# Independent Learning and the Essential Role of Feedback

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## Abstract

The broad constructs of learner control and independent/self-directed learning has been well researched in the learning sciences. This research has consistently revealed that under certain circumstances there can be negative consequences when learners are provided with high degrees of learner control. The role for feedback is linked to independent learning and is one of the most powerful influences on learner success. Specifically, as learner assessment is the *de facto* curriculum, feedback on progress is an essential driver. However, feedback is not discrete practice. Research in the learning sciences reveals that effective feedback involves a number of complex issues, including (a) the effective 'type' of feedback (immediate, delayed, knowledge of correct/incorrect response, etc.), (b) the kind of learning outcome (cognitive, intellectual, verbal or attitudinal) and (c) purposes (motivation, information, or contingent). Hence, feedback is an integral part of an instructional dialogue between instructors and learners and the effectiveness changes under different circumstances. The purpose of this chapter is to present a set of heuristics to guide effective strategies for course design based on what we know from the learning sciences on independent learning and feedback.

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## Introduction and Overview of the Chapter

The broad constructs of learner control and independent/self-directed learning, whereby the onus of responsibility for directing the learning activities rests with the learner, has been well researched of the last half century (Guglielmino, 2013). This research has consistently revealed that under certain circumstances there can be negative consequences when learners are provided with high degrees of independent learning (e.g., Kirschner, et al., 2016). For example, research on learner-control reveals that some learners' achievement is the same with control as without control—but learners who are poor performers learned the least. These learners seemed to have two characteristics in common: without guidance they fail to employ adequate review strategies, and they do not know how to manage their time and thus frequently do not complete the learning activities within the allotted time. Hence, the role for feedback to guide learners is also key, as it is one of the most powerful influences on learner success. Specifically, learner assessment can be considered as the *de facto* curriculum, hence feedback on learner progress is a key driver. However, research also reveals that the best kind of feedback involves a number of complex issues, including (a) the effective type of feedback (immediate, delayed, knowledge of correct/incorrect response, etc.), (b) the kind of learning outcome (cognitive, intellectual, verbal or attitudinal) and (c) purposes (motivation, information, or contingent). Feedback is not an unconnected practice but an integral part of an instructional dialogue between instructors and learners and needs to be adjusted based on the circumstances.

The purpose of this chapter is to present a set of heuristics to guide effective strategies for course design based on what we know from the learning sciences on independent learning and feedback. The heuristics are developed through a synthesis and conceptual integration across independent learning theories, the research on independent learning, and feedback, bringing together existing fragmentation across these different literatures. The synthesis of the literatures in this chapter represents, and emphasizes, narrative reasoning that seeks to present the big picture patterns between independent learning theories and feedback. The conclusion offers an integrated overview of the relationship between independent learning and feedback, which has not previously been synthesized. Hence, this chapter provides a parsimonious picture that links disparate aspects into an integrated set of heuristics for designing effective learning.

The chapter begins with a review of the literatures. The purpose of this part of the chapter is to untangle the various perspectives of independent-learning that underpin the theoretical literature. This is then followed by the associated theories, and the research within the learning sciences on independent learning and feedback, concluding with a set of heuristics on feedback.

## Independent-Learning

For over half a century, independent learning and associated concepts (i.e., self-directed learning, self-regulated learning, learner control, self-paced learning, discovery learning, inquiry-based learning) have been written about, theorized and researched in adult and

higher education. In higher education, the construct of independent learning is widely regarded as a critical aspect to success (success being defined as program completion). Independent learning emerged in the 1960s with 'self-directed learning' as the widely used phrase in the field. In 1961 Cyril Houle published *The Inquiring Mind* which opened a dialogue about an adult's need to direct their learning. Though, it should be noted that Eduard Lindeman first wrote about problems related to the field of self-direction in 1926 in his book *The Meaning of Adult Education.* While Houle and Lindeman did not use the phrase 'self-directed learning' in their writings, two of Houle's students (Tough, 1971; Knowles, 1975) used the phrase 'self-directed learning' and has subsequently been used to encompass the broad notion of a process by which one directs their learning. By the 1990s Candy (1991) noted that, "In recent years, the notion of self-direction has attained something of a cult status in the literature of adult education" (Candy, p. xiii). Over the last few decades, the interest in independent learning has not only grown but has been extended to include learner centered and constructivist pedagogical practices. The broad constructs independent/self-directed learning, whereby the onus of responsibility for directing the learning activities rests with the learner has been, and continues to be, well researched.

As noted above, the most common phrase used in the literature for the broad construct of independent-learning is 'self-directed learning'. How this phrase has been construed, deconstructed and theorized in the literature is vast. Ostensibly, self-directed learning refers to the degree of control over the choices that learners have within an instructional situation – or how much autonomy/independence they have. As such the use of the phrase 'independent learning' is a more correct term than self-directed learning. To be precise, it would be rather rare for learning to occur entirely void of any kind of directed assistance (e.g., books, videos, lectures, workshops, tutorials, etc.). Hence, the use of the term 'independent learning' is used in this chapter, rather than self-directed learning or learner control since these concepts are subsumed under independent learning.

The following subsections provide a brief overview of a few of the influential early theories and models on independent learning within the adult and higher education field. These theories and models continue to underpin our current beliefs about independent learning.

*Theories and Models: Past to Present*

Long's (1989) instructional model on independent learning was one of the earliest models of self-directed learning and provides an instructional framework to guide the learning process. This model is centered on the relationship between pedagogical control and psychological control. Pedagogical control (e.g., instructor control) is the degree to which learners have the autonomy to control their learning goals, choose resources and determine how their learning will be evaluated. Alternatively, psychological control focusses on the readiness of learners to maintain control of the learning process. When these two aspects of control are equal, or the psychological control surpasses pedagogical control, the situation can be defined as an independent learning condition. Pedagogical and psychological control are both on adjoining continuums (from low to high control),

forming four quadrants: (1) high pedagogical control and high psychological control, (2) low pedagogical control and low psychological control, (3) high pedagogical control and low psychological control, and (4) low pedagogical control and high psychological control. The ideal situation for independent learning, as proposed by Long, is when the learner has high psychological control and the instructor facilitates a low degree of pedagogical control. The ideal situation for learners unable or unwilling to engage in independent learning (low psychological control) is when the instructor facilitates a high degree of pedagogical control. The other two situations (high pedagogical control with high psychological control and low pedagogical control with low psychological control) are not optimal learning environments.

An essential aspect that Long's model highlights is that the instructor must match the level of pedagogical control with learner readiness. Specifically, the instructor must know their learners' readiness for independent learning and match the degree of control accordingly.

Following Long (1989), Candy (1991) also proposed a model with two interacting dimensions. One dimension is the degree of control within an institutional setting. In this dimension, at one end of the continuum, the educator has control over content presentation, what is to be learned and learner outcomes. The other end of the continuum is the degree to which the learners have control over the learning experiences. In this dimension, the learners have control outside the formal institutional setting. In this continuum the learner has control over the content, learning activities, when and where the learning takes place, and how the learning outcomes will be evaluated. The continuum of this domain represents the amount of control the learner has in making decisions about their learning experience.

Within these dimensions, Candy (1991) proposed four areas of self-directed learning: (1) personal autonomy, (2) self-management, (3) learner control and (4) autodidaxy. Personal autonomy includes independence, freedom of choice and rational reflection. For Candy, personal autonomy involves the personal characteristics of a learner and is one of the main goals of education. Self-management is the willingness and capacity to manage one's learning activities. Learner control is a learner's control over aspects of the learning activities and environment. Lastly, autodidaxy deals with learning outside formal educational settings. These aspects also fall on a continuum, implying that a learner's self-direction may be different in diverse content areas and contexts.

As noted above, the 'cult-like' status of independent learning has continued well into the 21st century. And while the nomenclature has changed over time (e.g., learner centered/learner centric, constructivism) the theoretical underpinnings have remained the same. A key aspect of supporting a learner centered classroom, for example, is for the instructor to become a 'guide on the side' rather than 'sage on the stage'. The role of the instructor is to facilitate the learners in their planning, managing resources and evaluating their own learning (e.g., Merriam, Caffarella & Baumgartner, 2007). Suggestions to foster this kind of learning environment typically include such instructional methods as problem-based learning, inquiry-based learning, experiential learning and project-based

learning. Inherent in these kinds of instructional methods is the requirement for the learners to independently (minimal support from the instructor) set their learning goals, planning and preparation, execute their learning activities, and evaluate how well they achieved their learning goals. It has been argued, in turn, this kind of learning environment is effective at facilitating higher levels of learning, alongside critical and creative learning skills (Bosch, Mentz & Goede, 2019; Garrison, 1997). As the majority of educators aspire to facilitate learners who are not only independent learners, but are also critical and creative learners, this is a seductive approach and easy to understand how it has achieved a cult-like following.

However, based on what we know from the theoretical literature, as well as the learning sciences, there are a few underlying assumptions that render these approaches unrealistic and often unachievable. First, not all learners want to engage in self-directed projects. Perhaps more importantly, not all learners are capable of directing their own learning activities. Additionally, few learners are equally effective at managing their learning across all subjects. While there are several theories and frameworks that can useful in understanding these differences (e.g., Borich, 2007; Brockett & Hiemstra, 1991; Garrison, 1987; Grow, 2003; Oswalt, 2003), Moore's (1997) theoretical framework provides explanatory power, supported by research, with respect to these kinds of differences.

The theory of Transactional distance developed by Moore (1973), sought to isolate those elements in educational transactions that most critically influence learners. Moore argued that the theory of transactional distance can be applied to several different learning environments where there is some form of separation between the learners and instructors – from distance learning to large enrolment lectures. Moore argued that if the degree of separation is great between learners and instructors, it can transform traditional expository teaching so significantly that alternative ways of teaching are needed. Similar to Candy's (1991) and Long's (1989) models, Moore's theory includes three variables that fall along a continuum. Two variables, dialogue and structure, encompass the instructional dimension. Dialogue is the interaction between the instructor and the learners, whereas structure is concerned with the elements of the course design. In learning environments where the learner receives high levels of directions and guidance (instructor control) through both a high degree of structure of the course and a high degree of interactive dialogue, there is a low level of transactional distance. Alternatively, where learners make their own decisions (learner control) about strategies and have little, if any, dialogue, there is a high level of transactional distance. According to Moore (1973), the learning dimension must also be considered, and the amount of learner autonomy exercised is the third variable. Unlike other theories and models on independent learning, Moore recognized that theories that only considered the variables in instruction (i.e., dialogue and structure) would be insufficient (Moore 1973; Moore & Kearsley 1996). In particular, even where a course is highly structured, the learners may decide for themselves whether the guidance and directions will be used and if so, when, where, in what ways, and to what extent (Moore 1973, 1991). The praxis of this theory, then, involves determining the right mix of structure, dialogue and autonomy for achieving successful learning transactions.

The value of Moore's theory with respect to independent learning is the assertion that an inverse relationship exists between the three factors, rather than two (dialogue, structure and autonomy) and an increase in one can lead to corresponding decreases in others. For example, a course with an inflexible structure (low learner control) can lead to a decrease in the quality of dialogue and sense of learner autonomy (independent learning), thereby increasing the learners' perception of transactional distance. However, Moore (1997) also notes that when a course's structure drops below a particular threshold (e.g., too much learner autonomy), the sense of transactional distance can actually increase, due principally to the potential for learner confusion.

While not specifically building on the research in the learning sciences, Moore's theory of transactional distance is most closely aligned with this research with respect to the need to determine the right mix of structure, dialogue and autonomy. In particular, many of the early theories and models asserting that learners want, and indeed, need, to direct their own learning to achieve higher levels of learning (e.g., critical and creative thinking), the research in the learning sciences does not align with these assertions. Following is an overview of what we know from the learning sciences on independent learning.

## Independent Learning and the Human Mind: The Learning Sciences

Noticeably absent in the literature on independent learning is an integration of what we know about how the mind and brain works. The learning sciences offer valuable insights with respect to independent learning.

Perhaps the most important aspect to consider within the learning sciences is what we know about cognitive overload and learner disorientation. For example, given the vast access to resources through the internet, low levels of pedagogical control (e.g., instructor direction) requires learners learn to make informed choices about which information they will or will not access; this involves having some prior knowledge of the content as well as using metacognitive skills. Learners who do not have these skills may experience cognitive overload and conceptual disorientation (Kanuka, 2002). The most prevalent issue for the 21st century learner is the seemingly endless amounts of information that learners can access on the Internet. The process of accessing information involves learners making decision of which, if any, to include in their learnings. That is, learners can decide whether to choose information identified by explicit connections or to freely explore in tune with their individual capacity and aims. The result is that independent learning can create environments endowed with high quantities of information for learning any topic but may also lead to some problems precisely due to the amount of information that can be freely accessed.

On a cognitive level, when learners self-direct access to resources, it can create difficulty with psychological and social order evolving from the need to ensure that learners attain a common base of knowledge and skills while allowing them to guide their own learning process. In particular independent learning can sometimes result in learner disorientation

and/or cognitive overload. Cognitive overload can then give rise to a further problem called conceptual disorientation that occurs when a learner loses sight of the task while exploring the content. And the 21st century learner has access to a lot of digital learning resources which requires navigation – not only on the Internet – but also when accessing open educational resources and massive open and online courses.

While independent learning is top of mind for many instructors arising from the vast access to digital resources, studies on learner control have been conducted over the past five decades. Prior to the 1980s studies on independent learning usually focused on "control of course flow, control of structural features of instruction and motivational effects of learner control" (Steinberg, 1989, p. 117). The results of these studies showed that some learners' achievement was the same with control as without control but learners who were poor performers in the subject area learned the least. These learners seemed to have two major deficiencies: (1) they failed to employ adequate review strategies and (2) they did not know how to manage their time and frequently did not complete the course during the allotted time (Steinberg, 1989).

As a whole, this research indicated that learners learn less with learner control and are not very proficient at selecting exercises at appropriate difficulty levels; learners who are high achievers in the subject area are most likely to manage their learning appropriately. This early research cited by Steinberg (1989) reveals that at times learner control results in greater task engagement and better attitudes, but not necessarily in greater achievement, and at times even led to worse performance. The research on aptitude and trait-treatment research yielded no definitive conclusions. Moreover, while many learners were motivated by independent learning, others were indifferent to it. These early studies were often criticized for failing to show advantages because they did not account for the psychological processes in learning and individual differences in learning skills and strategies (Steinberg, 1989). More recent studies have focused on these issues. Reviewing these studies, Steinberg discovered that most of the results are still in agreement with earlier research and none of the studies reviewed were in conflict. In general, the research indicates that when a task is not overly complex, there are likely to be few, if any, benefits of learner control. Learners with little knowledge of the content do not perform as well under learner control. This research indicates that the less a learner knows about a subject, the greater the need for instructional support.

Similar in focus to Steinberg (1991), Eklund (1995) reviewed research that studied relationships between learning outcomes and self-directed navigational paths on the Internet. The research cited by Eklund indicates that there is a relationship between high achievers and learner paths. It would appear that while much of the literature claims that independent learning provides higher order learning opportunities for learners in an ill-structured learning environment (e.g., the hypertext links on the internet), studies have revealed that learners tend to adopt a linear pattern similar to that taken with a book. Other studies have shown that knowledge of the subject matter correlates highly with the ability to navigate in a non-linear environment, in agreement with Stienberg's (1991) review of the research.

This early research on independent learning is inconsistent with the theories and models presented in the first section of this chapter. A key assumption in the theoretical literature on self-directed learning is that the instructors' role, while recognized, should be minimized to guiding the learners, allowing learners a high degree of control (Francom, 2009). A corollary assumption is that high levels of pedagogical control is necessary for the achievement of critical and creative thinking skills (Garrison, 1997; Guglielmino & Guglielmino, 2001). According to Okoro and Chukwudi (2011), for example, independent learning promotes the active engagement of learners in the learning process which supports the achievement of higher-order thinking skills, such as problem-solving, critical thinking and reasoning. Johnson and Johnson assert further, "When self-directed learners challenge themselves, creative thinking is often required to determine how best to complete an assignment or solve a problem" (p. 60). Suggestions for facilitating independent learning have included giving learners the control over organizing and evaluating their learning (Merriam, Caffarella & Baumgartner 2007). Merriam et al. also recommend that instructors' roles should be limited to helping learners locate resources or active teaching-learning strategies.

However, the learning sciences research indicates that various kinds of cognitive loads can occur for learners when learning environments are not designed appropriately, which includes designing for apposite levels of independent learning. For example, intrinsic load can occur when the content is difficult and knowledge of the content is limited. We know from the learning sciences research that complex content requires complex schemas, resulting in higher intrinsic loads (Choi et al. 2014; Paas et al. 2010; Sweller et al. 2011; Van Merriënboer et al. 2006). Appropriate instructional design will break down the complex material into subschemas, taught in isolation, and brought back as a combined and coherent whole (Kirschner et al., 2016). Van Merriënboer et al. (2006) also observe that intrinsic load is determined by prior knowledge of the learner.

Additionally, research by Chandler and Sweller (1991) demonstrated a 'split attention effect' occurs when high levels of the cognitive load (which they referred to later as 'extraneous load') was imposed unnecessarily by the format of instruction. Without careful design and knowledge of the learners' prior knowledge, independent learning imposes a format that can unnecessarily add to the extraneous load. Van Merriënboer et al. (2006) also illustrated that extraneous load is a result of poorly designed instruction. As with intrinsic load, a split attention effect can arise from instructional design that does not account for the cognitive architecture.

Finally, Sweller, Van Merriënboer and Paas (1998) determined germane load can also influence learning. Germane load is the processing, formation and automation of learner schemas. Germane load is important as it can facilitate effective learning arising from the ability for learners to effectively process the content. In an ideal learning situation, optimal use will be made of germane resources. Hence, when learning design focuses on learners' schema construction (germane load) it can reduce extraneous cognitive load by redirecting the learners' attention through optimal use of germane resources.

*In Brief*

The learning sciences research has consistently revealed that under certain circumstances there are negative consequences when learners are provided with high degrees of learner control. In particular, research on independent learning reveals that some learners' achievement is the same with control as without control – but learners who are poor performers learned the least. These learners seemed to have two characteristics in common: they fail to employ adequate review strategies and they do not know how to manage their time and thus frequently do not complete the course during the allotted time. Early studies were often criticized for failing to show learner control advantages because they did not account for the psychological processes in learning and individual differences in learning skills and strategies. More recent research has focused on these aspects and with similar/same findings.

An overview of the literature in the learning sciences reveal the overall effect of including learner control is negligible. There is some indication that:

- learners learn less with learner control and are not very proficient at selecting exercises at appropriate difficulty levels
- learners who are high achievers in the subject area are most likely to manage their learning appropriately
- at times learner control resulted in greater task engagement and better attitudes, but not necessarily in greater achievement—and at times even led to worse performance
- the research on aptitude and trait-treatment research yielded no definitive conclusions
- while many learners were motivated by learner control, others were indifferent to it

Here's what we know: When a task is not overly complex there are likely to be few, if any, benefits of learner control. More importantly, learners with little knowledge of the content do not perform as well under learner control. Relatedly, the less a learner knows about a subject, the greater his/her need for instructional support.

Here's what else we know: While there is much we know about the broad construct of independent learning, the research continues to have gaps. One of the most notable gaps in the literatures on independent learning is the effects of feedback. Alongside instructional design the role of feedback (or what Moore (1991) explains as an aspect of dialogue between the instructor and learner) is a key factor. Feedback is one of the most powerful influences on learner success. Learner assessment is considered as the *de facto* curriculum. As such, feedback on progress is a key driver for learners. In particular, we know significant increases in learning occurs when appropriate feedback is provided (Bermingha & Hodgson, 2006; Bone, 1999; Boud, 1995; Dochy, et al., 1999; Lysakowski & Walberg, 1981, 1982; Tennebaum & Goldring, 1989). Feedback is more strongly and consistently related to achievement than any other teaching behavior (Bellon, Bellon & Blank, 1992). This relationship is consistent regardless of grade, socioeconomic status, race, or institutional setting. When feedback and corrective procedures are used, most

learners can attain the same level of achievement as the top 20% of learners. However, research reveals that the best kind of feedback depends on a variety of variables.

**Feedback**

There is no question that feedback on assessment is important (Brown, 1997; Brown & Knight, 1994). It is one of the most powerful effects on learning and achievement (Hattie & Timperley, 2007). Research has shown that effective feedback is not a discrete practice, but an integral part of an instructional dialogue between the instructor and the learner, (or between learners, or between the learners and him/her/themselves) and is different under different circumstances. There is considerable research to show that effective feedback leads to learning gains (Nicol & MacFarlane-Dick, 2006). For example, the results of a meta-analysis by Van der Kliej, Feskens and Eggans (2015) consistently showed that more elaborate feedback led to higher learning outcomes than simple feedback, in particular with respect to higher order learning outcomes.

Providing the best kinds of responses involves a number of complex issues: what is the most effective type of feedback, for which kind of learning outcomes, and for what purposes? Following is a response to these questions based on a review of the research on feedback.

*No feedback* (NF) allows learners to progress without receiving any feedback. In research studies, this feedback option consistently received the lowest performance scores. This suggests that *any* type of feedback is better than no feedback at all.

*Knowledge of correct response* (KCR) provides learners with feedback only when a correct response is selected. Research studies show that this option is almost as ineffective on performance scores than no feedback at all.

*Knowledge of incorrect responses* (KIR) provides feedback to learners only after an incorrect response. Research studies indicate that this option is more effective than knowledge of a correct response or no feedback at all.

*Knowledge of correct and incorrect responses* (KR) informs learners of the correctness of each of their responses. Research studies are inconclusive as to the relative effectiveness of this response to those cited above.

*Knowledge of correct responses and knowledge of incorrect responses with correct responses given* (KR w/CR) is when a correct response is provided, the learner is informed that it is correct; if the response is incorrect, the learner is informed of the error and provided with the correct answer. Research indicates that informing learners of errors with the correct response provides useful information, which seems to be used to refine learning strategies that results in increased performance.

*Knowledge of correct responses and knowledge of incorrect responses with the correct response and an explanation provided* (KR w/CR & E) functions exactly the

same manner as knowledge of correct and incorrect responses with correct response provided except it has the addition of an explanation of why the response was incorrect. Research indicates that the increased elaboration of response serves as an additional instruction to assist in increased achievement.

*Knowledge of consequence* (KC) informs learners of the results of a response without being judgmental. This type of feedback is often used in combination of other kinds of feedback. This kind of feedback has not received attention from researchers yet.

How effective the above feedback is will also depend on the desired learning outcomes. Following is the relationship between learning outcomes and the type of feedback.

*Cognitive strategies* are learned techniques for manipulating information. Knowledge of consequence feedback allows learners to examine the effects of each decision and, as such, makes this type of feedback with this type of desired learning outcome the most effective.

*Intellectual skills* can be separated into higher levels (problem solving, rule learning, and defined concepts) and lower level (concrete concepts and discriminations) learning outcomes. Elaborate feedback that provides an explanation of errors as well as additional instruction (knowledge of response with correct response given) is the most effective at the higher level learning outcomes. Instruction at the lower level requires feedback that simply informs the learners of the correctness of their response (knowledge of correct and incorrect response).

*Verbal information* encompasses organization or memorization of information, facts, and labels. A desired outcome associated with verbal information is correct identification. The most effective feedback for this type of outcome is knowledge of incorrect and correct response.

*Attitudinal* changes require learners to understand why their attitudes are inaccurate. Three techniques commonly used in instruction to bring about changes in attitudes include positive reinforcement, modeling, and persuasive information. The feedback most appropriate for this type of learning outcome requires one of the three most complex and elaborate feedback types: knowledge of correct and incorrect response with correct response provided; knowledge of correct and incorrect responses with correct response and an explanation provided, and; knowledge of consequence.

Finally, there are three primary functions of the use of feedback that will also influence the desired learning outcomes and the most appropriate use of feedback type.

*Feedback for increased learner motivation*. This type of feedback is most often provided in the form of a reward for a correct response. The most effective type of feedback for motivational purposes is with knowledge of correct and incorrect response with positive reinforcement comments when correct and 'off the hook' responses when incorrect. Positive comments need to include praise for providing the

correct response that is personal and varied. Examples of varied praise responses might include "wow, excellent!" or "well done!" "absolutely!" or "good choice!" When learners respond incorrectly, care must be given to ensure that the responses do not discourage the learner and maintain a friendly tone. Examples of feedback for incorrect responses that let the learner 'off the hook' might include "many people get this wrong on the first try" or "this is a tricky concept" or "I used to have trouble getting this straight too." It also needs to be noted that learner feedback on assessment will quickly lose its effectiveness at increasing motivation if all the questions are the same format with similar and impersonal canned responses. Another way of increasing a learner's motivation, and confidence, is to develop at least some questions that everyone will get right.

*Provide additional information to the learner*. Informational feedback, which typically follows incorrect responses, consists of corrective statements and elaboration of the subject matter. The additional information is intended to help the learner perform more successfully in the future.

1. *Provide contingent feedback*. This kind of feedback is generally most associated with computer generated mastery learning and its ability to provide different levels of feedback with a single instructional lesson. The different levels of feedback are tailored to match the needs of the learners as well as the desired learning outcomes. One form of contingent feedback that is particularly well suited for computer generated use is elaboration of information to learners about the nature of their errors.

Of the types and functions of feedback, most instructors use information feedback and knowledge of results. With this in mind, there are guidelines to help define when to use informational feedback and knowledge of results. For example, information feedback has the greatest positive effect when it follows a wrong response by a learner. And, feedback after a correct response is not as important or facilitative. Too much feedback, or feedback messages that are too long and time-consuming, can slow down the pace of instruction and cause a confident learner to feel impatient or frustrated. It is important to look at the intended audience and decide if correct responses need to be confirmed. Confident learners with prior knowledge of the subject matter would not need continual confirmation, while inexperienced learners require such confirmation to build up confidence.

As the research illustrates, the effectiveness of feedback is a complex issue. The feedback model provided (Figure 1) provides a graphical illustration showing the relationships between the types of feedback, desired learning outcomes, and the primary functions of feedback.

*Immediate Feedback*

Finally, much of the literature advocating interactive instruction and active learning also claim that immediate feedback is desirable. But, again, this is not a straightforward issue. The research points out that there are certain conditions when immediate feedback, or

feedback given within a few seconds after a learner response, should be used. Yet, the research also indicates that there are also conditions when delaying the feedback to the end of a learning event enhances the instruction. The following are guidelines to help clarify these conditions.

- One of the most important conditions to study is the level of mastery of the learner. If the learner exhibits a low mastery of the material, immediate feedback seems to facilitate instruction because the learner is receiving the necessary help and information he or she needs while proceeding through the content.

- If the learner exhibits high mastery of the content, immediate feedback can impede the pace of learning and be perceived as a deterrent. More important to the high-mastery learner is the end-of-session feedback, or the type of feedback that is presented at the end of a unit to assess how a learner is progressing.

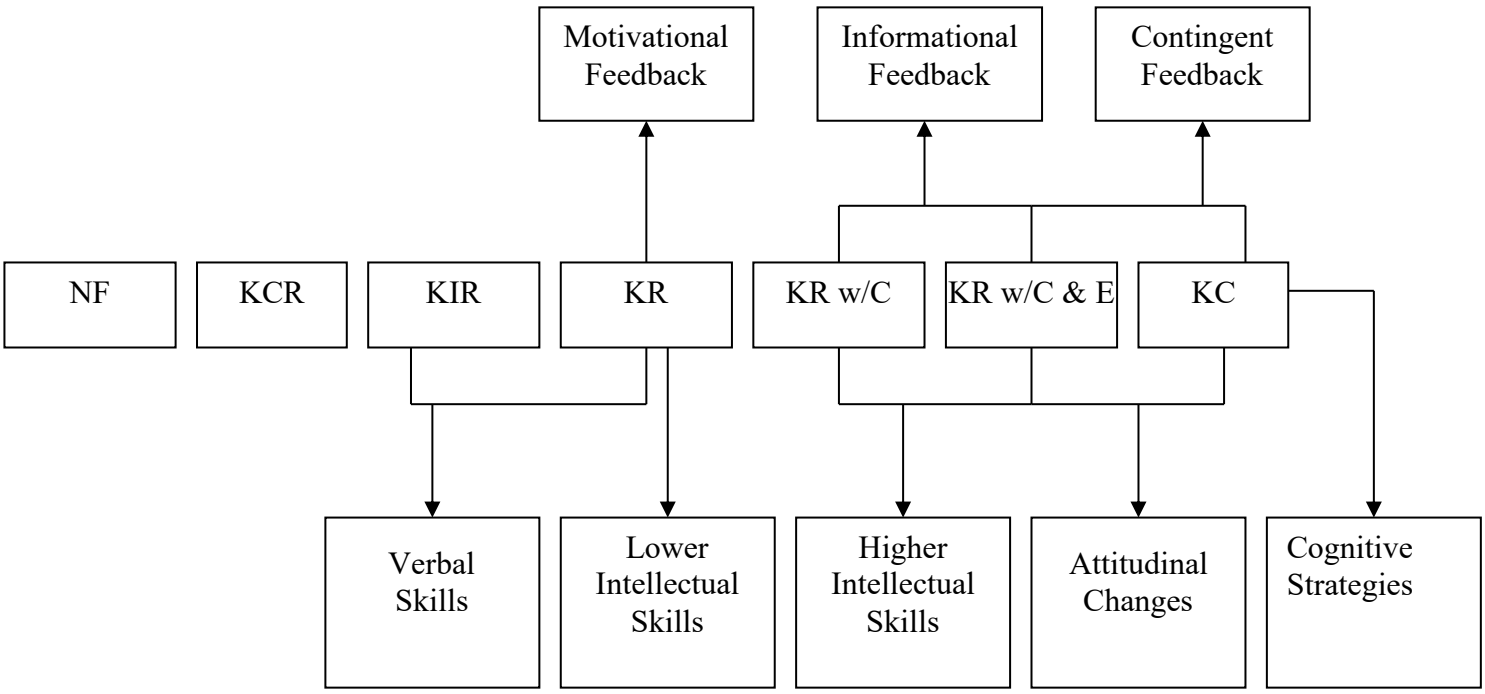
- Immediate feedback has been shown to facilitate short-term retention and initial acquisition of material. Immediate feedback also seems to facilitate the acquiring of knowledge when looking at the cognitive domain. If the primary goal is initial acquisition of content, or the recognition and immediate recall of ideas, then immediate feedback is desired.

- End-of-session feedback seems to facilitate long-term retention, especially with high-mastery learners.

- If the learners have no prior knowledge of the subject matter, immediate feedback seems to be mandatory. If learners do have prior knowledge of the subject matter, it may be worthwhile to delay informational feedback while still presenting knowledge of results immediately after the learners' response. This would have the effect of locating errors in the learner's mind, but would also delay the message that would help to correct the errors.

The most important aspect for instructors to consider is that feedback decisions should be based upon careful analysis of the learning outcomes, the target audience—and use with discretion and care.

**Figure 1: Feedback**




**Concluding Remarks**

It is difficult to understand the cult-like status that independent learning has attained, as well as the endurance it has sustained over the last half century. Many of the beliefs about independent learning are encompassed in this quote by Simsek (2012):

> … the rationale behind the concept of learner control is quite strong. Many educators suggest that learner control improves learners' involvement, motivation, mental investment, achievement, and attitudes toward learning. They claim that learner control provides learners freedom to select learning activities that suit their needs, expectations, and preferences. The idea is that informed learner control by motivated learners generally increases effectiveness, engagement, and efficiency of instruction. (n.p.)

Simsek also notes that, "As far as achievement is concerned, the results have been mixed. Most studies have found no significant differences between learner-controlled and program-controlled treatments" (n.p.). According to Karich, Burns and Maki (2014) giving learners control over their learning has "theoretical and intuitive appeal, but its effects are neither powerful nor consistent in the empirical literature base" (p. 392). The meta-analysis conducted by these researchers found negligible effects on learner outcome measures with components of independent learning. Further, their research revealed that behavioral variables had greater effects than academic achievement, suggesting that independent learning may enhance engagement, but not learner skills.

Based on the research in the learning sciences, it is possible that instructors who facilitate independent learning may impede the success for at least some of their learners and the view that it accommodates individual differences is naïve (Snow, 1980). Failing to understand the complexities of independent learning may lead to "adverse effects, such as disorientation and overload which [result in increased] attrition rates" (p. 172). Reviews of the literature suggest that learner control needs to be approached cautiously. For example, Lin and Hsieh (2001) conclude that, "While some students may gain educational benefit from this freedom, others may suffer as a consequence of being handed such control over their learning… [and] learning needs to be analyzed and evaluated with great care" (p. 383). And while independent learning might be popular with learners and instructors, there is little evidence that it facilitates effective learning, or any impact of learner success. Alternatively, there is a rather large body of research in the learning sciences that independent learning can create adverse effects, including imposing cognitive load, conceptual disorientation in addition to misconceptions, and disorganized knowledge. Moreover, the unbridled enthusiasm by instructors for independent learning and its concomitant instructional methods (discovery learning, inquiry-based learning, experiential learning, constructivism, etc.) might feel good for both learners and instructors, there is little evidence that it facilitates critical and creative learning. Indeed, the theories and frameworks on independent learning, and the related research, are based on learner and instructor perceptions rather than controlled studies on learner outcomes. Alternatively, there is considerable evidence spanning almost fifty years on the effectiveness of instructional design underpinned by the research on cognitive architecture, prior knowledge, cognitive load and feedback showing guided learning is essential to learner success.

Guided learning will include appropriate instructional design, which will include analyzing the learning environment and the learners, designing and developing the learning activities, and concluding with assessment and evaluation. With respect to assessment and evaluation, instructional dialogue (feedback) from the instructor to the learner is essential. As this chapter has illustrated, effective learning design needs to have an integrated approach based on what we know from the learning sciences on feedback. In particular, the role of feedback is linked to independent learning and is directly related to learner success. However, as figure 1 illustrates, feedback requires a nuanced approach, involving (a) the effective 'type' of feedback (immediate, delayed, knowledge of correct/incorrect response, etc.), (b) the kind of learning outcome (cognitive, intellectual, verbal or attitudinal) and (c) purposes (motivation, information, or contingent). Hence, feedback is an integral part of an instructional dialogue between instructors and learners *and* the effectiveness of feedback will be varied, depending on circumstances.

**References**

Bellon, J., Bellon, Elner, and Blank, Mary Annn (1992). *Teaching from a Research Knowledge Base: A Development and Renewal Process*. New York: Macmillan Publishing. https://doi.org/10.1177/019263659207654720

Bermingham, V. & Hodgson, J. (2006). Feedback on assessment: can we provide a better student experience by working smarter than by working harder? *The Law Teacher*, *40*(2),151-172. https://doi.org/10.1080/03069400.2006.9993204

Bone, A. (1999*). Ensuring successful assessment.* Coventry: National Centre for Legal Education. Online. Available at:

https://ials.sas.ac.uk/ukcle/78.158.56.101/archive/law/resources/assessment-and-feedback/bone/index.html

Borich, G. D. (2007). *Effective teaching methods.* Pearson, New Jersey

Bosch, C., Mentz, E., & Goede, R. (2019). *Self-directed learning: A conceptual overview*. In E. Mentz, J. De Beer & R. Bailey (eds.), Self-Directed Learning for the 21st Century: Implications for Higher Education (NWU Self-Directed Learning Series Volume 1), pp. 1–36, AOSIS, Cape Town. https://doi.org/10.4102/aosis.2019.BK134.01

Boud, D. (1995). Enhancing learning through self-assessment. London: Kogan Page.

Brockett, R. G., & Hiemstra, R. (1991). *Self-direction in adult learning: Perspectives on theory, research, and practice*. New York: Routledge.

Brown, G. (1997). *Assessing student learning in higher education*. London: Routledge.

Brown, S., & Knight, P. (1994). *Assessing learners in higher education*. London: Kogan Page.

Candy, P. C. (1987). *Evolution, revolution or devolution: Increasing learner-control in the instructional setting*. In Boud D and Griffin V (Eds): Appreciating adults learning: from the learners' perspective, pp. I59-178. London: Kogan Page.

Candy, P. C. (1991). *Self-direction for lifelong learning.* San Francisco: Jossey-Bass.

Chandler, P., & Sweller, J. (1991). Cognitive load theory and the format of instruction. *Cognition and Instruction, 8*(4), 293–332. https://doi.org/10.1207/s1532690xci0804_2

Choi, H.-H., Van Merriënboer, J. J. G. & Paas, F. (2014). Effects of the physical environment on cognitive load and learning: Towards a new model of cognitive load. *Educational Psychology Review. 26*(2), 225–244. https://doi.org/10.1007/s10648-014-9262-6

Dochy F., Segers, M. & Buehl, M. M. (1999). The Relation Between Assessment Practices and Outcomes of Studies: The Case of Research on Prior Knowledge. *Review of Educational Research. 69*(2), 145-186. doi:10.3102/00346543069002145

Eklund, J. (1995). Cognitive models for structuring hypermedia and implications for learning from the world-wide web. *Proceedings of AusWeb'95*. Ballina, NSW, pp. 111-118.

Francom, C. J. (2009). *Experimental syntax: Exploring the effect of repeated exposure to anomalous syntactic structure – Evidence from rating and reading tasks*. PhD thesis, University of Arizona.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly, 48*(1), 18-33. https://doi.org/10.1177/074171369704800103

Gibbs, G. & Simpson, C. (205). Conditions under which assessment supports students' learning. Editors' Introduction, 1(1), 3–31. Online. Available: https://eprints.glos.ac.uk/3609/1/LATHE%201.%20Conditions%20Under%20Which%20Assessment%20Supports%20Students%27%20Learning%20Gibbs_Simpson.pdf

Grow, G. O. (1991). Teaching learners to be self-directed. *Adult Education Quarterly, 41*(3), 125-149. https://doi.org/10.1177/0001848191041003001

Guglielmino, L. M. (2013). The case for promoting self-directed learning in formal educational institutions. *SA-eDUC journal, 10*(2), 2-18.

Guglielmino, P. J. & Guglielmino, L. M. (2001). Moving toward a distributed learning model based on self-managed learning. *SAM Advanced Management Journal, 66*(3), 36-43.

Hattie, J. & Timperley, H. (2011). The power of feedback. *Review of Educational Research, 77*(1), 81-112. https://doi.org/10.3102/003465430298487

Hattie, J. & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81-112. DOI: 10.3102/003465430298487

Houle, C. O. (1961). The Inquiring Mind, University of Wisconsin Press, WI, US.
Johnson, D.W. & Johnson, R.T., 2019, 'The impact of cooperative learning on self-directed learning', in E. Mentz, J. De Beer & R. Bailey (eds.), *Self-Directed Learning for the 21st Century: Implications for Higher Education* (NWU Self-Directed Learning Series Volume 1), pp. 37–66, AOSIS, Cape Town. https://doi.org/10.4102/aosis.2019.BK134.02
Kanuka, H. (2002). Guiding Principles for Facilitating Higher Levels of Web-Based Distance Teaching and Learning in Post-Secondary Settings. *Distance Education*, *23*(2), 163-182, DOI: 10.1080/0158791022000009187
Karich, A. C., Burns, M. K., & Maki, K. E. (2014). Updated meta-analysis of learner control within educational technology. *Review of Educational Research, 84*(3), 392-410.
Kirschner, P. A., Sweller, J. & Clark, R. E. (2016). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based teaching. *Educational Psychologist 41*(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1
Knowles, M. S. (1975). Self-directed Learning: A Guide for Learners and Teachers, Association Press, New York, NY, USA.
Lin, B. & Hsieh, C-t. (2001). Web-based teaching and learner control: A research review. Computers & Education, 37, 377-386.
Long, H. B. (1989). Self-directed learning: Merging theory and practice'. In H.B. Long (ed.), *Self-directed learning merging theory and practice*, pp. 1–12, Research Center for Continuing Professional and Higher Education of the University of Oklahoma, Norman, OK.
Lindeman, E. C. (1926). The Meaning of Adult Education, Harvest House, Montreal, USA.
Lysakowski, R. S. & Walberg, H. J. (1981). Classroom reinforcement and learning: A quantitative synthesis. *The Journal of Educational Research, 75*(2), 69-77. https://doi.org/10.1080/00220671.1981.10885359
Lysakowski, R. S., & Walberg, H. J. (1982). Instructional effects of cues, participation, and corrective feedback: A quantitative synthesis. *American Educational Research Journal, 19*(4), 559-578. https://doi.org/10.2307/1162544
Merriam, S. B., Caffarella, R. S. & Baumgartner, L. M. (2007). *Learning in adulthood: A comprehensive guide*. John Wiley & Sons, San Francisco, CA.
Moore, M. G. (1973). Towards a theory of independent learning and teaching. *Journal of Higher Education*, (44), 661-679.
Moore, M. (1997). Theory of Transactional Distance. In Keegan, D. (1997). (Ed.). Theoretical Principles of Distance Education. Routledge, pp. 22-38.
Moore, M. & Kearsley, G. (1996). *Distance education: A systems review*. Belmont: Wadsworth Publishing Company.
Nicol, D. J. & MacFarlane-Dick, D. (2005). Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199 – 218. DOI: 10.1080/03075070600572090
Okoro, C. O. & Chukwudi, E. K. (2011). Metacognitive strategies: A viable tool for self-directed learning. *Journal of Educational and Social Research, 1*(4), 71–76.
Oswalt, D. F. (2003). *Instructional-design theory for fostering self-directed learning*. PhD thesis, Indiana University.
Paas, F., Van Gog, T. & Sweller, J. (2010). Cognitive load theory: New conceptualizations, specifications, and integrated research perspectives. *Educational Psychology Review, 22*(2), 115-121. https://doi.org/10.1007/s10648-010-9133-8

Simsek A. (2012). *Learner Control*. In: Seel N.M. (eds) Encyclopedia of the Sciences of Learning. Springer, Boston, MA. https://doi.org/10.1007/978-1-4419-1428-6_372

Snow, R. E. (1980). Aptitude, learner control, and adaptive instruction. *Educational Psychologist, 15*(3), 151-158. https://doi.org/10.1080/0046152800952922

Sorgenfrei, C. (2016). The effectiveness of e-learning systems: A review of the empirical literature on learner control. *Decision Sciences Journal of Innovative Education, 14*(2), 154-184

Steinberg, E. R. (1989). Cognition and learner control: a literature review, 1977-1988. *Journal of Computer-Based Instruction, (16)*4, 117-121.

Steinberg, E. R. (1991). Computer-assisted instruction: a synthesis of theory, practice, and technology. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc., Publishers.

Sweller, J., Ayres, P. & Kalyuga, S. (2011). *Cognitive load theory*. Springer, New York, NY.

Sweller, J., van Merrienboer, J. J. G. & Paas, F. (1998). Cognitive Architecture and Instructional Design. *Educational Psychology Review, 10***,** 251-296. https://doi.org/10.1023/A:1022193728205

Tenenbaum, G., & Goldring, E. (1989). A meta-analysis of the effect of enhanced instruction: Cues, participation, reinforcement and feedback and correctives on motor skill learning. *Journal of Research & Development in Education, 22*(3), 53–64.

Tough, A. (1971). The Adults' Learning Projects: A Fresh Approach to Theory and Practice in Adult Learning, Ontario Institute for Studies in Education, Toronto, ON, USA, 1971

Van der Kleij, F. M., Feskens, R. C. W., & Eggen, T. J. H. M. (2015). Effects of feedback in a computer-based learning environment on Students' learning outcomes: a Meta-Analysis. *Review of Educational Research, 85*(4), 475-511.

Van Merriënboer, J. J. G., Kester, L. & Paas, F. (2006). Teaching complex rather than simple tasks: Balancing intrinsic and germane load to enhance transfer of learning. *Applied Cognitive Psychology, 20*(3), 343-352. https://doi.org/10.1002/acp.1250