CRITICAL THINKING:

PRACTICAL STRATEGIES FOR TEACHING AND LEARNING

"It is the work of true education . . . to train young people to be thinkers, and not mere reflectors of other people's thought."[1]

Most educators would agree that the development of critical thinking should be a key focus of teaching and learning. In some countries, critical thinking is a major component in national curriculum standards. For example, the Australian Curriculum[2] identifies critical and creative thinking as one of seven general abilities at the heart of effective learning. And the New Zealand Curriculum[3] identifies "thinking" as the first of five key competencies that are essential for living and lifelong learning. The rapid rate of change in so many aspects of 21st-century life requires the ability to process, interpret, analyze, and respond to problems and challenges in a broad range of socio-cultural contexts. For this reason, critical thinking, including the ability to think independently, is central to successful teaching and learning.

An awareness that critical thinking is important, however, is not enough. Teachers need to actively engage students of all ages in critical thinking. This suggests two questions: *What does critical thinking look like in the classroom*? and *What strategies can be used to facilitate critical thinking?*

The Critical Thinking Classroom

A "thinking" classroom is a flexible classroom that includes collaborative learning, where different points of view and solutions to problems are shared. It is a place where students engage in substantive communication with one another and with their teacher(s) regarding problems, issues, and questions that extend to life beyond the classroom. Substantive communication involves engagement in "sustained conversations about the concepts and ideas they [students] are encountering. These conversations can be manifest in oral, written or artistic forms"[4] and can occur between teacher and student(s), or among students themselves. This classroom dynamic includes regular peer and teacher feedback that demonstrates strong personal and corporate reflection and well-informed evaluation that is evidence based, rather than unsubstantiated opinion.

A safe learning environment is a basic requirement for critical thinking and learning to occur. This is an environment where learners are free to express their ideas, to explore different perspectives and solutions to problems, and to make mistakes in their quest to discover solutions and answers through a process that includes hypothesizing, testing, and validating the ideas. In a Christian context, this environment is enriched by values based on biblical principles that guide the choice of content and the nature of the learning experiences.

A body of evidence supports the idea that critical thinking and learning needs to be visible so that all learners can access it.[5] A "thinking" classroom allows student movement and exposes young people to the full range of learning modes. This includes making thinking visible through using different writing surfaces where students can express, clarify, and hone their ideas by generating visual texts such as mind maps

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and graphic representations, as well as engaging in discussion. In a "thinking" classroom, students are readily able to access different sources of information, such as technology, books, the teacher or an expert in the field, in order to test and confirm their ideas and different points of view.

Willingham questions whether critical thinking can actually be taught and argues, "Decades of cognitive research point to a disappointing answer: not really."[6] If this is so, then teachers are likely to have a very frustrating time attempting to facilitate students in the development of critical thinking. This article argues that, while critical thinking may not be a "skill" per se, the process of engaging in critical thinking does involve a set of skills that can be taught and mastered. Figure 1 provides a conceptual model of the dynamic process of engaging in critical thinking so it becomes a cognitive habit. It is this **process** and **practical strategies** for its implementation that will now be examined.

The Process Explained

As indicated in Figure 1, the development of critical thinking is conceptualized as a dynamic process based on the interaction of carefully considered learning activities and communication, including feedback. The learning activities should be based on problem solving that includes cognitive processes such as wondering, puzzling, reflecting, and hypothesizing. This requires the development of a safe learning environment that is conducive to experimentation and testing. In the context of this model, critical thinking is closely allied to creative thinking.

Learning, as conceptualized in this model, is not content-driven. Rather, the design of learning activities involves the teacher and the students in a process of selectively using information, content, evidence, and research that will be useful for engaging with the question or issue and solving the problem. Critical thinking is required not only for the selection of relevant content and information, but also for how to judiciously approach problem solving.

Factors influencing the effectiveness of critical thinking include time spent on the learning activity and the dispositions the students and the teacher bring to the learning experience. Quality feedback underpins the process of critical thinking, and this includes substantive communication between the student and the teacher, and among the students themselves.

Key elements of critical thinking include exploration, experimentation, risk-taking, discovery, independent thinking, evaluation, validation, and creation. These elements presuppose the development of trust between students and the teacher, and a learning environment embedded in Christian values such as acceptance, perseverance, and loving-kindness. This environment allows students to make mistakes and learn from them as part of the process of developing their critical-thinking abilities. In keeping with the research of Collins[7] and van Gelder,[8] the underlying premise of this model is that critical thinking involves skills that can be taught.

Figure 1. A Conceptual Model of the Process of Mastering Skills Embedded in Critical Thinking

Considered in the context of Christian values
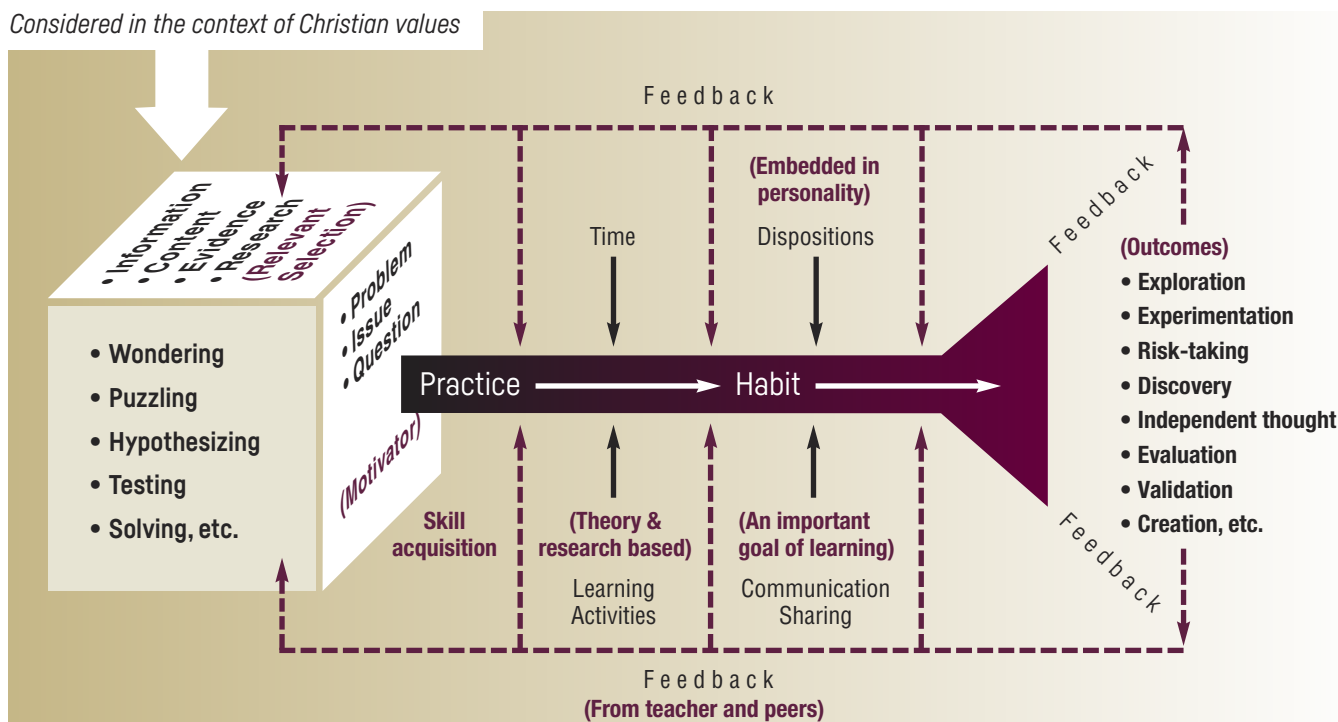
A dynamic, flexible process based on strategies that are student-centered and habit-forming

Practical Strategies for Mastering Skills Embedded in Critical Thinking

The following ideas are based on authentic classroom practice that promotes critical thinking. The New South Wales Quality Teaching Model (QTM)[9] has been used as the pedagogic framework for these strategies. It can be seen that other theoretical frameworks such as Anderson and Krathwohl's[10] update of Bloom's Taxonomy.[11] Pearson's Red Critical Thinking Model,[12] and Ennis's[13] Taxonomy are also useful tools for planning learning experiences that develop students' critical thinking.

Strategy No. 1: Design Engaging, Authentic, and Challenging Questions or Problems

If the intention of education is to teach students to think critically and independently, participants need the opportunity to practice and master the prerequisite skills. Learning activities should be designed to engage students in significant, authentic learning experiences based on challenging questions, issues, and problems. The Technologies Department at Avondale School, New South Wales, Australia, under the leadership of Nigel Lynn, launched an initiative that serves as an example of how the design of learning activities and units of work can help build critical-thinking skills. The Year 8 Design Challenge (Term 4, 2013) was used as a pilot program for combining creative and critical thinking in the context of planning collaborative, authentic learning experiences linked directly to the local community. The central activity challenged students to design an item to meet the needs of residents of a nearby retirement village.

The rationale for targeting the population was based on four criteria: (1) accessibility, including proximity to the school; (2) the needs-based design of the activity; (3) the scheduled time for teaching the unit in which the project was embedded; and (4) the availability of clientele in conjunction with the timing of the unit.

The project had to be designed around an authentic, community-based need identified by the students after soliciting input from their "clients." This involved interview-type conversations between the students and clients. Explicit criteria for the design of the item were:
▪ The design had to be for a specific product, rather than a system or an environment;
▪ The finished product had to be functional;
▪ The product had to be finished to a high standard over a 13-week period; and
▪ Students were allowed to use technologies of their choice to realize the product.

Besides identifying and exploring the need for specific products, the design cycle required critical research of existing products and the formulation of a design that was "new" as well as useful. This involved problem-solving skills that included the elements of experimentation and testing of the design solutions to justify a final prototype. The cycle involved ongoing feedback from peers, as well as the teacher, and this informed the design and creation of the final product.

Students participated in design teams that included peers with

A satisfied client proudly displays the portable walking stick holder designed by a Year 8 Design Team. Clients were transported from a nearby retirement village to Avondale School (Australia), where regular consultations took place in the Collaborative Learning Center.

Regular consultations led to strong friendships between clients and design team members. This team created a storage chest for family memorabilia for a client, who became a friend. Other design teams can be seen in conversation with their clients. The senior Hospitality class at Avondale School provided afternoon tea.

lenge had been completed.

Examples of realized products included: an iPad stable table with an adjustable gradient platform; a mobile knitting station that stores wool and allows the operator to knit using wool fed from the station, thus avoiding knots and tangles; and a portable walking stick holder that can be clamped to any item of furniture in order to keep the walking stick accessible for the user. These products required the implementation of critical-thinking skills that were problem-based and had authentic value for senior members of the local community. The pilot program was refined, and the project was undertaken, again, the following year (2014) with similar learning gains for the Year 8 students and benefits for the community members.

Observations and Reflections

A number of observations can be made regarding this project. First, the process of design was collaborative. The teachers collaborated in the creation of the project. Student teams engaged in substantive communication that allowed for dialogue regarding different points of view and different approaches to dealing with the design challenge. As a result, each team member was exposed to a variety of design approaches and the rationale for each. Second, students were engaged in highly effective pedagogy. The programming for this project was based on the QTM (2003)[14] and activated each of the three dimensions: Intellectual Quality, Quality Learning Environment, and Significance. Third, the project engaged students in a high level of authentic learning because the focus problem was related directly to the real-life needs of their clientele. Finally, the project engaged students in a high level of critical and creative thinking, in terms of Pearson's Red Critical Thinking Model.[15] Important aspects of the process of design and collaboration included active engagement in examining and evaluating assumptions about the design project and the most effective way(s) to meet the needs of the given clientele. This was achieved mainly through substantive communication, questioning, peer evaluation and feedback, and reflecting on different points of view and contributions to the dialogue and planning process. Team members were required to back up their ideas with evidence, rather than opinion. They were involved in analyzing the ideas they generated and the data given as part of the process of selecting the most effective way to meet the design challenge. They were then required to draw their conclusions and come to an agreement regarding the best approach to the design, working as a team to achieve their project goal.

Strategy No. 2: Establish Routines That Make Critical Thinking Visible

Harvard University's Project Zero[16] has yielded well-researched evidence indicating the effectiveness of making thinking visible in the classroom. The resources that have been developed as part of the project provide worth-

whom they would not usually work. Normal classes were replaced by team workshops where the management and interpretation of the design process involved group interaction and discussion. Students were able to consult with any of the four technology teachers in order to create the final solution to their design challenge. A significant aspect of the teaching and learning process was that teachers took on the role of consultants. Each team was self-regulating and responsible for directing its own design and learning process.

Explicit criteria were discussed through substantive team communication, and high expectations were clearly enunciated at the beginning of the project. These expectations were realized not only in the final design product, but also through ongoing documentation of the design process and the cumulative learning that occurred.

During participation in the project, students were encouraged to reflect on the design process, at both a personal and team level. Team captains represented their teams at periodic meetings, with the teachers present. This allowed for important cross-team dialogue regarding issues they encountered and a range of possible solutions.

The sharing of ideas enriched the range of solutions and approaches to problems that arose. In addition, team captains discussed the process and progress of each team's design activity. The discussion included peer reflection, evaluation, and feedback—all key elements of critical thinking. They then shared feedback with their teams, where further reflection and refinement of the designs occurred. This process continued until the design chal-

while strategies for assisting students to practice and master thinking routines, including those related directly to critical thinking. The ideas are expressed in terms of routines that are regularly activated in the classroom. The work of Ritchart and Perkins[17] and Ritchart, Church, and Morrison,[18] for example, provides a rich resource in this area. These routines are equally applicable in primary and secondary school classes. One of the core routines is *Connect-Extend-Challenge*.

This routine provides students with a logical framework for *connecting* new information with what they already know and understand. Once this important link has been established, students are encouraged to *extend* their thinking by considering new questions that move their thinking in new directions. In the context of critical thinking, the third step in this routine is probably the most important. Students engage in reflecting on those aspects of the learning experience and content that *challenge* or *puzzle* them. They think critically by asking questions, reflecting, and setting themselves problems to solve, with a view to coming to a deeper understanding of the information, concepts, content, and underlying princi-

Recommended Reading and Resources for Critical Thinking

Costa, A. L., and B. Kallick, eds. *Learning and Leading With Habits of Mind.* Alexandria, Va.: Association for Supervision and Curriculum Development, 2008.

Foundation for Critical Thinking: The Critical Thinking Community (n.d.). *Strategy List: 35 Dimensions of Critical Thought*: https://www.criticalthinking.org/pages/strategy-list-35-dimensions-of-critical-thought/466.

Harvard School of Graduate Education, *Project Zero: Visible Thinking* (n.d.): http://www.visiblethinkingpz.org/VisibleThinking_html_files/VisibleThinking1.htm.

_____, *Visible Thinking Resource Book*: http://admin.kasa.org/Professional_Development/documents/ThinkingClassroomResourceGuide.pdf.

Pithers, R. T., and R. Soden, "Critical Thinking in Education: A Review," *Educational Research* 42:3 (2000):237-249.

Team for the Advancement of Critical Thinking: Surry Community College, *Tips for Fostering Critical Thinking* (n.d.): http://www.surry.edu/Portals/0/teachingstrategy_tips.pdf.

The George Lucas Educational Foundation: Edutopia. *Resources and Downloads for Teaching Critical Thinking* (n.d.): http://www.edutopia.org/stw-kipp-critical-thinking-resources-downloads#graph2.

make **connections** between the two texts.

▪ *What new insights about values did you gain from your viewing of the film? To what extent has your understanding of these values and the way each composer has treated them been enriched?* This question required students to **reflect** on and **evaluate** their learning in terms of the extent to which their understanding had been extended.

▪ *What is still challenging you, in terms of the treatment of values you have explored across the two texts? To what extent do these values and the way they have been explored coincide with or challenge your own values?* These questions provided students with the opportunity to **reflect** on and **think critically** about the gaps in their understanding. In addition, the "Challenge" component of this routine provided an avenue for students to critically reflect on their own values. The responses were then shared in class, where different points of view were considered, textual evidence was gathered, and the propositions were then peer evaluated. It should be pointed out that, prior to reaching this level of thinking and sharing, a high degree of relational trust had been developed.

ples they are studying. A practical example demonstrates how thinking routine strategies can be used to foster critical thinking that is enriched by focusing on values.

In the context of a study of transformation of text, a group of Year 11 English students explored how elements of Shakespeare's comedy, *The Taming of the Shrew,* were transformed in the film, *Ten Things I Hate About You,* directed by Gil Junger. This included an examination of the underlying values and socio-cultural contexts of each text. In order to promote critical thinking, students were required to reflect on their learning and understanding of the texts through the use of the thinking routine, *Connect-Extend-Challenge*. They were asked to select three specific values explored in Shakespeare's play, and then analyze and evaluate how these values were either reinforced or challenged in the film. They were required to do this with reference to specific scenes from each text. The process involved group discussion, brainstorming, substantiating through use of textual support, peer evaluation of the quality and defensibility of the ideas, and generating a visible representation of this process of thinking in a form of their choice, such as a mind map, flow chart, or diagram.

In order to be deliberate in their thinking and economical in their use of time, students were asked the following guiding questions:

▪ *How did the treatment of values in the film compare to the treatment of the same values in the play?* This question invited students to

Throughout this thinking routine, students were recording and mapping their ideas on large pieces of paper, which enabled them to visually represent their responses to each stage of the thinking routine. During this process, they were also involved in discussing and sharing ideas. Their "visible thinking" was then placed on the noticeboard at the back of the classroom so all students could access a variety of perspectives and ideas, including textual evidence that supported their thinking.

Strategy No. 3: Create Thinking Zones

The organization of classroom spaces and classroom time are important considerations for the development of critical thinking. One idea is to create a "thinking zone" in the classroom. This can be as simple as organizing a circle of desks, cordoned off with a bead curtain, where students may choose to sit and critically think about their learning and understanding of content and concepts. The thinking zone can be equipped with technology that enables online communication, such as discussion threads, blogs, Twitter, or Skype.

Teachers can integrate thinking zones into their planning as they design regular critical and creative-thinking focus periods for each lesson. The critical-thinking activities can be as short as 10-minute segments of a lesson or can continue over a number of lessons. The point is to make critical thinking a classroom habit that is regularly practiced by the students and their teacher(s).

Conclusion

The intent of this paper was to present a model of the process of mastering skills known to be embedded in critical thinking and, with the model, provide a selection of strategies for facilitating learning a range of approaches for mastery of these skills. A discussion of the principles underlying the strategies was informed by examples of learning experiences being tried in our school. Results of these trials seem to indicate that critical thinking can be learned using appropriate strategies.

While these results rest heavily on qualitative evidence, there is clear indication that critical thinking can be taught and that the deliberate teaching of and programming for critical thinking does improve the quality of student learning and motivation. The Year 8 design project demonstrates how critical thinking can be developed in a learning context where emphasis is placed on problem solving that is authentic and directly related to community needs. The design cycle provides a useful framework for developing critical thinking that involves research, experimentation, and testing of the design, as well as ongoing evaluation of the design product. The observations based on this project strongly support the notion that the skills implicit in critical thinking can be taught.

In the case of the Year 11 English class engaged in the visible thinking routine, student feedback was positive.[19] Prior to the implementation of the *Connect-Extend-Challenge* thinking routine, these students depended on teacher input. After implementation, they focused on *their* thinking. As a follow-up, students engaged in designing research projects based on their particular needs and interests, thus leading to differentiated learning experiences and a notable difference in the level of student engagement and motivation. This suggests three important principles for the development of critical-thinking skills. First, students need to be engaged in a structured approach to thinking. Second, students need to be engaged in self-direction where they critically think about their own understandings and interpretations of subject content. Third, students need to be provided with opportunities to practice and develop critical-thinking skills.

"Thinking zones" call for flexible approaches to organizing the classroom and designing programs where stronger emphasis is placed on the developing of thinking skills. This approach also relies on a differentiated approach to teaching and learning and provides students with the opportunity for independent, critical thinking. It has been found that some students engage more readily in the thinking-zone approach to teaching and learning than do others, responding to a more carefully scaffolded approach to the development of critical thinking. Overall, most students require training in order to understand *how* to self-direct, and to master the skills implicit in being able to think critically and independently.

Teachers themselves need to model critical thinking in their day-to-day classroom activities. There is a strong case for encouraging teachers to be involved in professional development and learning conversations that not only equip them to facilitate students' critical thinking, but also build their ability to think critically. As teachers build their competency, they will recognize that strategies exist that can be applied to the design of learning experiences that foster mastery of critical thinking, and they will grow confident in using these approaches in their classrooms. A list of recommended reading is included for further information and ideas. ✐

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13. Robert Ennis, "A Taxonomy of Critical Thinking Dispositions and Abilities." In *Teaching Thinking Skills: Theory and Practice,* Joan B. Baron and Robert J. Sternberg, eds. (New York: W. H. Freeman, 1987), pp. 9-26.

14. New South Wales, *Quality Teaching in NSW Public Schools: Discussion Paper*, op. cit.

15. Watson, "Critical Thinking—The Key to Working Smarter," op. cit.

16. Harvard University Project Zero: http://www.pz.harvard.edu/.

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19. Student comments such as, "I haven't really thought about how I think," and "I found the last part of the thinking routine quite hard. It made me think in a different way," confirmed a change in their approach to studying Shakespeare and in their evaluation of their own thinking.