

# Using technology to foster reflection in higher education

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Technology-facilitated learning is quickly becoming mainstream in most higher education institutions. Simultaneously, although not necessarily related, tertiary administrators are calling for students exiting university to exhibit the capacity for reflection and higher order thinking. Instructors, therefore, are faced with two challenges: implementing technology and increasing reflective learning. This paper argues that technology can be used to help instructors in this feat. Technology-facilitated learning offers many opportunities for students to engage in reflective tasks, if implemented properly. Ensuring conditions for promoting reflection, as outlined in the literature, are present, will yield successful changeovers for instructors beginning to use technology, instead of traditional face-to-face methods, to foster high levels of reflection and deep learning in their classrooms.

Keywords: reflection, technology, higher-order learning, higher education

## Introduction

The perceived value of reflection as a means of enhancing students' learning has been prominent in educational literature for many years. Indeed, Rogers (2001, p. 37) suggests that since Schön's *The Reflective Practitioner* was published in 1983 "numerous articles and books on the topic of reflection have appeared." The published studies regard reflection, or critical reflection, as pertinent to creating learning experiences, where meaning is generated from experience by bringing into consideration one's thoughts, feelings and actions (Brockbank & McGill, 1998). It follows that this process enhances "one's overall effectiveness" by allowing one to make "better choices or actions in the future" (Rogers, 2001, p. 41).

With the influx of technology in the tertiary classroom in recent years, special attention has been paid to using these technologies to foster reflective thinking. With mixed results, studies have used learning management systems, computer conferencing, email, chat, online discussion, and ePortfolios as tools to enhance reflective thinking among university students. This array of technologies has been used to replace the traditional face-to-face, paper and pen teaching methods, namely; group discussion, writing, rewriting, and journaling, which are believed to encourage critical reflection. These studies suggest that although there may be merit to using these learning technologies in teaching, they do not always successfully foster reflection.

This paper argues that reflection is a complex process that strongly influences learning by increasing understanding, inducing conceptual change, and promoting critical evaluation and knowledge transfer. When instructors do not generate reflective learning opportunities in the classroom, prospects are lost for better learning outcomes. Much research has been devoted to conditions that must necessarily be present when fostering reflection. With the increase of technology-mediated learning in today's classroom, it is imperative that instructors understand how to ensure these conditions are present when using technologies to create optimal reflective learning environments.

## Reflection in education

One of the earliest cited definitions of reflection in education comes from John Dewey (1910, p. 6), according to whom reflective thought is the "

active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends.

LaBoskey (1994) adds that the analysis begins with a problem, or uncertainty, which causes the individual to carry out an "active exploration", identify the nature of the problem, and generate possible solutions. Furthermore, Kemmis (1985) suggests reflection is a "dialectical process" that looks both inward at the individual's thoughts, and outwards at the situation and is thus 'meta-thinking', where the

relationship between thought and action in a particular context must be considered before moving to further thought and action.

Similar to Dewey, Schön (1987) views reflection as a response to a problem but asserts that the individual responds to an *unexpected* issue, then uses prior knowledge and problem solving abilities to develop measures to address the situation (Makinster, Barab, Harwood, & Anderson, 2006). Schön (1987) also makes the distinction between “reflection-in-action” and “reflection-on-action”: the former occurs while the learner is in the midst of their experience; such an analysis may arise because something unexpected has occurred and may change the outcome of the experience. The latter is a process that occurs after the experience has taken place and often provides clarification and insights through evaluation by self or with others.

Others add that reflection is a means of examining experience (Boud, 2006). The Kolb-Lewin learning cycle, for example, includes reflection as one stage of a four-step process (Smith, 2001). While it is important to note that Kolb includes reflection as a key aspect in learning from experience, this cycle pays “insufficient attention to the process of reflection” (Smith, 2001) and Kolb “seems to take reflection as self-evident” (Boud, 2006, p. 159).

Boud, Keogh, and Walker (1985) describe a model of reflection in the learning process, which begins with the “totality of experiences of learners” (p. 20), including their behavior, ideas and feelings. The learner then engages in intellectual and affective processes: returning to experience, attending to feelings, and re-evaluating the experience. Finally, the model lists possible outcomes of reflection, including: synthesis, integration and appropriation of knowledge, validation of personal knowledge, a new emotional state, or the decision to apply knowledge and act. This model provides more insight than Kolb’s learning cycle, but is missing an important element of the process: the context surrounding the learner. Boud, Keogh, and Walker do nod to the importance of the instructor’s role and the creation of context but at the time discussion of context was beyond the scope of their investigation.

## Reflection and learning

From Dewey’s initial definition to Boud, Keogh, and Walker’s model, each of the above descriptions reveals a process. Indeed, Woerkom (cited in Hoyrup & Elkjaer, 2006, p. 29) suggests reflection is

a complex activity aimed at investigating one’s own action in a certain situation and involving a review of the experience, an analysis of causes and effects, and the drawing of conclusions concerning future action, and which results in a changed conceptual perspective.

As this and other definitions suggest, reflection is a process beginning with a descriptive tale and leading to critical analysis. Each level of reflection leads to a stage of cognitive processing; high levels of reflection thus lead to deep levels of learning. Unfortunately, the literature often fails to make the connection between learning and reflection (Moon, 1999). The following attempts to portray how the levels of reflection are linked to and bring about cognitive stages of student learning.

### Stimulated reflection and cognitive stimulation

Reflection usually begins with an “awareness” stage, which can occur when learners are presented with and stimulated by new information, often arising from, or in the form of an experience. At this stage, most students will also go through a “self-awareness” stage, which includes analysing feelings and examining how the situation and the individual have had a reciprocal affect on each other, and becoming aware of their view of the world (Brigden, 2004; Schunk, 1991; Moon, 1999). It follows that the learners should then be able to regulate their own behavior, and consequently be able to continue their engagement in the reflective process (Brigden, 2004; Schunk, 1991).

Often when learners become aware of new subject matter, they become cognitively stimulated and feel they must make sense of the new information; until the new information can be assimilated and accommodated, they are in a state of cognitive disequilibrium (Gregoire, 2003). Researchers suggest that cognitive disequilibrium facilitates further reflection and can lead to conceptual change, but only if the students are properly motivated (Bendixen & Rule, 2004; Schunk, 1991). In higher education, the awareness stage of reflection and the following cognitive stimulation stage can be encouraged when instructors present students with questions, tasks, problems, and objectives that put them in a state of

cognitive disequilibrium and thus stimulate them to reach comprehension (Graesser, McNamara, & VanLehn, 2005), while at the same time motivating them to fully engage in the process.

Students who become aware of new information but do not attempt to accommodate it take a surface approach to learning and will often only memorise the information presented to them for assessment purposes (Moon, 1999), if they are motivated to reach higher levels of reflection, however, they will be more likely to take a deep approach to learning.

### **Descriptive reflection and cognitive retrieval**

As learners continue to engage with the material, their comprehension of the new information presented to them can be enhanced by their prior knowledge and past experiences, all which have helped shape their view of the world (Boud, Keogh, & Walker, 1985). Boud, Keogh, and Walker (1985, p. 27) suggest that learners “return to the experience”, recall what has taken place and their reactions to the situation. This descriptive level of reflection is often seen in journal writing or discussion when learners are asked to describe the event to others using “close detail” and avoiding judgments, while at the same time recognising alternate views, and attempting to provide reason or justification for actions (Hatton & Smith, 1995). The description students provide can be used as a record for future stages of reflection and can help ensure they are reflecting upon events as they actually happened (Boud et al. 1985). Descriptive reflection can help clarify the “personal perceptions of the learner” so that they can take a step back and see the situation as others would and in a wider context (Boud et al., 1985, p. 28).

Descriptive reflection can help students engage in cognitive retrieval, which encapsulates both “Remembering” and “Understanding” in Bloom’s Revised Cognitive Domain Taxonomy, by encouraging them to recall, remember and recognise relevant prior knowledge from long-term memory in their descriptive tale. Students who are engaging with the material at this stage should be able to explain ideas or concepts and construct meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarising, inferring, and comparing (Anderson & Krathwohl, 2001; Schultz; Brigden, 2004). The new material can then be assimilated and accommodated into their cognitive structure “to make sense of the new learning and what is known” (Moon, 1999, p. 143).

Arguably, descriptive reflection is the lowest desirable level of reflection. Students that reach only the descriptive level are beginning to make meaning of the material presented to them, but to be able to “work with meaning” (Moon, 1999, p. 143), they must engage with the material at a deeper level. Cognitively, then, students at this level should be able to explain the material and how they understand it, but they most likely will not be able to apply their understanding to different contexts.

### **Dialogic reflection and reconceptualisation**

To help students apply their understanding and work with meaning, after they have described the event in writing or verbally, and come to understand the material, they should be encouraged to “re-evaluate” their experience (Boud, Keogh, & Walker, 1985, p. 30), which includes: (1) association – relating and connecting new knowledge with prior knowledge; (2) integration – seeking connections among facts; (3) validation – testing for “internal consistency” between new ideas and existing knowledge and between the student’s own views and others’ perspectives (p. 33); and (4) appropriation – making knowledge one’s own. Dialogic reflection occurs when students take a step back while considering, exploring, and judging prior knowledge and the current situation or experience to create possible alternative solutions (Hatton & Smith, 1995; Brigden, 2004).

Dialogic reflection thus helps induce conceptual change, or, helps students see the world differently (Thomas & Bowden, 1994). Reconceptualisation involves learners using their prior knowledge to shape their learning, or accommodating new knowledge by replacing current conceptions with more profitable ones. This stage is thus a process of searching for meaning, coming to an understanding, and applying new knowledge (Gregoire, 2003; Thomas & Bowden, 1994). Students might demonstrate this level of cognitive ability by distinguishing between different parts, breaking material into constituent parts and determining how the parts relate to each other and to an overall structure or purpose through differentiating, organising, and attributing (Anderson & Krathwohl, 2001; Schultz). For example, students could show they have reached the reconceptualisation stage by using and synthesising different pieces of information they have been given, or gained through resources, over a period of time to solve a problem or create a new product (Brigden, 2004).

## Critical reflection and application

Often the creation of a new product or idea, or the resolution of a problem is the end point of a learning task. Students can be encouraged to reach even deeper levels of learning, however, by engaging in critical reflection. When reflection is occurring at this level, students will critically analyse the situation, event, or experience and come to a decision for action, which may require critical thinking involving association, integration, validation, and appropriateness (Hatton & Smith, 1995). Specifically, what moves the learner beyond dialogic reflection is the ability to evaluate, or judge the value of something, which is critical for developing a new perspective, and leads the learner to make a decision about the necessity of change in action (Brigden, 2004; Anderson & Krathwohl, 2001; Schultz).

Decisions about changes in action can lead the learner to apply their newfound knowledge, which may include doing things differently, clarifying issues, or developing skills (Boud, Keogh, & Walker, 1985). This stage entails a “more extensive accommodation of the cognitive structure” (Moon, 1999, p. 146). Students demonstrating this level of cognition should be able, for example, to explain how what they have learned can be applied to broader situations, outside of and not necessarily related to their class learning. At this point, learners may begin the reflective cycle again, as their action and application may cause them to be stimulated with new information, or, this may be the end of the reflective cycle.

Figure 1 summarises and conceptualises the process of reflection by drawing the links between levels of reflection with corresponding stages of cognitive processing, as discussed above, to illustrate how reflection leads to higher levels of learning. Students do not always reach critical reflection because they are not always able to get beyond the individual cognitive processes. Instructors in any learning environment in tertiary education should be aiming to have students reach dialogic and critical reflection levels. Understanding reflection and how it fits into the learning process, should help instructors create supportive learning contexts that optimise opportunities for the highest levels of reflection.

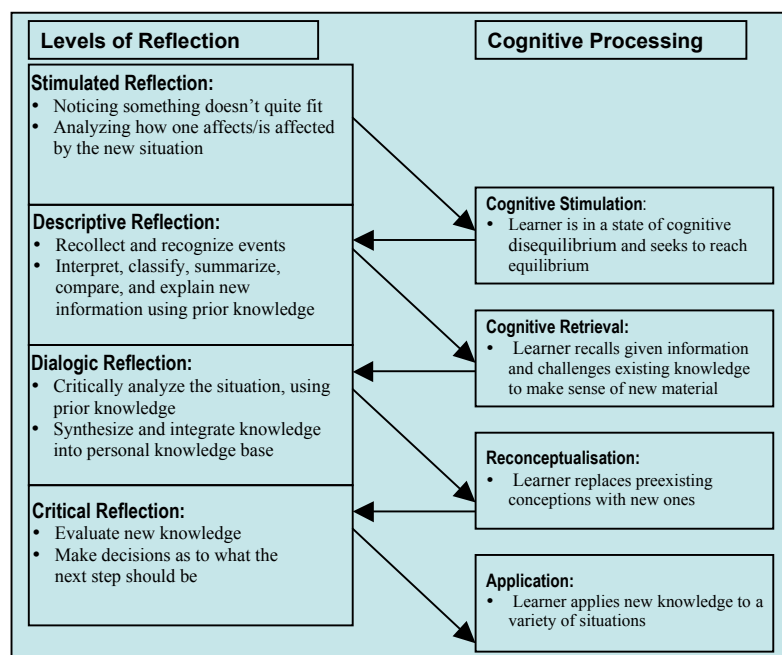


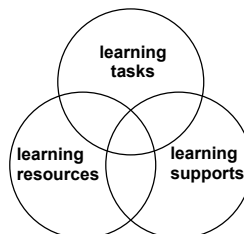
Figure 1: Levels of reflection leading to deep levels of learning

## Learning environment

The importance of reflection for helping lead students to higher levels of learning, including synthesis, analysis, and application, has been established. The following sections are concerned with enhancing student learning by fostering reflection in tertiary education. This paper works on the premise that student reflection generally does not just “happen”, but “conditions can be structured to encourage it to happen” (Moon, 1999, p. 165).

Student learning in higher education occurs in a context within a learning environment. Boud, Keogh, and Walker (1985) suggest that it is the role of “those who assist the learner” to create a place and context for learning, support and encourage the learner, and provide useful learning resources (p. 38). A number of models exist that outline constituent elements of effective online learning settings that can be designed by

the instructor. One that is particularly useful for understanding how to design a learning environment that may promote reflection, is Oliver and Herrington's (2001, p. 17) "framework describing critical elements of online learning settings", shown below. They suggest that learning tasks, learning supports, and learning resources are the three critical elements of effective constructivist settings. Here, learning tasks "form the context for student learning" (p. 21), learning resources help students complete the learning task by giving them "access to...information and... content" (p. 22), and learning supports "enable the online learner to complete the tasks that have been set" (p. 23).



**Figure 2: Framework describing critical elements of online learning settings**

In terms of providing an optimal learning environment for promoting reflection, these three constituent elements are critical: when these elements are present, it is more likely students will engage in higher levels of reflection and thus reach deeper levels of learning. Providing engaging tasks gives students reason to participate in the various stages of cognitive processing and levels of reflection. Giving different forms of support helps students complete the task and encourages them to eventually become autonomous learners. Finally, giving students access to multiple resources allows contact with content, information, and the underpinning knowledge they need to fully engage in reflective thinking. The following discusses how including these elements in the learning environment can increase reflection.

### **Learning tasks**

There are several examples of learning activities that seem to promote reflective thinking, including: writing and rewriting (Moon, 2005; Roberts, 2002), problem solving (Schunk, 1991; Hmelo-Silver, 2004), reflective discussion (Brockbank & McGill, 1998; Mezirow, 1990), role play (Roberts, 2002; Seale & Cann, 2000), and group work (Wiley, Sanchez, & Moher, 2005; Zeichner, 1994; Hmelo-Silver, 2004). Although each of these activities has the ability to promote reflection, it is only when they are centered on a specific task, with reflection as a goal, that the activities will succeed in fostering deep learning. Moon (1999, p. 175-176) suggests that tasks that encourage reflection might portray the following characteristics: include "messy or ill-structured material of learning", asks "the right kinds of questions" without clear answers and thus "promote analysis, synthesis, or reasoning", sets challenges, encourages students to "integrate new learning into previous learning", requires the "ordering of thoughts", and involves evaluation. When instructors implement learning activities centered on tasks with these characteristics, students will be more likely to reach higher levels of reflection.

### **Learning supports**

Regardless of the type of learning activity and task, in an effective learning environment, the instructor needs to provide students with support. Oliver and Herrington (2001, p. 55) describe learning supports as the means by which students are given feedback and guidance and their contribution to "the learning setting is encouraged and strengthened." In terms of promoting reflection, a number of learning supports are needed and contemporary thinking suggests the need for support to encourage reflective practice (conative), supports that can develop and nurture reflective practices (scaffolds), and collaborative and interactive supports that stimulate and inspire further reflection (social).

#### *Conative support*

When implementing the learning activities, it is generally the goal of instructors to have students engage in high levels of reflective thinking and thus reach deep levels of learning, but educators cannot guarantee that students will actually engage in the cognitive processing cycle when stimulated with new knowledge. Although it is the learner who ultimately decides how much effort and time to expend (Boud, Keogh, & Walker, 1985), the instructor can encourage the learner to fully engage in the learning task by creating an environment that fosters proper attitudes and motivation.

Attitude is a critical component of the reflective process; Dewey (1960) suggests that for students to wholly engage in reflective thinking, they must be responsible, open-minded, and wholehearted.

Instructors can promote responsibility by encouraging students to consider both immediate and future objectives and goals and helping students recognise that their actions and choices affect the future (LaBoskey, 1994). Instructors should also create an environment where students have the opportunity to listen to and be respectful of others, thus fostering students' desire to hear diverse perspectives and their ability to consider all facts (Dewey, 1960). Students who are open-minded will be more likely to engage in conceptual change because they will realise that their presuppositions are not necessarily accurate. Finally, instructors need to encourage students to be wholehearted: to take risks, work through fears and uncertainties, and move to action (Goodman, 1991). Being whole-hearted suggests that students will be able to reach the transfer and application stage of the cognitive processing cycle because they are willing to change their conceptions and beliefs.

Even if students are responsible, open-minded, and wholehearted, they are not always very curious, so it is the instructors' role to maintain students' curiosity through motivation and thus entice them to move through all stages of the cognitive processing cycle (Etkina, Mestre, & O'Donnell, 2005). Instructors can increase motivation by creating an appropriately difficult challenge that piques students' interests (Alessi & Trollip, 2001; Schunk, 1991). Students will also more likely remain motivated if they consider the task to be useful and if they can see how the outcome will have an impact, both personally and more globally (Alessi & Trollip, 2001; Etkina et al., 2005). Finally, students may be more motivated to fully engage in the learning activity if it is graded (Moon, 1999).

### *Scaffolds*

While engaging in the learning task, students often need information and provisional support from "more competent others (teachers, parents, peers)" (Hartman, 2002, p. 166), until they have the metacognitive skills to engage in reflection autonomously. Hartman likens scaffolding to training wheels on a bicycle because temporary support is provided until the rider can maintain balance, once this happens, the wheels are taken away and "the rider self-balances" (Hartman, 2002, p. 167). Oliver and Herrington (2001, p. 68) describe scaffolding as a means of support "that is reduced as the learning progresses." They suggest that student learning and the process of scaffolding can be deemed successful "if the learning is maintained after the scaffold has been removed."

Scaffolding in a learning environment can be supplied in various ways. Grabinger and Dunlap, (cited in Oliver & Herrington, 2001, p. 68) suggest scaffolding can be given by:

- the instructor modeling reflective behaviour through discussion with students and identifying the processes used in reflective thinking;
- facilitating a "discussion of learning processes" and "providing timely feedback and coaching";
- encouraging students to verbalise their learning processes; and
- promoting a supportive environment where students can identify areas of uncertainty and "articulate their ideas to aid their learning."

The instructor should provide scaffolding to support learners as they work through complex tasks. The support is gradually lessened and removed until the learner can engage in reflective thinking autonomously.

### *Social support*

From descriptive reflection to critical reflection, each level describes learners as taking part in some form of dialogue: with self and/or instructor and/or peers. Interaction is critical because although it is the individual who engages in information processing, they do so in a social environment (Hoyrup & Elkjaer, 2006).

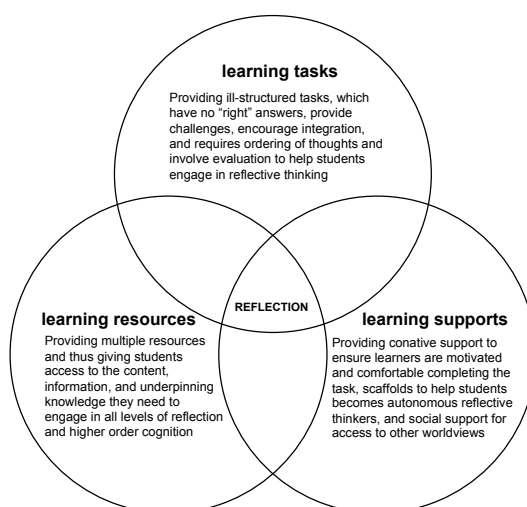
Instructors can encourage students to reflect individually through writing or verbal dialogue with self, but communicating with others increases the chances learners will see their actions without any self-deception and will thus be more able to fully engage in the different stages of the information processing cycle (Brockbank & McGill, 1998). Instructors who encourage collaborative activities, therefore, provide opportunities for students to experience other worldviews, to see things in different contexts, to have a better chance of challenging their assumptions, and, finally, to emerge with and be able to apply new understandings (Brockbank & McGill, 1998).

## **Learning resources**

The literature suggests over and over again that reflective practice is fostered when students are given access to multiple worldviews, thus expanding their experience and conceptual basis. Within Oliver and

Herrington's framework, learning resources is one of the three constituent elements of an effective learning environment. In terms of providing students with access to multiple worldviews, learning resources is perhaps the most crucial element because it offers the content, information, and underpinning knowledge students need to engage in all levels of reflection and higher order cognition. Oliver and Herrington (2001, p. 49) suggest that an important skill in higher education is the ability to access multiple resources and then determine "the credibility and utility of the information that is accessed." They continue by stating that when designing learning environments, instructors should give students access to multiple resources which offer several views and perspectives "on the content and information in question" (p. 49). By providing resources, instructors help students deal with "large amounts of information and make meaningful use of it" (p. 49). Students will gain the most benefit from learning resources when reflecting if they are information-rich, authentic, and interactive (Oliver & Herrington, 2001). Resources that fit the criteria for helping students reach high levels of reflection include, but are not limited to, books, papers, articles, web links, case studies, lectures, tutorials, and simulations (Oliver & Herrington, 2001)

Figure 3 illustrates the constituent elements that need to surround learners in the learning environment in order for them to achieve high levels of reflection and cognitive processing.



**Figure 3: Constituent elements of a learning environment promoting reflection**

## Bridging the gap

So far, it seems fostering high level reflective thinking in tertiary education should be an easy feat: how reflection fits in with learning and the constituent elements of an effective learning environment are highly documented in the literature. The reality, however, is that many tertiary institutions "fall short in allowing opportunities for reflection" (Barak, 2006, p. 133). Several reasons for the lack of reflection in higher education have been cited in the literature including the problem of instructors' diverse understandings of the term reflection and how it can be recognised and documented (Loughran, 1996; LaBoskey, 1994) and, increasingly, the size of tertiary classes not allowing time and opportunity for reflective thinking.

This paper clearly demonstrates that, although reflection is a complex process, it can be encouraged in the right context. Instructors will know students are reaching high levels of reflection if they produce critically evaluated work and can apply and transfer their knowledge to various situations. The real issue standing in the way of tertiary students becoming autonomous reflective thinkers, then, appears to be the lack of opportunity in the classroom. With the increase of classroom sizes and the changes in tertiary economy has come an increase in the use of technology (Sims & Bovard, 2004). Computer-facilitated learning has become a widespread topic in the literature and, indeed, many have researched different types of computer-mediated reflective learning activities, mostly online journal writing, with mixed results. Sims and Bovard (2004, p. 2) argue that often online learning is not successful because instructors simply move traditional teaching methods to a technology-facilitated environment, they suggest that

we must go beyond that comfort zone and research the teaching and learning environments that will be, interactions and dynamics that we may not feel comfortable with at the moment, but which will be the social milieu for future generations.

These technologies, if implemented properly, can be very advantageous. For example, computer-facilitated activities can potentially change the traditional role of the instructor from the main source of information and power to a partner/facilitator of learning (Barak, 2006). They also offer several other benefits for students, including: access to resources, experiences using authentic contexts communication with peers and experts, “safe space” for interactions and personal thoughts, “anytime, anywhere” learning, etcetera (Land, 2000, Barak, 2006; Rose & Devonshire, 2004; Paulus & Roberts, 2006).

The potential benefits of computer-mediated technologies are significant in terms of fostering deep learning. This brings us back to Sims and Bovard’s (2004) suggestion that instructors implementing technology-facilitated learning activities need to “move forward” from traditional teaching methods in order for learning to be successful. Perhaps this is so, but instructors need to be careful not to take statements such as this too literally. Years of research have been devoted to understanding how students learn and how instructors can encourage students to reach deep levels of learning and reflection; there are many learning activities that have been found to promote reflection and have long been implemented and researched in traditional face-to-face classroom settings. Although there is a growing trend to move these learning activities into computer-mediated environments, the research surrounding the implementation of technology-facilitated learning is still in its infancy (Al-Mahmood & McLoughlin, 2004). The literature does suggest that there are numerous computer-mediated tools, such as electronic portfolios, blogs, online tutorials, discussion tools, and so on, which support learning, and possibly promote reflective thinking, although how reflection is promoted is not always clear. When using such technologies, instructors need to ensure students are provided with a specific task, learning supports (cognitive, scaffolds and social), and multiple resources, as shown in Figure 3, thus increasing the potential for computer-mediated technologies to serve as catalysts in promoting critical reflection and meaningful learning.

So, while implementing computer-mediated learning activities certainly requires a change in practice on the part of the instructor, documented evidence on encouraging reflection in the classroom must not be forgotten. Instructors can, and should, still promote reflection in the tertiary classroom, and, certainly, technology offers many opportunities, especially in large classes, to help instructors in this feat. Technology, then, can successfully bridge the gap between the call for reflection in higher education and tertiary students actually becoming reflective practitioners.

## Conclusion

When creating a learning environment that is optimal for engaging learners in reflection, it is necessary to understand the thought process students engage in when reflecting. Students are often told to reflect on their work; instructors often assume students are reflective thinkers. Indeed, Boud, Keogh, and Walker (1985, p. 8) state

the activity of reflection is so familiar that, as teachers or trainers, we often overlook it in formal learning settings, and make assumptions about the fact that not only is it occurring, but it is occurring effectively for everyone in the group.

Many educators assume students are reflective thinkers because all students certainly do think. A distinction must be made, therefore, between *thinking* and *thinking reflectively*. The former has become a catchphrase, encompassing such cognitive and metacognitive processes as analysing, reasoning, remembering, rationalising, conceiving, conceptualising, and so on. The latter, however, although a process that falls into the definition of thinking, is in itself a distinct form of learning. Reflection is a way of thinking; it is a form of contemplation that determines how one comes to act on new understandings. This contemplation involves being stimulated by new information, bringing prior experiences to the forefront of one’s mind and considering how “old knowledge” affects new situations, it is about one looking internally to one’s thoughts and externally to the issue at hand. Reflection is a process that leads to conceptual change, knowledge transfer, and action.

This paper introduces a model of constituent elements that must be present in a learning environment hoping to promote reflection. The supports included in this model are not new, indeed, each of them has been discussed in the literature at length. The difference now, is that although most papers discuss these elements in terms of traditional face-to-face classroom settings, this paper introduces Oliver and Herrington’s model for effective online learning environments to the discussion surrounding reflection and proposes that these conditions must be present in technology-facilitated learning environments hoping to promote reflection. Future practice ensuring computer-mediated reflective learning activities consistently provide students with a reason and will to engage, support, and various resources will likely boast more successful outcomes than what has been presented so far in the literature.



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