

The Reflective Learning Framework: A guide for students and educators

Version 2.1

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Table of Contents

The Reflective Learning Framework: A guide for students and educators	1
Introduction.....	3
Background.....	3
The Reflective Learning Framework	5
Recount	8
Temporal Progression	8
Important Aspects of the Experience	9
Connection to Academic Theory	10
Discussion	11
Relating to Other Context /Drawing Connections	11
Personal Thoughts and Feelings	12
Cause-and-Effect Relationships.....	14
Other Possible Responses	15
Planning and Future Practices.....	16
Sample Reflection.....	19
Sample Evaluation Matrix Template	23
References.....	24

Introduction

Most of us understand the role of experience in the learning process in an intuitive way. Learning through experimentation, stumbling upon a great idea while participating in a new activity, or reflecting on the consequences of a mistake are surely universal experiences. That said, it should be noted that experiential learning is not necessarily a direct result of experiential education. Experiential education “is the philosophical process that guides the development of structural and functional learning experiences,” while experiential learning “refers to the specific techniques or mechanisms that an individual can implement to acquire knowledge or meet learning goals” (Roberts 2012 as referenced by Higher Education Quality Council of Ontario, 2016 p. 18). Because of its relevance to education, the role of experience in the learning process has long been of interest, and has been addressed by researchers that include, among others, John Dewey, Kurt Lewin, and Jean Piaget (see Higher Education Quality Council of Ontario, 2016; D. A. Kolb, 2015). The body of knowledge on this topic is extensive, and covers learning styles, intrinsic versus extrinsic motivation, surface versus deep learning, as well as tools and techniques for educators – including community-based learning, problem-based learning, and reflective writing.

Background

It is widely agreed that experience plays an important role in learning (Higher Education Quality Council of Ontario, 2016; D. A. Kolb, 2015). According to the Association for Experiential Education,¹ “experiential learning occurs when carefully chosen experiences are supported by reflection, critical analysis, and synthesis.” Mezirow and Associates explain that “critical thinking is informed by reflection” and use it synonymously with “reflective learning”. The authors state that “[a]lthough it is possible to think without either reflecting or learning, thought that involves critical reflection involves learning.” (1990 p. xvii) Thus, while critical thinking is a function of cognition, reflection is a function of metacognition and encouraging it is one of the desired outcomes of reflection (Moon, 2006). Anderson et al. describe the two important aspects of metacognition, “(1) knowledge about cognition and (2) control, monitoring, and regulation of cognitive process.” (2001 p. 43) Kuiper and Pesut suggest that “critical thinking is to cognitive skill acquisition as reflective thinking is to metacognitive skills acquisition...” (2004 p. 384) This implies that just thinking or having an experience do not necessarily result in learning, but rather critical thinking and reflection support and facilitate the learning process. Mezirow (1998) makes the distinction between “reflection” and “critical reflection” in that reflection is looking back on an experience, but not necessarily making an assessment of what is being reflected upon. We will continue to use the term reflection to imply critical reflection.

The use of reflection in the learning process has been studied in a variety of fields, including health (Mann, Gordon, & MacLeod, 2009), professional practice (Schön, 1987), professional development (Moon, 1999), the arts (Leijen, Lam, Wildschut, & Simons, 2009) and

¹ <http://www.aee.org/what-is-ee>

more. Moon mentions that “[o]ne of the difficulties of studying the literature on reflection is that it emanates from many different sources” (1999 p. vii), and she highlights some that have attempted to transcend disciplinary boundaries, including Boud, Keogh and Walker (1985) and Mezirow (1990) among others.

Although reflection has been studied from many different perspectives, they all have in common a desire to help learners to better develop knowledge, skills, and abilities. In her book, *Learning Journals: A Handbook for Reflective Practice and Professional Development*, Moon (2006) places emphasis on the role of reflection in learning by identifying some purposes for learning journals, which include “to record experience” (p. 44), “to facilitate learning from experience” (p. 45), “to develop critical thinking skills or the development of a questioning attitude” (p. 46), “to encourage metacognition” (p. 46), “to enhance problem-solving skills” (p. 47), “as a means of assessment in formal education” (p. 47), “to enhance reflective practice” (p. 48) “to enhance creativity” (p. 49), and “as a means of communication between one learning and another” (p. 51). In his work, *Using Journal Writing to Enhance Reflective Practice*, Boud (2001) states that journal writing can be a record of events, a form of self-expression, and even a form of therapy. Boud presents journal writing as “a device for working with events and experiences in order to extract meaning from them”, in order to “make sense of the world and how we operate within it.” He also explains that “[a]s a vehicle for learning, [reflection] can be used in formal courses..., professional practice or any aspect of informal learning.” (Boud, 2001 p. 9) Schön believes that “education for reflective practice, though not a sufficient condition for wise or moral practice, is certainly a necessary one.” (1987 p. xiii) Mezirow (1998) introduces critical reflection of an assumption (CRA) and critical self-reflection of an assumption (CSRA), which can impact one’s frame of reference and have transformational change for the individual.

Thanks in large part to the works of John Dewey and David Kolb, it is widely accepted that experiences form the basis for reflections which in turn can lead to new ideas, new experiences, and learning (see, inter alia, Boud, 2001; A. Y. Kolb & Kolb, 2009; D. A. Kolb, 2015; Moon, 1999). Through this cyclical process, ideas are formed and re-formed as learning continues (A. Y. Kolb & Kolb, 2009). In his *Experiential Learning Theory* and the appropriately titled *The Experiential Learning Cycle*, Kolb (2015) places the act of reflection as the first step towards drawing meaning from an experience, which helps guide the learner to establish new ideas and to engage in new learning experiences (see the learning cycle in Figure 1).

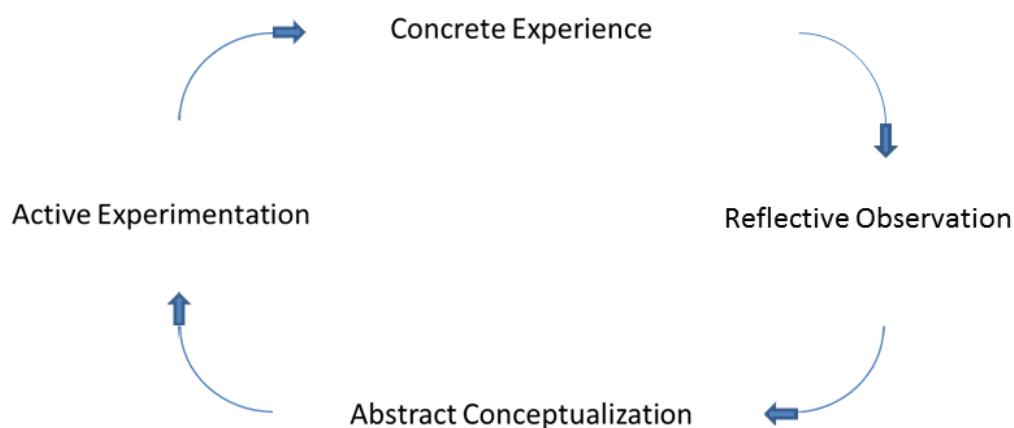


Figure 1. The Experiential Learning Cycle (Adapted from Figure 2.5 in D. A. Kolb, 2015 p. 51).

The Reflective Learning Framework

The Reflective Learning Framework (RLF) was mainly based on the work of Mary Ryan (2011) and further developed, first to address some of the challenges faced when applying it, in terms of consistency and ease of use, and later to align it with the widely accepted Bloom's Taxonomy of Educational Objectives. Bloom's Taxonomy helps educators categorize learning objectives, which is important for a variety of reasons, including helping educators to see the objectives from the student's point of view, to see the relationship between knowledge and cognitive processes of the learning objectives, and to see the relationship among objectives as well as how they are taught and how learning is assessed (Anderson et al., 2001) Bloom's Taxonomy includes four knowledge dimensions: *Factual*, *Conceptual*, *Procedural*, and *Metacognitive*, and six categories of cognitive processes. The categories of cognitive processes, which can be seen in Figure 2, are listed from those that are "most commonly found in objectives" on the bottom to those that are "less frequently found in objectives" at the top (Anderson et al., 2001 p. 30). Anderson et al. also refer to those categories higher up as having a "higher level of complexity." (2001 see p. 34 for example) Under each cognitive process category are two or more cognitive processes, which can be seen in Table 1. For example, the category *Remember* includes two processes, *recognizing* and *recalling*.

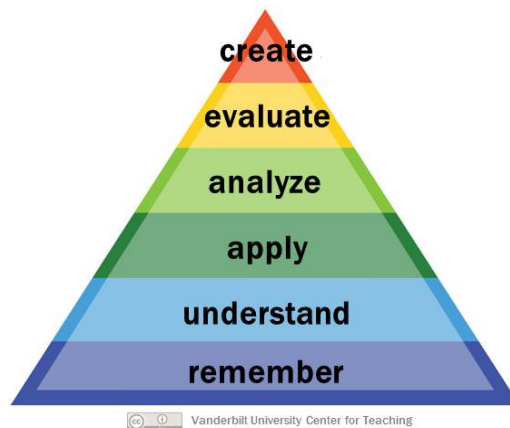


Figure 2. Cognitive process categories of Bloom's Taxonomy (Adapted from Vanderbilt University, 2018)

Table 1. Categories and Cognitive Processes of Bloom's Taxonomy (Adapted from Anderson et al., 2001)

Categories and Cognitive Processes of Bloom's Taxonomy	
1. Remember	
	1.1 Recognizing 1.2 Recalling
2. Understand	
	2.1 Interpreting 2.2 Exemplifying 2.3 Classifying 2.4 Summarizing 2.5 Inferring 2.6 Comparing 2.7 Explaining
3. Apply	
	3.1 Executing 3.2 Implementing
4. Analyze	
	4.1 Differentiating 4.2 Organizing 4.3 Attributing
5. Evaluate	
	5.1 Checking 5.2 Critiquing
6. Create	
	6.1 Generating 6.2 Planning 6.3 Producing

The RLF is broadly divided into two main categories with a total of eight reflection components (See Table 2 and Table 3). The organization of the RLF is roughly based on the levels of cognition required. As such, each RLF reflection component is broken down into either two or three specific criteria directly related to a cognitive process and knowledge dimension outlined in Bloom's Taxonomy. The reflection category of Recount includes more lower level cognitive processes, which correspond to Bloom's Taxonomy for *Remember*, *Understand*, and also includes *Analyze*. While Bloom's Taxonomy also includes the category *Apply*, none of the RLF components aligned with that specific category. The Discussion category includes more higher level cognitive processes categories, which correspond to Bloom's Taxonomy for

Analyze, Evaluate, and Create. The cognitive process category *Analyze* is included in both Recount and Discussion. It is not to say that recounting requires *only* lower level cognitive processes, rather it requires more of the lower level cognitive processes in general.

Adopted from previous works, the literature review above, and aligned with the widely accepted Bloom's Taxonomy of Educational Objectives (Anderson et al., 2001), the RLF has been developed to support student reflection within the Sustainable Future Program courses at McMaster University. However, although the framework was developed for a specific program, a primary goal was to ensure the categories were general enough to be used for various applications. That being noted, it is encouraged that consideration be given to framework modification to suit the specific nature, context, and level for the specific application.

Recount

Upon completion of this task, the student will be able to retell their story to give the reader a sense of their experience. Note that the reader may be the student at a later date, and the story should be told to remind them of their own experience. If someone else will be reading the reflection, such as an instructor or a mentor, the student should provide the reader with information to help them understand the student's experience. This can be accomplished by including the following components:

Temporal Progression

Relevance

A reflection is an account of learning at a point in time, which is impacted by such things as past experiences, culture, and current events. David Kolb describes how learning is a process whereby ideas are continually re-formed by experience and that “[n]o two thoughts are ever the same, since experience always intervenes.” (D. A. Kolb, 2015 p. 37) In this respect, recounting an experience with respect to temporal order of events from memory will support retention (Anderson et al., 2001) of information as well as lay the foundation for critical reflection and future learning. This will involve recalling and organizing details and elements (Anderson et al., 2001) of the events from the experience. It is important to note that we use the term “event” to mean any such occurrence or circumstance of importance, which include personal encounters, activities, and having thoughts, feelings, and ideas.

Assessment

Upon completion of this task, the student will be able to *Remember* and *Analyze* details of their experience, specifically through the cognitive processes of *recalling* and *organizing*.

With respect to the cognitive process categories and cognitive processes involved, Anderson et al. describe that “Remembering involves retrieving relevant knowledge from long term memory” (p. 66) and includes the two cognitive processes of *recognizing* and *recalling*. Specific to this reflection category, Anderson et al. describe how “[r]ecalling involves retrieving relevant knowledge from long-term memory when given a prompt to do so.” (2001 p. 69) The reflection assignment and the RLF category of Temporal Progression are the prompts for the student to retrieve the relevant information. A higher level cognitive process category, *Analyze*, is described as “breaking material into its constituent parts and determining how the parts are related to one another and to an overall structure.” (2001 p. 79) The category *Analyze* is broken down into three cognitive processes of *differentiating*, *organizing*, and *attributing* (Anderson et al., 2001). Specific to this reflection component, “[o]rganizing involves identifying the elements of a communication or situation and recognizing how they fit together into a coherent structure.” (2001 p. 81) Thus, the student will organize the information that they retrieved from memory and create a coherent structure for further reflection.

It is important to note that Anderson et al. describe how when the goal is to promote retention, objectives focus on the cognitive process category of *Remember*, but when the goal is to promote transfer, the objectives focus on the other categories, including *Analyze* (2001). As

such, while the reflection component for Temporal Progression includes one criterion related to the cognitive process category of *Remember*, all other categories of the RLF focus on cognitive process categories that promote knowledge transfer. Knowledge transfer is one the main objectives of the reflection assignments in our program.

Both reflection criteria under the category of Temporal Progression require the use of *Factual knowledge*. Anderson et al. describe that “*Factual knowledge* encompasses the basic elements that experts use in communicating about their academic discipline, understanding it, and organizing it systematically.” (p. 45) *Factual knowledge* is further divided into two subtypes: *knowledge of terminology*, which includes “knowledge of specific verbal and non-verbal symbols” (p. 45), and *knowledge of specific details and elements*, which “refers to knowledge of events, locations, people, dates, sources of information, and the like.” (p. 47) The authors go on to describe how facts can be distinguished from terminology, in that “terminology generally represents the conventions or agreements within a field (i.e., a common language), whereas facts represent findings arrived at by means other than consensual agreements made for purposes of communication.” (p. 47). As such, we are mainly concerned with *knowledge of specific details and elements* of the student’s experience.

Connecting this description to reflection, the student will be able to *recall* relevant information from memory and *organize* information, including temporal progression of events. This can be accomplished by including the full date of when the reflection is taking place, as well as temporal indication of major events that would contribute to the understanding of the experience. The student will be able to demonstrate how they organize information by providing reference to time when recounting events throughout the reflection to demonstrate progression of learning in connection to their experiences. As such, accurately *recalling* and *organizing* information will also support reflection associated with other RLF categories such as Cause-and-Effect Relationships, as described below.

It may be helpful to note that references to time such as “last week” or “yesterday” are quite sufficient once the full date of writing has been included.

Important Aspects of the Experience

Relevance

Differentiating the important from the unimportant aspects of the experience will enable the student to focus their critical reflection on those aspects that are most relevant. *Summarizing* the information will further distil the key themes or main points for which to focus on. Important aspects of the story may include those events that brought about an important thought, realization, reaction and/or feeling. An event can be described but unless clearly summarized, including why and how the event is important for and connected to the student’s learning, it could merely be interpreted as random information.

Assessment

Upon completion of this task, the student will be able to *Analyse* and *Understand* the important aspects of their experience, specifically through the cognitive processes of *differentiating* and *summarizing*.

With respect to the cognitive processes involved, Anderson et al. describe that the main process category, *Analyze*, “involves breaking material into its constituent parts and determining how the parts are related to one another and to an overall structure” (2001 p. 79) and that the process of *differentiating* “involves distinguishing the parts of a whole structure in terms of their relevance or importance.” The authors go on to describe how it “occurs when a student discriminates relevant from irrelevant information, or important from unimportant information, and then attends to the relevant or important information.” (Anderson et al., 2001 p. 80) The process of *summarizing* “involves constructing a representation of the information, such as the meaning of a scene in a play, and abstracting a summary from it, such as determining a theme or main points.” (Anderson et al., 2001 p. 73)

Both reflection criteria require the use of *Conceptual knowledge*. Anderson et al. describe that “*Conceptual knowledge* includes knowledge of categories and classifications and the relationships between and among them...” (2001 p. 48) *Conceptual knowledge* is further divided into three subtypes, one of which being “*knowledge of theories, models, and structures*”, which includes “knowledge of principles and generalizations together with their interrelationships that present a clear, rounded, and systemic view of a complex phenomenon, problem, or subject matter.” (Anderson et al., 2001 p. 51) As such, as a student is *differentiating* important information from lots of other information from their experience and *summarizing* it into a structure for their reflection, they will be required to employ *Conceptual knowledge*, as is described above.

Connecting these descriptions to reflection, the student will be able to distinguish the important parts of the experience and *summarize* the main points and key themes to include why and how the particular events are relevant to their learning.

Connection to Academic Theory

Relevance

Reflection here is tied to an academic assignment whereby it helps to connect theory and practice to enhance understanding of each and promote the transfer of knowledge. The student may recall information from lectures, readings, or other sources, or they could seek out new information to help them to make sense of and extract meaning from their experiences. In either case, students will focus on *comparing* and detecting similarities and differences between theory and practice as well as make inference about their relationship through proper sourcing of information. Furthermore, maintaining consistent and correct referencing is necessary to ensure academic integrity.

Assessment

Upon completion of this task, the student will be able to *Understand* correspondences between theory and practice, specifically through the cognitive processes of *comparing* and *inferring*.

With respect to the cognitive processes involved, Anderson et al describe *Understand* as the ability to “construct meaning from instructional messages, including oral, written, and graphic communications, however they are presented to students.” (2001 p. 70) The process of

comparing “involves detecting similarities and differences between two or more objects, events, ideas, problems, or situations, such as determining how a well-known event...is like a less familiar event...” and “includes finding one-to-one correspondences between elements and patterns in one object, event, or idea and those in another object, event, or idea.” (Anderson et al., 2001 p. 75) *Inferring*, another cognitive process within the category *Understand*, “occurs when a student is able to abstract a concept or principle that accounts for a set of examples or instances by encoding the relevant features of each instance and, most important, by noting the relationships among them.” (Anderson et al., 2001 p. 74) As such the student will demonstrate how information from theory and from practice can together support learning. In addition to *comparing* and *inferring*, instructors may choose to also encourage their students to focus on other processes such as *interpreting*, which Anderson et al. describe as being able to “convert information from one representation form to another” (p. 70), or *exemplifying*, which occurs when a student gives a specific example or instance of a general concepts or principle.” (Anderson et al., 2001) These are ways in which the RLF can be modified to meet specific educational objectives.

Please see the description for *Conceptual* knowledge above, as well as a description for the subtype of *knowledge of theories, models, and structures*. The other two subtypes of *Conceptual knowledge* are “*knowledge of classifications and categories*”, which “includes the specific categories, classes, divisions, and arrangements that are used in different subject matters” (Anderson et al., 2001 p. 49) and “*knowledge of principles and generalizations*”, which are described as being “composed of classifications and categories” but “tend to dominate an academic discipline and are used to study phenomena or solve problems in the discipline.” (Anderson et al., 2001 p. 51) In the reflection component of Connection to Academic Theory, any of the three subtypes of *Conceptual knowledge* are applicable.

Connecting this description to reflection, the student will be able to detect correspondences between concepts from theory and from experience as well as to abstract relevant features from theory and practice and note the relationships between them with proper sourcing of information.

Discussion

Upon completion of this task, the student will be able to discuss their experiences and more effectively reflect on and make meaning from them. Through the use of higher level cognitive processes – namely from the categories of *Analyze*, *Evaluate*, and *Create* – applied through reflection will support knowledge transfer, and can be used to support new learning experiences, as described by Kolb’s Experiential Learning Cycle. Employing higher level cognitive process can be accomplished through the following reflection components:

Relating to Other Context /Drawing Connections

Relevance

Relating ideas and/or events from one context or situation to another will support knowledge transfer and the ability to reason by analogy (Anderson et al., 2001). This will involve *comparing* ideas and/or events, *differentiating* the relevant aspects of the ideas and/or

events, and providing a specific example of a related idea or event from another context.

Relating information from one context to another will help create dissonance between the information in its specific context and the knowledge at the conceptual level. Similarly, the idea of detaching the concepts from the situation and creating dissonance is reflected by Grossman (2009 p. 21) as he describes that by detaching oneself from one's thoughts and feelings that they are able to see them as objects for which to reflect on, and suggests that this would allow for higher levels of reflection to occur. As such, this process further supports the Experiential Learning Cycle and future learning.

Assessment

Upon completion of this task, the student will be able to *Understand* similarities and differences between ideas and events, *Analyze* and make distinctions about relevant aspects relating to other situations or contexts, and demonstrate their understanding through providing an example. The cognitive processes involved include *comparing*, *differentiating*, and *exemplifying*.

With respect to the cognitive processes in this reflection component, *comparing* and *differentiating* have already been described above. Anderson et al. describe that "*exemplifying* involves identifying the defining features of a general concept or principle...and using these features to select or construct a specific instance..." (2001 pp. 71-72) All reflection criteria in this component of Relating to Other Contexts/Drawing Connections require the use of *Conceptual knowledge*, which has also been described above.

Connecting this description to reflection, the student will be able to compare ideas and/or events and detect similarities and/or differences, distinguish relevant aspects relating the ideas and/or events, and provide one or more specific example of the general concept or principle from another situation. As such the student will be able to demonstrate how their conceptual knowledge from one situation can be transferred to another.

Personal Thoughts and Feelings

Relevance

A thought is "[a]n idea or opinion produced by thinking, or occurring suddenly in the mind." (Oxford University Press, 2017). A feeling, on the other hand, is "[a]n emotional state or reaction" and "[a] belief, especially a vague or irrational one." (Oxford University Press b, 2017) Note that in this context, we are not referring to rational thinking, as we were above, and we are not referring to "[t]he capacity to experience the sense of touch." (Oxford University Press b, 2017) In this light, we will argue that our thoughts and feelings are impacted by our motivational beliefs – our self-efficacy beliefs, goals, values, and interests (Anderson et al., 2001). Reflecting how our thoughts and feelings are shaped will support the act of critical reflection and help derive meaning from the overall experience. In this way, students will connect with the cognitive and affective domains. While the idea of including personal thoughts and feeling into a reflection to support learning may seem obvious to some, feedback has indicated that additional support is still useful.

As described by Boyle et al., “[a]ffective activities are processes that deal with emotions, feelings and values; they lead to perceptions of learning tasks (or moods) that help to determine students’ approach to learning activities.” (2007 p. 301) Sinatra and Pintrich (2003) argue for the importance of affect in the ability to produce conceptual change. Mezirow states the importance of learning through “...becoming critically reflective of assumptions and participating in discourse to validate beliefs, intentions, values and feelings.” (1998 p. 197) Kaufman describes the difference between a reflex response and a reflexive response, in that a reflex response is unconscious, impulsive, automatic, uncritical, and lacks thought, while a reflexive response involves “more thinking and reflecting on their own situation...[and developing a] greater awareness of their positionality and situationality.” (2013 p. 76). Kaufman also states that “...the mere act of realizing you think differently than others is the first step on the path toward reflexivity.” (p. 79) Furthermore, reflecting on personal thoughts and feelings and how they are involved in learning through experience thus provides an individual, deeply personal connection to the experience and the learning. This uniquely individualized aspect of experiential learning supports metacognition, which is another objective of the reflection assignments in our program.

Assessment

Upon completion of this task, the student will be able to *Analyze* how their thoughts and feelings are shaped and *Understand* how they impact their own learning, specifically through the cognitive processes of *attributing*, *organizing*, and *summarizing*.

With respect to the cognitive process categories, *Analyze* and *Understand* have been described above, as have the processes of *organizing* and *summarizing*. We now also include the process of *attributing*, which is under the category of *Analyze*. Anderson et al, describe that “[a]ttributing occurs when a student is able to ascertain the point of view, biases, values, or intention underlying communications” and further point out that “[i]n contrast to *interpreting*, in which the student seeks to *Understand* the meaning of the presented material, *attributing* involves an extension beyond basic understanding to infer the intention or point of view underlying the presented material.” (Anderson et al., 2001 p. 82) An important distinction to make is that the RLF category for *attributing* requires the student to reflect on their own underlying points of view, biases, values, and/or intentions, rather than those of another. This is identified by the indication to use *Metacognitive knowledge* specifically.

The two types of knowledge required for the reflection component of Personal Thoughts and Feelings are *Conceptual knowledge* and *Metacognitive knowledge*. Anderson et al. describe *Metacognitive knowledge* as “knowledge about cognition in general as well as awareness of and knowledge about one’s own cognition.” (2001 p. 55) More information on this topic has been included in the associated paper (forthcoming). The subtypes of *Metacognitive knowledge* include *strategic knowledge*, which is “knowledge of the general strategies for leaning, thinking, and problem solving” (p. 56); *knowledge about cognitive tasks, including contextual and conditional knowledge*, which includes “knowledge of different learning and thinking strategies...and what general strategies to use and how to use them” (pp. 57-58); and *self-knowledge*, which “includes knowledge of one’s strengths and weaknesses in relation to cognition and learning.” (Anderson et al., 2001 p. 59) What is important to describe here, is that *self-knowledge* includes motivational beliefs, including self-efficacy beliefs, beliefs about goals, and beliefs about values and interests (Anderson et al., 2001). Anderson et al. describe that “[j]ust as students need to develop self-knowledge and awareness about their own knowledge

and cognition, they also need to develop self-knowledge and awareness about their own motivation.” (2001 p. 59)

Connecting this description to reflection, the student will be able to *Analyze* personal points of view, biases, values, and/or intensions; organize personal thoughts and/or feelings within the context of their learning experience; and summarize the main points and key themes identified. While providing a clear summary is important in all categories, the authors found it particularly important to specifically include it as a criterion for this reflection category to encourage students’ attention on abstracting the main points and themes of their analysis of their own thoughts and feelings, which are very subjective and highly complex.

Cause-and-Effect Relationships

Relevance

If a certain action caused a certain response, desirable or undesirable, reflecting on the events and the relationship between them will help create meaning, support knowledge transfer, and allow for further reflection and learning. This will require the student to distinguish relevant information as well as construct a model of how the specific parts fit together and impact one another. It will also involve evaluating the relationships to determine if the outcome is positive or negative, based on personal standards and criteria. Through reflection, the student will be able to state their criteria for evaluation based on their personal goals, values, and/or interests to judge if the outcome was good or bad.

This is an appropriate time to highlight that reflection content satisfying one reflection component or criterion may also satisfy or partially satisfy multiple reflection criteria simultaneously. For example, a student who discusses their pro-environmental beliefs, motivations, and values related to their personal thoughts and feelings about corporate apathy to climate change could easily extend their explanation to include their personal criteria and standards for making judgements on a related cause-and-effect relationship.

Assessment

Upon completion of this task, the student will be able to *Analyze* relevant aspects of their experience, *Understand* cause-and-effect relationships, and *Evaluate* the outcomes based on their own criteria, specifically through the cognitive processes of *differentiating*, *explaining*, and *critiquing*.

Both knowledge dimensions (*Conceptual* and *Metacognitive*) have been previously described as has the cognitive process of *differentiating*. We now include the cognitive process category *Evaluate*, as well as the cognitive processes of *explaining* and *critiquing*. First, the process of *explaining* is included under the category *Understand* and “occurs when a student is able to construct a cause-and-effect model of a system... including each major part in a system or each major event in the chain, and uses the model to determine how a change in one part of the system or one “link” in the chain affects a change in another part.” (Anderson et al., 2001 pp. 75-76) Anderson et al. state that “*Evaluate* is defined as making judgements based on criteria and standards”, highlighting the importance of using standards with “clearly defined criteria.”

(2001 p. 83) The cognitive process of *critiquing* involves making a judgement based on criteria and standards and is said to be “at the core of what has been called critical thinking.” (Anderson et al., 2001 p. 84) Of importance to the process of *critiquing* in this reflection criterion is that it requires the student to evaluate the product of the relationship by employing *Metacognitive knowledge* (see description of *self-knowledge* above), to identify their personal criteria and standards based on their own motivational beliefs.

Connecting this description to reflection, the student will be able to distinguish relevant aspects of their experience; construct a cause-and-effect model, including the impacts of changing one part in the system; and judge the outcome of the relationship, based on personal criteria and standards.

Other Possible Responses

Relevance

Reflecting on issues or problems and coming up with alternative approaches to addressing them will support knowledge transfer and also support creative thinking to find new ways of doing things. This will involve analysing the problem, creating possible solutions, and evaluating their anticipated outcomes based on personal standards and criteria.

Coming up with new approaches and ways of doing things involves divergent and creative thinking. As stated by Anderson et al. “when generating transcends the boundaries or constraints of prior knowledge and existing theories, it involves divergent thinking and forms the core of what can be called creative thinking.” (p. 86)

As stated previously, reflection content can easily be extended to satisfy multiple reflection components and criteria. For example, *analysing*, *understanding*, and *evaluating* cause-and-effect relationships of past events, as was discussed above, can easily be extended to support the creation of other possible responses, actions, or ways of doing things differently in future. Furthermore, by using knowledge created through developing other possible responses and continuing to employ critical and creative thinking skills, the alternative response can be further explored, analysed, and evaluated, enhancing one’s ability to transfer knowledge between situations and foster continuous learning.

Assessment

Upon completion of this task, the student will be able to *Analyze* a problem, *Create* possible responses to address it, and *Evaluate* the anticipated outcomes based on personal criteria and standards, specifically through the cognitive processes of *differentiating*, *generating*, and *critiquing*.

Both knowledge dimensions (*Conceptual* and *Metacognitive*) have been described previously, as have the processes of *differentiating* and *critiquing*. We will now present the cognitive process category of *Create* and process of *generating*. *Create* is the most complex cognitive process category as it “involves putting elements together to form a coherent or functional whole.” (Anderson et al., 2001 p. 84) Anderson et al describe how “[o]bjectives classified as *Create* have students make a new product by mentally reorganizing some elements or parts into a pattern or structure not clearly presented before” and that “[t]he processes

involved in *Create* are generally coordinated with the student's previous learning experiences.” (2001 pp. 84-85) Important to the understanding of this category and the three associated processes, Anderson et al. offer the following description: “[t]he creative process can be broken down into three phases: problem representation, in which a student attempts to understand the task and generate possible solutions; solution planning, in which a student examines the possibilities and devises a workable plan; and solution execution, in which a student successfully carries out the plan.” (2001 p.85) As such, the three cognitive processes of *Create* are: *generating*, *planning*, and *producing* (Anderson et al., 2001). The process of *generating* is the focus of this reflection criterion. Anderson et al. describe that “[g]enerating involves representing the problem and arriving at alternatives or hypotheses that meet certain criteria.” (2001 p. 86)

Connecting this description to reflection, the student will be able to distinguish the issue being addressed, provide alternative responses to addressing the issue, and judge the expected outcome(s) based on personal criteria and standards.

Planning and Future Practices

Relevance

Developing ideas and creating plans and next steps for future practices will support continued learning through new experiences. Evaluating the anticipated outcomes will support knowledge translation between past and future experiences. This will involve *generating* possible solutions or next steps, *planning* the processes ahead, and *checking* the possible outcomes to be achieved. Through discussing the possible benefits or challenges of their plan, the student will be able to further demonstrate their knowledge of the procedure and or their own metacognition.

Kolb and Kolb describes the stage following Reflective Observation, known as Abstract Conceptualization, happens when reflections are “assimilated and distilled into abstract concepts from which new implications for action can be drawn.” (A. Y. Kolb & Kolb, 2005 p. 194) As such, by reflecting on past events that inform future responses, actions, and new experiences, and creating plans to see the experience through, the next phase of the Experiential Learning Cycle can begin.

Assessment

Upon completion of this task, the student will be able to *Create* possible solutions and next steps, as well as plans for seeing them through, and *Evaluate* the expected outcomes, specifically through the cognitive processes of *generating*, *planning*, and *checking*.

With respect to the cognitive processes involved, *planning* and *checking* have yet to be explained. The process of *planning* is within the category of *Create* and involves “developing a plan for solving the problem.” (Anderson et al., 2001 p. 87) Anderson et al. describe that *checking* “involves testing for internal inconsistencies or fallacies in an operation or a product” such as “whether or not a conclusion follows from its premises, whether data support or disconfirm a hypothesis, or whether presented material contains parts that contradict one another.” (2001 p. 83)

Unique to this reflection component, the student will be required to employ *Conceptual knowledge* as well as *Metacognitive* and/or *Procedural knowledge*. Specifically, *generating* possible solutions will require *Conceptual knowledge*, but *planning* the solution and *checking* the expected outcomes could leverage *Metacognitive* and/or *Procedural knowledge*. Anderson et al. describe *Procedural knowledge* as the “knowledge of how” to do something, often taking “the form of a series or sequence of steps to be followed”, and also includes knowing when and where to use the process (2001 p. 52). *Procedural knowledge* is discipline specific unlike *Metacognitive knowledge*, which cuts across disciplines (Anderson et al., 2001). We have included the option for students to explore *planning* and *checking* future practices using either *Procedural* or *Metacognitive knowledge*. For example, a student may be reflecting on future plans to improve their home garden and choose to focus on specific procedures such as testing soil and adding nutrients or different types of sediment that will meet the requirements of a specific plant. The student could then check for inconsistencies between their plans and the discipline knowledge to identify and work to overcome potential challenges, therefore enabling the student to effectively implement the plan. This first example would require the use of *Procedural knowledge*. Alternatively, the student could choose to focus on improving their garden through their preferred method of watching online videos. Possible challenges may include issues with videos as their sole source of information if unique issues arise, such as pests that need to be identified. This second example would employ the use of *Metacognitive knowledge*.

Connecting this description to reflection, the student will be able to present one or more possible solutions or next steps, provide evidence of planning with attention to detail, and present possible benefits and/or challenges including how challenges could be overcome. Again, with respect to planning and checking, students have the flexibility to employ their knowledge of discipline-specific procedures or their personal metacognitive strategies.

Table 2.1 RLF with Connection to Bloom's Taxonomy: Recount

Reflection Component	Criteria 1	Criteria 2
Temporal Progression	Recall relevant information from memory.	Organize information, including temporal progression of events.
Connection to Bloom's	Remember, Recalling (1.2). Factual knowledge.	Analyze, Organizing (4.2). Factual knowledge.
Important Aspects of the Experience	Distinguish the important parts of the experience.	Summarize the main points and key themes.
Connection to Bloom's	Analyze, Differentiating (4.1). Conceptual knowledge.	Understand, Summarizing (2.4). Conceptual knowledge.
Connection to Academic Theory	Detect correspondences between concepts from theory and from experience.	Abstract relevant features from theory and practice and note the relationships between them with proper referencing of information.
Connection to Bloom's	Understand, Comparing (2.6). Conceptual knowledge.	Understand, Inferring (2.5). Conceptual knowledge.

Table 2.2 RLF with Connection to Bloom's Taxonomy: Discussion

Reflection Component	Criteria 1	Criteria 2	Criteria 3
Relating to Other Contexts/ Drawing Connections	Compare ideas and/or events and detect similarities and/or differences.	Distinguish relevant aspects relating the ideas and/or events.	Provide one or more specific example of the general concept or principle from another situation.
Connection to Bloom's	Understand, Comparing (2.6). Conceptual knowledge.	Analyze, Differentiating (4.1). Conceptual knowledge.	Understand, Exemplifying (2.2). Conceptual knowledge.
Personal Thoughts and Feelings	Analyze personal points of view, biases, values, and/or intentions.	Organize personal thoughts and/or feelings within the context of the learning experience.	Summarize the main points and key themes identified.
Connection to Bloom's	Analyze, Attributing (4.3). Metacognitive knowledge.	Analyze, Organizing (4.2). Metacognitive knowledge.	Understand, Summarizing (2.4). Conceptual knowledge.
Cause-and-Effect Relationships	Distinguish relevant aspects of the experience.	Construct and use a cause-and-effect model, including the impacts of changing one part in the system.	Judge the outcome of the relationship, based on personal criteria and standards.
Connection to Bloom's	Analyze, Differentiating (4.2). Conceptual knowledge	Understand, Explaining (2.7). Conceptual knowledge.	Evaluate, Critiquing (5.2). Metacognitive knowledge.
Other Possible Responses	Distinguish the issue being addressed.	Provide alternative responses to addressing the issue.	Judge the expected outcome(s) based on personal criteria and standards.
Connection to Bloom's	Analyze, Differentiating (4.2). Conceptual knowledge.	Create, Generating (6.1). Conceptual knowledge.	Evaluate, Critiquing (5.2). Metacognitive knowledge.
Planning and Future Practices	Present one or more possible solutions and or next steps.	Provide evidence of planning with attention to detail.	Present possible benefits and/or challenges including how challenges could be overcome.
Connection to Bloom's	Create, Generating (6.1). Conceptual knowledge.	Create, Planning (6.2). Procedural and/or Metacognitive knowledge.	Evaluate, Checking (5.1). Procedural and/ or Metacognitive knowledge.

Note: Numbers in brackets following the connection to Bloom's Taxonomy are associated with the categories and cognitive processes outlined by Anderson et al. (2001). They may be used to allocate marks to each component or criterion as demonstrated in the Sample Evaluation Matrix Template, which can be found at the end of this report.

Sample Reflection

Assessment and evaluation notes can be seen in the right-hand column below to see how the authors have assessed the reflection. A sample blank evaluation template follows.

Sample Reflection:	Sample Reflection Evaluation:
<p>Car-free Living</p> <p>By Jane Doe</p> <p>August 22, 2014</p> <p>Growing up in the country, public transit and cycling were not options and getting a car was a rite of passage necessary for any sort of independence.</p> <p>In 2004, I moved to Hamilton for school and along came my car.</p> <p>Four years later, there I was living in the middle of the city with a house, a dog, and a car. I would joke that I didn't actually <i>need</i> a car. To be honest, I feared the possible reality that I would not be as happy without one.</p> <p>It was a small repair in November of 2011, one burnt-out headlight. It would have been an easy, low cost fix. However, it was just enough hassle for me to finally make the decision to become car-free for the first time in my adult life.</p> <p>I strategized on how I was going to improve my personal "modality", by increasing the number of modal options readily accessible. I bought a new bike, entered taxi-cab numbers into my phone, and kept transit tickets on-hand.</p> <p>Today, cycling is my main mode of transportation and I am riding (almost) year-round. I rent cars when I need them, I travel by transit when it is convenient to do so, and I call</p>	<p>Temporal Progression. Full date is included.</p> <p>Important Aspects of the Experience. Clear summary is provided, including context that contributed to expectations and life values associated with car ownership. Reference to Personal Thought/Feelings of car ownership as a value for independence.</p> <p>Temporal Progression of events is provided.</p> <p>Personal Thoughts and Feelings about fearing the need, or dependence on a car. Combined with first sentence, receives full marks. This is also an Important Aspect of the Experience.</p> <p>Important event that leads to getting rid of the car.</p> <p>Other Possible Responses. Distinguishes the issue, provides alternatives, and judges the outcome of increased modality. However, does not fully describe personal criteria and standards for why increased modal options are important.</p> <p>Cause and Effect Relationships. Distinguishes relevant aspects, constructs a cause-and-effect model and</p>

<p>a taxi when I am tight for time. As suspected, I have increased my physical activity and the time I spend outdoors. Additionally, I am better at planning ahead. My holiday shopping is done well in advance, I plan my trips more efficiently, and I always give myself more than enough time to travel. Overall, I feel that these things contributed to my increased happiness and lower levels of stress.</p> <p>It seems simple. I love cycling. Yet, for years I traveled mainly by car. One day, I decided to do more of what I loved, and it has benefitted me every day since. I found an article showing that there are lots of people who find enjoyment in active commuting, even more than those who travel by car!² In reading this article, I found that many of the ideas mentioned in the article really resonate with me, such as enjoyment found in walking and cycling with groups of friends as well as finding enjoyment in cycling through areas where you feel there is a sense of community. This article and my experience made me wonder what our society would be like if people focused on things they found true happiness in. Would we all be in better health because we spent more time with our pets and in the park, rather than in front of the TV? Would we get to work invigorated because we walked with a friend? Furthermore, would our</p>	<p>describes how the system is linked. Judges the outcome with partial description of personal criteria and standards –“happiness” as described above.</p> <p>Connection to Academic Theory. Full marks.</p> <p>Also reinforces the connection between cycling and happiness.</p> <p>Relating to Other Contexts. Full marks.</p> <p>Other possible responses. Briefly discusses other possible responses as well as the results that could be achieved.</p> <p>Other Possible Reponses. Problem is addressed,</p>
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² Paez. A., Whalen, K., 2010. Enjoyment of Commute: A comparison of different transportation modes. Transportation Research Board A: Policy and Practice. V.44, 537–549

<p>planet be in better health too? My guess is yes. I took this as a challenge to evaluate things in my life that I take great joy in and do more of them, which seems simple. For example, I love cooking and I find great joy when my house is filled with my friends and family. Rather than eating out at a restaurant, I recently started hosting monthly dinner parties where everyone brings a dish to prepare at my house. We find ourselves laughing and spending quality time together. We also try to include as many local and fresh ingredients into our meals as possible. This has become another example to confirm my theory. To be honest, just as commuting in the company of others increases enjoyment of traveling, washing dishes in the company of friends makes doing the task fun. Going forward, I am going to continue to find things that I enjoy and substitute those that are less beneficial to my health, my bank account, and the environment.</p> <p>My next goal includes finding outdoor, active, and community-based activities that my friends and I can take part in. Most recently, I have invited my neighbourhood friends to attend this month's Art Crawl together. I have also initiated a weekly, Sunday morning, escarpment stair climbing group with my athletic friends.</p> <p>I do anticipate that this will be a fun and rewarding challenge early on. However, I think once the novelty wears off I will be less inclined to continue. However, I have to remember that getting rid of my car did not</p>	<p>alternatives are provided, judges the outcome based on personal criteria and standards.</p> <p>Cause-and-Effect Relationships. Most aspects are relevant, other than comment about local and fresh ingredients. Health and sustainability seem to be themes, but are not explicitly discussed. Could ask why this contributes to their happiness. Includes aspects about social connections and happiness, as described above. Makes a judgement based on personal criteria and standards described above.</p> <p>Relating to Other Contexts. Full marks.</p> <p>Connection to Academic Theory. Connecting back to earlier paragraph about enjoyment of active commute.</p> <p>Thoughts and Feelings. These are discussed later in the experience. As such could ask if these were always values or if they developed through the experience.</p> <p>Planning and Future Practices. One or more solutions presented, evidence of planning, possible benefits as well as challenges are discussed as well as how challenges can be overcome described below. Full marks.</p>
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<p>seem easy, convenient, or fun in the beginning. I knew it would be hard and that I would encounter problems along the way. I did persist though, and it was well worth the effort.</p> <p>Another challenge will be in finding outdoor activities in the winter. I think following up an outdoor activity with hot chocolate might help keep my friends and I motivated. It is likely that I will have to work with my friends to decide what we can do to maintain the enjoyment when the cold weather arrives.</p>	
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Sample Evaluation Matrix Template

RLF Component and Criteria	Marks
Temporal Progression	
<ul style="list-style-type: none"> Recall relevant information from memory. Organize information, including temporal progression of events. 	/1 /2
Important Aspects of the Experience	
<ul style="list-style-type: none"> Distinguish the important parts of the experience. Summarize the main points and key themes. 	/2 /1
Connection to Academic Theory	
<ul style="list-style-type: none"> Detect correspondences between concepts from theory and from experience. Abstract relevant features from theory and practice and note the relationships between them with proper referencing of information. 	/1 /2
Relating to Other Contexts/ Drawing Connections	
<ul style="list-style-type: none"> Compare ideas and/or events and detect similarities and/or differences Distinguish relevant aspects relating the ideas and/or events. Provide one or more specific example of the general concept or principle from another situation. 	/2 /2 /2
Personal Thoughts and Feelings	
<ul style="list-style-type: none"> Analyze personal points of view, biases, values, and/or intentions. Organize personal thoughts and/or feelings within the context of the learning experience. Summarize the main points and key themes identified. 	/2 /2 /2
Cause-and-Effect Relationships	
<ul style="list-style-type: none"> Distinguish relevant aspects of the experience. Construct and use a cause-and-effect model, including the impacts of changing one part in the system. Judge the outcome of the relationship, based on personal criteria and standards. 	/2 /2 /2
Other Possible Responses	
<ul style="list-style-type: none"> Distinguish the issue being addressed. Provide alternative responses to addressing the issue. Judge the expected outcome(s) based on personal criteria and standards. 	/2 /2 /2
Planning and Future Practices	
<ul style="list-style-type: none"> Present one or more possible solutions and or next steps. Provide evidence of planning with attention to detail. Present possible benefits and/or challenges including how challenges could be overcome 	/2 /2 /2
Total	/39
Comments:	

Notes: As the level of cognitive processing required for Discussion is higher than is required by Recount, instructors and evaluators may choose to assign marks accordingly and as we have done here. Each component in the Recount category is marked out of three, with the specific criterion being marked out of one or two, depending on which one requires a higher level of cognitive processing as outlined by Bloom's Taxonomy. Each component in the Discussion category is marked out of six, with each criterion being assigned a mark value out of two.

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