MODULE 5:

TEACHING AND LEARNING 21ST CENTURY SKILLS

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In this session the reader will

1. Consider the opportunities and challenges of teaching programs that integrate 21st century skills into learning across discipline areas.
2. Situate the teaching of 21st century skills within several dominant theories of pedagogy.
3. Review a practical application of the ideas presented in this and the preceding modules.
Purpose of this module

The purpose of this module is to bring together; first, a system of assessment based on a developmental perspective and, second, plans for teaching and learning that are linked to that system. We can begin by defining what is meant by a ‘developmental perspective’. This was explored in Modules 1 and 2 of these professional learning materials. To recap, a developmental perspective on assessment and teaching:

1. first involves a particular view of what students are learning: Assessing the development of students’ understanding of particular concepts and skills requires a model of how student understanding develops over a set period of (instructional) time. Second, it involves the structure and timing of instruction: A developmental perspective moves away from ‘one shot’ learning and testing situations and away from a cross sectional view of student performance. Instead it focuses on the process of learning and on an individual’s progress through that process.¹

The opportunities and challenges of teaching 21st century skills

Although the need for 21st century skills, such as collaborative problem-solving and ICT literacy, among others, is generally recognised, teaching those skills is too often divorced from content. This compromises the chance of successful outcomes. Rather, teaching and learning programs need to integrate the development of collaborative and critical thinking skills into the learning of content across discipline areas.

To develop an understanding of how best to teach, and learn, 21st century skills, we can draw on the insights of many scholars and educators. These could, for example, include John Dewey’s work on intentional teaching with carefully planned goals and strategies, Jean Piaget’s writing on assimilation and accommodation as part of the constructive process of learning, and Lev Vygotsky’s theories about the socially-mediated nature of learning and the importance of cultural tools.

The use of a developmental framework to assess and monitor learning helps us to think about student proficiency in a particular way. It directs our thinking and planning to the following questions:

- What does this student (or this group of students) know how to do? What skills and understanding has the student already mastered? How can the student and teacher use this foundation to move forward to a deeper and richer understanding?

What is this student (or this group of students) likely to learn next? What is the student currently ready to learn? What sorts of skills and knowledge is the student likely to be able to demonstrate with the support of a more able peer or teacher? To this end, what goals or targets should be set for the student’s learning?

In their paper on 21st century assessments and environments for knowledge building, Scardamalia, Bransford, Kozma, and Quellmalz (2010) proposed two general and complementary strategies for teaching and learning, one based on the approach of working backward from goals, and the other described as an ‘emergence’ approach. The latter strategy allows for the identification of new goals based on the capabilities of learners. As teachers, when we work backward from a goal we have a set end point for our instruction. We want students to understand a certain set of facts, or master a procedure or strategy, which can be clearly identified. We have an established goal for instruction, and usually there is a well-defined set of steps towards that goal. By comparison, in less defined areas of knowledge, we may support our students’ explorations towards new knowledge. We must be prepared to renegotiate goals for learning, as students demonstrate their individual strengths and viewpoints. This links well with a view of learning as a constructive activity, in a Piagetian sense, in which new ways of knowing are developed through the accommodation or assimilation of information and experiences.

**Teaching and learning as intentional, goal-directed activities**

John Dewey (1938) described teaching and learning as intentional and goal-directed activities. He also emphasised child-centred education and the special role of the teacher in making sense of the world for students. Dewey argued that teachers should become expert observers of their students, and use their observations and knowledge of expected patterns of development to determine the kinds of instructional activities and experiences their students are ready for and that are likely to interest and motivate them.

Further, Dewey maintained that a classroom activity cannot be described as a learning activity unless it has been planned with a clear instructional purpose in mind. Dewey recommended that, when teachers plan classroom activities for their students, they ask themselves how a particular activity will build on what the students can already do and what sorts of skills or abilities it will help them to develop or improve. They should ask why it is important for their students to develop these skills and abilities, and consider how this will help them to lead richer and more satisfying lives.

Dewey thus believed that teachers need to invest time and effort to:

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- Carefully observe their students, and get to know them well in terms of their abilities and interests.
- Plan activities and instruction tailored to the current level of understanding and the interests of students.
- Purposefully and explicitly target their students’ acquisition of new skills and the broadening or extension of existing ones.
- Organise and document their observations, plans, strategies, and activities.

**Building new knowledge**

The Swiss psychologist, Jean Piaget, wrote extensively about the constructive nature of learning. He described the way that students incorporate or assimilate new knowledge into their existing knowledge structures or, conversely, accommodate new knowledge when they shift or change a belief or concept in light of new evidence and experiences. As students work to build their skills in a learning domain such as collaborative problem-solving or ICT literacy, they may assimilate knowledge by adopting, adapting, borrowing, remixing, or tinkering with it so that it fits well with their existing store of information and ideas. Or they may respond to feedback that makes them re-evaluate the things they believed to be accurate and useful, to allow a new form of knowledge or a new way of approaching a problem to emerge.

**Teaching and learning as a social transaction**

Another major theme of this module is the importance of social relationships for teaching and learning, a theme that fits well with the social and collaborative nature of many 21st century skills. This idea draws on Lev Vygotsky’s (1978) understanding of learning as a fundamentally social process, in which children and young people learn to use the tools and materials of their social group - tools such as language, numbers, texts, technologies, and cultural modes of reasoning, discussion, and argument, to name but a few – within the context of supportive relationships with more able others. Indeed, Vygotsky argued that everything is learned first through interaction with others and then internalised by the individual.\(^4\)

In Module 1, we discussed the assessment of 21st century skills framed by Vygotsky’s definition of a student’s zone of proximal development. Fundamental to this idea is a belief that, to best support a student’s learning, we should think about the skills that are ‘budding’ or showing the first signs of development. And work with the student to scaffold that burgeoning understanding and knowledge by providing models, mentors, feedback, encouragement, supported opportunities for practice, and the like.

Teaching as differentiated instruction

It can be challenging to see how we can meet the individual learning needs of each and every student in the classroom. One solution is to adopt a pedagogical approach that Tomlinson (2008) described as ‘student-aware teaching’. In this approach, teachers acknowledge the different starting points, readiness for instruction, learning targets, and requirements for support of the students in their classes. They could, for example, use information provided by their class reports (see Module 4) to help them group students appropriately so they can better target and differentiate learning activities and experiences. Tomlinson pointed out that a pre-condition for differentiation is that teachers must know what students can do and monitor student progress towards their learning objectives. Her contention was that differentiated instruction is a way of thinking about teaching that acknowledges diversity and individuality among students.

The critical elements of differentiated instruction, in Tomlinson’s view, relate to building trust between teacher and students, ensuring a good fit between learning experiences and students’ abilities and interests, honouring and encouraging student ‘voice’ or self-determination as learners, and developing students’ awareness of their own learning.

Assessment as teaching and learning

Another approach is to acknowledge the symbiotic relationship between assessment and teaching and learning. From this perspective, assessment is not a discrete activity conducted at the end of a period of teaching and learning and designed to check on how well new material has been understood. Rather, assessment is part of the ongoing process of teaching and learning, embedded in a network of consideration of a person’s skills and knowledge, reflection on the things that are understood and areas for improvement, use of feedback to identify areas for practice and further exploration, and monitoring of progress towards new skills and improved proficiency. Participation in assessment procedures can be part of the learning experience, especially when students are encouraged to use feedback from collaborative partners, more capable students, as well as their teachers, to refine and improve their performance and skills.

Applying these approaches to teaching collaborative problem solving skills

By nature, 21st century learning tasks are frequently open-ended, involve unbounded sets of information, and there may be ongoing redefinition of the goal of the task. It is important that students develop skills to establish and adapt goals according to available information, seek out relevant and valid information for the task, and continually monitor their own progress. These requirements can fit well with intentional goal-directed learning as advocated by Dewey. In taking this approach the teacher’s role is to set highly motivating tasks with
achievable goals, and to provide sufficient structure and scaffolding based on a thorough understanding of the students’ interests and needs. The students also set goals and targets for their learning, and move forward with a clear understanding of the usefulness and application of the new skills and understanding they are forming.

Many of Tomlinson’s ideas resonate with those of Dewey’s, but Tomlinson (2004) provides further guidance on strategies for incorporating the principles of targeted and differentiated instruction into classroom practice. For example, to create a good fit between students and their learning experiences, Tomlinson noted that teachers in differentiated classrooms draw upon strategies such as small-group instruction, materials presented at a variety of reading levels, personalised rubrics, learning contracts, a variety of product and task options with common learning goals, and independent studies. Small-group instruction may be particularly helpful in targeting learning tasks, allowing students to shape their own learning goals, and to seek out and select materials and information of relevance to the task. The task of teachers will be to provide the most effective structure through the establishment of smaller groups based on like abilities or to provide opportunities for peer mentoring.

The application of Vygotsky’s principles to the teaching of collaborative problem solving skills has direct relevance in relation to social skills which are inherent in all collaborative processes. The relevance of social learning is not limited to the teaching of social skills but can be seen as applying equally to the cognitive skills of goal setting, planning, building knowledge, analysis and synthesis. It follows that the principle of social learning is vital to teaching in this domain.

**Teaching and learning in mixed ability classrooms**

This section provides an example of the way that teachers can use student assessment data as a foundation for planning a targeted and differentiated teaching sequence. The assumption is that the example teaching sequence is suitable for delivery across multiple lessons and within a mixed ability class of students. In other words, it is expected that students in the same classroom may be working at any of four or possibly more stages of knowledge and understanding in both the cognitive and social aspects of collaborative problem-solving. This is illustrated below, using the student profile reports introduced in Module 4.
Figure 1. Two examples of student profile reports, representing students with similar levels of cognitive skills but different levels of social skills on the two different skills progressions.

Figure 1 shows reports for two students, one of whom was assessed as working at the third stage on the cognitive aspects of collaborative problem-solving but at the fifth stage on the social aspects while the second student was assessed as working at the third stage on both cognitive and social aspects of this skill domain. Clearly, the first student has some strengths and abilities that the second student has yet to develop in terms of social collaborative skills. The teacher may target learning experiences similarly for both students to improve their performance on the cognitive aspects, but they will benefit from different support and conditions to build their capacity to work with others on a problem-solving task.

Imagine how this might look in a class of twenty or more students. Figure 2 represents this for a hypothetical classroom.
Figure 2. Illustration of the spread of students across cognitive and social aspects of collaborative problem-solving in a hypothetical class of 20 students. Note: Each student in this illustration is represented by an X.

The example teaching and learning sequence presented below suggests ways that the teacher of students in a class such as the one illustrated in Figure 2 might differentiate instruction for students working at different stages of cognitive skill, while also being mindful of the students’ different stages of social skill and understanding.

Teaching and learning intention:

In this section, a teaching and learning sequence is presented with the purpose of building students’ capacity to take a structured approach to planning. This includes:

- identifying information they require that they have not been given
- searching for and collecting information they need
- organising information they are given together with information they collect
- following a process to generate ideas, present and discuss them, and finally to decide on a single idea to follow through with
- testing ideas for feasibility relating to a given set of constraints
- presenting a plan in enough detail to be implemented by another group

Stages on the cognitive skill progression used as a basis for differentiating the teaching and learning sequence:

Students who are just beginning to develop some initial planning skills will be learning to discuss ways of planning within a group to direct their activity in completing the task. They will be able to think of ideas and test them out through discussion or experimentation, but they require some guidance on taking a more directed approach to understanding the resources they are given or are able to gather.

As students improve their understanding and proficiency, they will begin to select their own methods and tools to structure their planning process. They need to be supported in developing an ability to organise information from different sources which may not coincide,
and to reorganise information in light of additional or altered information.

For students who have well-developed planning skills, the activity should promote a deeper understanding of generating creative ideas by combining contributions from all members of the group, and understanding the different strengths and abilities within a group. Students should be supported to develop increasing levels of sophistication in targeting communication online and face-to-face in order to

- search for information
- encourage contributions from all group members
- challenge group members

**Theme: Planning and excursion**

Students work in groups to discuss and agree on a plan for an excursion with given time and budget constraints. Students present the plans to the class and the class can vote and, if practical, decide to go on the most popular excursion. The plans should be evaluated by the class against other criteria such as feasibility, clarity, and creativity. If the task is not suitable for the school or class context, other ideas for themes could be used and developed in a similar way. Some examples are: planning a school event or a celebration, or preparing a presentation on a particular topic.

In the case of an excursion, the plan should include:

- mode of transport
- itinerary, including schedule of times
- schedule of costs
- parent permission forms
- email to school Principal requesting permission
- booking requests in the form of an email for any attractions/museums, etc. to be visited

**Embedding the task in different curriculum or subject areas**

The goal of the excursion can be adapted to address a particular topic to be covered in a curriculum or subject area. Some examples are given in the table below:
<table>
<thead>
<tr>
<th>Subject area</th>
<th>Goal of the excursion</th>
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<tbody>
<tr>
<td>Science - level 4</td>
<td>Investigation of an ecosystem of a given type, or containing given elements. Students could be expected to create a model of the ecosystem showing all the interactions, and to give examples of evidence of the interaction.</td>
</tr>
</tbody>
</table>
| Art - year 7 | Exploration of different styles of painting. Students could be directed to find two typical examples of paintings for a given set of styles and explain why they represent the style in question. Students could write a description of each painting and include background information on the artist. Some examples of styles that could be explored are:  
  - Cubist  
  - Impressionist  
  - Renaissance  
  - Expressionist |
| History - year 8/9 | Compilation of biographical information on a particular historical figure with local relevance to the city or country. The biography could be presented in the form of a play, documentary or book. |

Before the students begin the task, discuss the aspects that are not negotiable and agree on a set of rules to put in place. This applies to groups working at all levels on the cognitive and social skills progressions.

1. **For students working at Stage 1 on the cognitive skills progression:**

Present this activity as a closed task by naming a destination with two feasible modes of transport for reaching the destination. Provide instructions in verbal, written and pictorial form. Scaffold students’ searching and planning by providing two or three websites, a map and a few relevant and irrelevant public transport timetables. Work collaboratively with the group to investigate the resources at their disposal and, if required, to establish some initial rules for deciding which resources are likely to be useful.

Leave time at the end of the session for students to describe the process they went through, to name one thing they contributed, and one thing each other member of the group contributed.

Provide a rubric for students to evaluate the excursions proposed by the class against specific criteria. This could be done after the students have an opportunity to vote for the idea they like the most, to contrast the two methods of evaluation.

Variations for students who are working at different stages on the social progression:
For students working at stage 1 on the social skills progression:

For students working at stage 2 on the social skills progression:

For students working at stage 3 on the social skills progression:

For students working at stage 4 or above on the social skills progression:

2. For students working at Stage 2 on the cognitive skills progression:

Build in an explicit planning stage for students to identify and list the information they need. Scaffold the searching for modes of transport by explicitly teaching internet searching skills, including ways to restrict searches and evaluate the usefulness of different sources of information.

Provide a structure for negotiations to select a single idea for an excursion. This could take the form of a set of guiding questions. Each student could present one or two ideas to be typed up in a single document. Direct the students to use a colour coding system to indicate the stage of negotiation of the ideas, for example, –

- Green for proposed ideas
- Yellow for ideas that have been discussed
- Blue for ideas that have been agreed upon for final voting

Allow time for reflection to identify the process they followed, what worked well, and what they could have done differently.

Also ask students to reflect on and describe how the skills they learnt about in doing the task, could be applied to other areas of study or life.

Conduct a class discussion on how the excursion plans could be evaluated and facilitate agreement on the criteria to be used. Following an evaluation against the agreed criteria, allow students to vote for the excursion they would like to go on.

Variations for students who are working at different stages on the social progression:

For students working at stage 1 on the social skills progression:

For students working at stage 2 on the social skills progression:

For students working at stage 3 on the social skills progression:

For students working at stage 4 or above on the social skills progression:

3. For students working at Stage 3 on the cognitive skills progression:

Draw up a list of requirements for the excursion, two of which are challenging to satisfy in one excursion (i.e. requirements that are contradictory to each other).

Specify a planning stage for students to decide on a method for generating and selecting ideas for the destination. Set the task of presenting this plan as a flow chart.
Students could also be expected to draw a diagram of the solution paths they explored, showing how they worked together to select the options they chose (destination, mode of transport, attractions to visit).

When students have spent some time attempting to satisfy the ‘contradictory’ requirements, allow them to select one requirement to exclude from the list, and continue with their planning.

Allow time for reflection at the end of the task to identify the process they followed, what worked well, and what they could have done differently.

Also ask students to reflect on and describe how the skills they learnt in doing the task, could be applied to other areas of study or life.

Before allowing students to vote on the excursions, conduct a debate with each group arguing for the excursion idea of another group.

Variations for students who are working at different stages on the social progression:

For students working at stage 1 on the social skills progression:

For students working at stage 2 on the social skills progression:

For students working at stage 3 on the social skills progression:

For students working at stage 4 or above on the social skills progression:

4. For students working at Stage 4 or above on the cognitive skills progression:

Set a challenging set of requirements for students to address in the excursion. For example, outline specific information that needs to be collected in relation to a scientific or historical topic. Build a connection to current learning across curriculum areas.

Allow students to discuss, negotiate and decide on a process for planning the excursion. As part of this process, set the task of researching and selecting appropriate graphic organisers and planning and presentation tools for analysing and presenting the proposed approaches.

Once they have tabled their ideas for an excursion, but before they have selected the one to present, change some parameters or goals to necessitate a re-planning activity. Guide students to use the same planning tools and graphic organisers to update their planning to accommodate the changes.

Allow time for reflection to identify the process they followed, what worked well, and what they could have done differently.

Also ask students to reflect on and describe how the skills they learnt in doing the task, could be applied to other areas of study or life.

Set the class the task of building an evaluation framework for deciding on the best excursion.

Variations for students who are working at different stages on the social progression:
For students working at stage 1 on the social skills progression:

Use small groups or pairs to allow students to become comfortable with the basic skills of collaboration. Allow students to choose partners they are comfortable to work with. For example, a ‘clock buddies’ strategy might be used for assigning pairs.

Before students start the task, explicitly identify one listening skill you would like the students to demonstrate. Describe and model the listening skill. During the task, provide positive feedback when you observe students using the selected listening skill.

Explicitly identify verbal cues in the context of discussions during the task. Where necessary, guide students through appropriate responses to these direct cues.

2. For students working at stage 2 on the social skills progression:

Keep the group sizes small and, to promote engagement, start off with a discussion on how the task is relevant for building skills necessary in everyday life. Link the goal or topic of the task to previous learning.

Encourage students to ‘have a go’. Discuss the consequences of avoiding risks in the context of group collaboration. Ask students to watch out for their fellow students taking a risk in participating and contributing ideas, and point it out when they do.

Identify points during discussion where communication is not clearly understood. Ask the student to repeat what he/she said. Ask another student to explain what he/she heard.

Provide opportunities for students to try alternative ways of communicating their ideas.

Explicitly identify non-verbal cues in the context of discussions during the task. Guide students through ways to adapt a response to accommodate non-verbal cues.

At the end of each session, allow time for reflection, and ask students to identify examples of positive behaviours and approaches displayed by themselves and others in their team.

3. For students working at stage 3 on the social skills progression:

Ask students to each propose one idea, then re-allocate ideas to different students who must try to persuade the group to adopt the idea.

Provide a different set of resources to individuals or sub-groups to motivate students to collaborate. For example, one group could be given access to various forms of maps, and another could have all the information relating to transport – timetables, route diagrams. They should be instructed to communicate verbally without allowing the other group visual
access to their materials.

Set goals for positive behaviours such as providing encouragement to other group members. Use a **Y chart** to brainstorm how these could be recognised and the impact they could have.

Identify opportunities for reflection and use a **freeze-frame strategy**, for students to discuss what is working or not working, and to identify options to proceed.

At the end of each session, allow time for reflection, and ask students to identify examples of successful strategies and positive behaviours displayed by themselves and others.

**4. For students working at stage 4 or above on the social skills progression:**

Group size could be increased to create a greater challenge in achieving a positive collaborative dynamic. In order to motivate all students to participate, set the group an additional task of evaluating the style and level of contribution of all group members against agreed rubrics. The students could be asked to present a pie chart that they construct jointly, to show individual contributions to the task.

Provide further challenge to students by removing face to face collaboration, allowing online communication only, in the form of emails, shared documents and chats. The group size can be increased as long as all members are contributing sufficiently.

Set goals for putting into practice positive group behaviours such as providing feedback to other group members to improve their contributions. Use a **Y chart** to brainstorm how these behaviours could be recognised and the impact they could have.

During the task, identify opportunities for reflection and use a **freeze-frame strategy** for students to discuss what is working or not working, and to identify options to proceed.

At the end of each session, allow time for reflection, and ask students to identify examples of successful strategies and positive behaviours displayed by themselves and others in their team.
Definitions:

**Freeze-frame**

During a group discussion there may be opportunities to re-focus the discussion or deal with conflict by instructing students to ‘freeze’ the discussion so that the situation can be analysed in more depth. Alternative responses or actions can be created with the benefit of time for thought. Prompts can be given such as “What led to this situation?”, “What were you planning to say?”, “What response do you think that would lead to?”, “What other possibilities are there?”, and “How would a different question or action change the discussion?”.

**Y Chart**

A Y Chart is a visual form of presenting ideas on how to recognise or understand the characteristics of a particular behaviour or situation. Students usually create their own Y Charts through brainstorming what the behaviour or situation ‘looks like’, ‘feels like’ and ‘sounds like’. It helps to focus attention on observable characteristics that students can use to identify these behaviours or situations.
Clock buddies strategy

Clock buddies provides a quick way of pairing up students. Each student is given a clock with a space for a name beside each hour on the clock. The students are then given the task of finding a different partner for each hour on the clock and to fill in the names in the appropriate spaces, and ensure their name is in the same space on the partner’s clock. The teacher can then direct the students to use their 7 ‘o clock buddy for a task, for example.