that interests and makes sense to them (Hung & Swe Khine, 2006). They are thus more likely to focus their attention on such issues or related problems and this would ultimately lead to increased engagement in learning and enhanced performance as illustrated in Fig. 7.2. In such a context, it is important for science educators to expose learners to live or symbolic models with whom they can relate to or have some sort of affinity or interest. Such models may be national or international figures in various fields like sports, cinema, medicine, politics and technology and dealing with issues that are of interest to the science learners. This would help to "capture" the learner's attention to the desired behavior displayed by the models and lead to retention and reproduction of the behavior in the event of a stimulus.

Learners can be made to interact with each other around the models' behavior through discussions and sharing of their points of view and ideas. In this way, models can support learning and allow students to learn from each other during group or whole-class discussions about the behavior displayed by the models.

Social Learning in Science Using Digital Technologies

The section below will document some insights into Social Learning Theory in technologically-based science teaching and learning. We are living in a technology era and our youth are considered to be digital natives. They are very inclined to technology, gadgets, tablets, cell and smart phones.

Science education does not exist in isolation in schools. Outside schools there are many contexts where students are exposed to and learn about science such as television, films, newspapers, museums, internet, and so on. Digital technologies provide an interface between the learners and the concept to be understood. For example, when learners are engaged with animations, short videos or explanations by scientists about science concepts such as photosynthesis, solar system, global warming or water cycle, this can enhance learning of the concepts. Such situations represent examples of symbolic or verbal instructional models in accordance with Bandura's Social Learning Theory. Thus ICT can provide a means of exposing learners to symbolic and verbal instructional models thereby facilitating integration of the Social Learning Theory in the teaching and learning of science. This may ultimately result in increased student engagement and motivation and support their learning (UNESCO, 2012) which will help as future youth and citizens to participate fully and actively in decision-making related to any socio-scientific issue thus ensuring a scientifically literate citizenry.

Conclusion

Social learning theories emphasize changes in behavior and learning through the observation and imitation of the actions and behaviors in the environment. Social Learning Theory is still a valid theory in science education. Today science education is not solely limited to learning scientific concepts. More importantly, it englobes the science process skills and scientific attitudes. These competences are a requisite for all learners to address and face local and global challenges such as food security, energy crisis, and climate change. These issues and challenges are the very concrete contextual situations that should be embedded in science teaching and learning.

Teaching and learning in science involve knowledge acquisition through learning processes put in place by science educators and owned by the learners whereby the latter are engaged in quality or systematic observation of natural phenomena or lived models. Learners then collectively find the most appropriate means to make sense and meaning of the phenomenon and models understudy and they will be required to argue on their findings and come up to a conclusion under the facilitating processes of the educator. Though these transactions of science teaching and learning corroborate with problem-based and inquiry learning strategies, this chapter documented how these current practices of teaching and learning in science align with Bandura SLT. The chapter also elucidated some features of Bandura SLT. It also showcased, using examples, that today, the theory has still its significance in teaching and learning of science.

Further Reading

Crittenden, W. F. (2005). A social learning theory of cross-functional case education. *Journal of Business Research, 59,* 960–966.

Mesoudi, A. (2017). Pursuing Darwin's curious parallel: Prospects for a science of cultural evolution. *Proceedings of the Natural Academy of Sciences, 114*(30), 7853–7860.

References

Amineh, R. J., & Asl, H. D. (2015). Review of constructivism and social constructivism. *Journal of Social Sciences, Literature & Language, 1*(1), 9–16.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215.

Blunsdon, B., Reed, K., McNeil, N., & McEachern. (2003). Experiential learning in social science theory: An investigation of the relationship between student enjoyment and learning. *Higher Education Research & Development, 22*(1).

Boundless Psychology. (2016). Bandura and observational learning. *Boundless Psychology.* Retrieved from https://www.boundless.com/psychology/textbooks/boundless-psychology-textbook/learning-7/cognitive-approaches-to-learning-48/bandura-and-observational-learning-203-12738/.

Chen, M. (2015). *Social development theory*. University of Victoria. [E-book]. Retrieved from https://onlineacademiccommunity.uvic.ca/learningdesign/wp-content/uploads/sites/1178/2015/06/Mingli-Chen-ebook.pdf.

Chomsky, N. (1959). Review of skinner's verbal behavior. *Language, 35*(1), 26–58.

Culatta, R. (2015). Social *learning theory*. Innovative Learning. [Blog post]. Retrieved from http://www.innovativelearning.com/teaching/social_learning_theory.html.

Edinyang, S. D. (2016). The significance of social learning theories in the teaching of social studies education. *International Journal of Sociology and Anthropology Research, 2*(1), 40–45.

Facione, P. A. (2007). Critical thinking: What it is and why it counts. [Blog post]. Retrieved from http://www.telacommunications.com/nutshell/cthinking7.htm.

Fontana, D. (1995). *Psychology for teachers* (3rd ed.). Hampshire and New York: Palgrave.

Greenfield, D. B., Jirout, J., Dominguez, X., Greenberg, A., Maier, M., & Fuccillo, J. (2009). Science in the preschool classroom: A programmatic research agenda to improve science readiness. *Early Education and Development, 20*(2), 238–264.

Hackling, M. W. (2005). *Working scientifically. Implementing and assessing open investigation work in science: A resource book for teachers of primary and secondary science*. Published by Western Australia: Department of Education and Training. Perth.

Huitt, W., & Monetti, D. (2008). Social learning perspective. In W. Darity (Ed.), *International encyclopedia of the social sciences* (2nd ed., pp. 602–603). Farmington Hills, MI: Macmillan Reference USA/Thompson Gale. Retrieved from http://www.edpsycinteractive.org/papers/soclrnpers.pdf.

Hung, D., & Swe Khine, M. (2006). *Engaged learning with emerging technologies*. New York, NY 10013 USA: Springer.

Jarvis, P., Holford, J., & Griffin, C. (2003). *The theory and practice of learning* (2nd ed.). London: Kogan- Page.

John-Steiner, V., & Mahn, H. (1996). Sociocultural approaches to learning and development: A Vygotskian framework. *Educational Psychologist., 31*(3/4), 191–206.

Jonassen, D. H., & Strobel, J. (2006). Modeling for meaningful learning. In D. Hung & M. Swe Khine (Eds.), *Engaged learning with emerging technologies* (pp. 1–27). Springer.

Kelland, M. (2015). Learning theory and personality development. OpenStax-CNX module: m58073. [Blog post]. Retrieved from https://cnx.org/contents/R3cpfhGP@1/Learning-Theory-and-Personalit.

Kihlstrom, J. (2014). *The evolution of cognitive social learning theory*. [Blog post]. Retrieved from http://socrates.berkeley.edu/~kihlstrm//MemoryWeb/learning/SocialLearningTheory.html.

Laliberte, M. D. (2005). A (very) brief history of learning theory. Worcester Polytechnic Institute NERCOMP SIG. Presentation Retrieved from http://file.upi.edu/Direktori/FPIPS/JUR._PEND._SEJARAH/195704081984031-DADANG_SUPARDAN/BRIEF_HISTORY_OF_LEARNING.pdf.

Oğuz, A. (2007). A look at the theories on the formation of science concepts via samples from theory to practice. *Education, Science, Society Journal, 5*(19), 26–51.

McDevitt, T. M., & Ormrod, J. E. (2002). *Child development and education*. Upper Saddle River, NJ: Merrill Prentice Hall.

McLeod, S. A. (2016). Bandura—Social learning theory. [Blog post]. Retrieved from www.simplypsychology.org/bandura.html.

Miller, N. E., & Dollard, J. (1941). Social learning and imitation. In R. Culatta (Ed.), (2015) *Innovative learning*. New Haven: Yale University Press. Retrieved from http://www.innovativelearning.com/teaching/social_learning_theory.htm.

Ministry of Education. (2008). *The Ontario curriculum grades 11 & 12, science*. Retrieved from http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf.

Mukhopadhyay, R. (2013). Problem solving in science learning—Some important considerations of a teacher. *Journal of Humanities and Social Sciences, 8*(6), 21–25.

Ormrod, J. E. (2008). *Educational psychology: Developing learners*. Upper Saddle River, N.J. Pearson/Merrill/Prentice Hall. 6th Ed.

Saçkes, M., Trundle, K. C., Bell, R. L., & O'Connel, A. A. (2011). The influence of early science experience in kindergarten on children's immediate and later science achievement: Evidence from the early childhood longitudinal study. *Journal of Research in Science Teaching, 48*(2), 217–235.

Science Education for Responsible Citizenship. (2015). Report to the European Commission of the Expert Group on Science Education. Directorate-General for Research and Innovation. European Commission B-1049 Brussels. Retrieved from http://ec.europa.eu/research/swafs/pdf/pub_science_education/KI-NA-26-893-EN-N.pdf.

Sternberg, R. J., & Williams, W. M. (2009). *Educational psychology*. Merrill. Pennsylvania State University.

Stone, D. (1998). Social cognitive theory. Article Retrieved from http://mrspettyjohn.pbworks.com/f/SocialCognitiveTheory.pdf.

UNESCO. (2012). The positive impact of eLearning—2012 update, white paper. Education Transformation. Retrieved from http://www.unesco.org/fileadmin/MULTIMEDIA/HQ/ED/pdf/The%20Positive%20Impact%20of%20eLearning%202012UPDATE_2%206%20121%20(2).pdf.

Wikipedia. (2017). Social learning theory. Retrieved August 25, 2017, from https://en.wikipedia.org/wiki/Social_learning_theory.

Willard, E. (2015). Origins of social learning theory. [Blog post]. Retrieved from https://www.tutor2u.net/psychology/reference/origins-of-social-learning-theory.

Wismath, S., Orr, D., & Zhong, M. (2014). Student perception of problem solving skills. Transformative dialogues. *Teaching and Learning Journal, 7*(3), 1–17.

Anwar Bhai Rumjaun is an Associate Professor in the Science Education Department at the Mauritius Institute of Education in Mauritius. He is engaged in teaching and teacher programme, school curriculum and textbook development, and research in education. He is currently a Senior Honorary Research Associate at the UCL Institute of Education. He also supervises Master and Doctoral students registered with MIE and with University of KwaZulu-Natal (South Africa) and University of Brighton (UK). His research interests are in Science/Biology Education, Environmental Education/ESD, and Policy responses to Science Education.

Fawzia Narod is an Associate Professor in the Department of Science Education at the Mauritius Institute of Education. In addition to teaching and coordination of courses and programmes, she is actively engaged in research in education and development of curriculum and curriculum materials. Dr. Narod also supervises MA and Ph.D. research dissertations for the University of Brighton (UK) and University of Kwazulu-Natal (South Africa). Her research interests include the use of ICT as a pedagogical tool, Chemistry Education, teacher development, and educational management among others.