Developing effective change / instruction

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Objectives At the end of this unit you should be able to

- describe key decisions to be made in developing effective change / instructional programs
- the key learner interactions in an teaching unit- teaching
- describe strategies for evaluating instructional units
- recommend procedures for intervention and teaching modification
- recommend ways of teaching students how to learn, how to manage learning,
- recommend procedures for assessing learning, psychoeducational assessment,

Key issues in curriculum development

- objectives
- mode of information presentation
- scope and sequence of learning
- means by which students will display knowledge both formatively and summatively
- lesson plan

Key learner interactions in an teaching unit- teaching

Clusters of teaching procedures match and support each of these functions. I will look at some examples

Key learning functions	Teaching procedures
have an impression of the outcome of the learning	Help students see the outcome of learning • *This is what you will be know / be able to do when you have learnt ...* • What will you know / be able to do having learnt • Visualise the learning outcomes • Use of outcomes ?
have an explicit purpose or reason for learning the particular ideas	Present ideas/ procedures as • problems to be solved. • challenge questions; questions teaching might answer • ideas that don't fit with what is knows, have unexpected outcome. • novelty; make the novelty of new ideas stand out. • things useful for us to know or do; help to achieve some goal. • ambiguous situations that they are encouraged to resolve • open-ended tasks, students frame up questions and an action plan. • fantasy and imagination • ambiguous situations that they are encouraged to resolve
Let students see how they might achieve outcome	Have students • develop a learning pathway or action plan • periodically negotiate the next part of the 'journey' with them • show them where new ideas are on their journey as they learn. • show how each idea is an extension of ideas learnt, how it fits in with them, for example, *"You already know about .. / how to do ...Now you are going to learn .... / how to ..*
use what they know	Have students • stimulate relevant existing knowledge • recode to match teaching information • automatise aspects • question aspects of the new ideas, identify and value what they don't know • recall what they know about how to learn from past experiences, see that they have been able to learn in the past, what they did to learn

change what they know, first in particular contexts	• teach the new ideas as episodes, actions and familiar language. • have students question existing knowledge to link with new ideas • cue students to think about the idea in different ways • teach students to switch ways of thinking about ideas. • have learners act on the ideas in global ---> analytic ways • help students use their thinking spaces most effectively • ensure students continue to be challenged to learn • use cooperative, collaborative learning where possible
abstract the new ideas	• have students summarise across episodes, generalise the ideas • develop general prediction or expectation about ideas, procedure, formula. • help students categorise their knowledge • teach students to link the ideas with what they know. • teach episodic, network, procedural, affective aspects in integrated way • elaborate and extend the ideas • teach the conventional ways of communicating the ideas

respond emotionally to the ideas learnt	Invest emotion in ideas learnt; have students
	• comment on how interesting / useful they found the ideas.
	• value themselves as learners, see that their activity led to learning.
	• give themselves positive feedback "*Praise yourself for a job well done*"
	• comment on how they are feeling, it is acceptable to say *"This isn't bad; I feel I am making progress"*, they are doing things they couldn't have done earlier
	• develop positive attitudes to learning; teachers show they value
	  • curiosity and preparedness to enquire
	  • students studying and reflecting on how they learn.
	• attribute success and failure functionally.

learn the strategies used to learn successfully	Have students • answer *What did you do to learn the new ideas ?* • 'think aloud'. learn to talk about how they think and learn • make links between ideas in different ways and describe how they direct their learning and thinking • keep track of the learning actions that work best for them, when to use each • share what they do as they work through tasks, trial each other's actions • maintain a record of their learning actions, 'ground rules for learning, • decide what they can do when they have difficulty getting started, deciding what to do, 'get lost' while applying a procedure, • speed up the time that it takes them to solve problems. • see their way through problems, • see possible 'danger areas, dead-ends' etc.' coming up.
see learning progress being made	Students review progress; • *what have you learnt ? say, write, draw, do.* • *what can you do now that you couldn't do earlier ?* • tick off on their journey where they are. • show how well they know /can do an idea
encode the new idea in long term memory	Have students • describe what they will remember as concisely as possible. • link ideas to existing knowledge; *What do these ideas remind me of ?* • draw picture of main ideas, use concrete model, represent them in actions • draw semantic or network map of the ideas, show links with existing knowledge. • describe when ideas might be used in future. • imagine themselves remembering the idea and say what is helping them do so.

recall and apply ideas in a range of situations	Students
	• suggest contexts to which they can transfer ideas
	• suggest how they can decide where the ideas can be used
	• note how far they can transfer with / without model
	• create new episodes for the ideas
	• apply higher levels of Bloom;
	• apply Taylor's multiple talent model ;
	  • decision making; evaluate alternatives, justify decisions made,
	  • planning; plan and organize a specific outcome or solution
	  • forecasting; predicting future events, looking at causes and / or effects of situations
	  • creativity; create new meanings, relationships and ideas.
	  • communicating ideas both verbally and nonverbally
	• distinguish between the types of questions and invent names for the different types
	• use open-ended tasks for further learning.
	• categorise problem solving contexts.

automatise it	Students
	• speed up recall and deciding when to use ideas, for example, in matching games
	• practise repetitively parts at a time
	• automatize links between ideas, for example, in rapid quizzes, card games
	• recall ideas by using a few key words to cue the ideas.
	• include automatizing activities into our regular teaching
	  • regular revision of key ideas
	  • rapid exposure to and processing of ideas
	• emphasise semantic links between ideas so that one idea stimulates related ideas
	  • build links between ideas "If ... happens, it means ....."
	  • draw network diagrams of related ideas, hierarchies, concept trees
	• practise recalling links between ideas

practise organising the knowledge for display in assessment	Have students • discuss how they believe they will be expected to display the ideas in the future. • work in small groups to write assessment tasks for peers, make up mock tests. • practise recalling the ideas in different assessment tasks. • analyse possible assessment tasks, discuss how well they assess knowledge, • suggest possible questions given the answers to questions

Evaluating instructional units

- in terms of learning outcomes Need to look at long-term outcomes.
- relevance to goals
- relevance to student population
- in terms of effectiveness in fostering successful learning

Range of contexts in which these interactions developed

- lecture context
- tutorial context
- classroom context
- individual learning context

Different teaching strategies

Differences in the content to be taught

high vs low consensus fields. Some subjects have a well-established set of concepts and different teachers will probably all teach the same basic content the in high consensus subjects, In other subjects, the likelihood of differences in what is important may lead to a greater difference between teachers; these are the low consensus subjects.

In high consensus subjects, the intention of the teaching may be to have students learn the well established knowledge base while in low consensus subjects the intention may be to teach a broad impression of the nature of the subject and to understand and appreciate differences. Direct teaching

may be seen to be more appropriate for the high consensus subjects while discussion teaching strategies are more appropriate for the low consensus subjects.

Differences in the types of outcomes sought: purpose can be to

- acquire and retain culturally valued knowledge as it is presented
- acquire and recast culturally valued knowledge at higher, more complex personally elaborated ways
- teach attitudes, dispositions towards subjects, beleifs
- teach higher level ways of thinking and learning

Differences in teaching style : teaching personality:
- high vs low tolerance of different types and levels of structure
- intellectual agility
- locus of authority in teaching; total control vs shared control

Effectiveness of lecture teaching strategy

Lecture - relatively long, uninterrupted presentation of largely auditory information. Positive aspects of lectures cf reading the same content:
- lecturer can repeat content using different words
- can give students a framework, an overview, a critique unlike that done in text
- students are not passive; learning from a lecture context requires student activity (follow an argument, filter essential from non-essential information, etc.)
- it gives students a type of reinforcement not available in other educational procedures (Elsen, 1969) and can allow positive emotional interaction between students and lecturer
- it is inexpensive.

In terms of learning outcomes, when content outcomes are measured using formal assessment procedures. In a comparison of almost 100 studies, the lecture strategy is as efficient as the small group discussion strategy (Dubin & Taveggia, 1968). It is possible, of course that using the final exam score is not an appropriate test of the comparative effectiveness, because some students may take additional steps to compensate for lecturer weaknesses. When the outcomes are retention rates and higher level thinking, the discussion strategy is superior (McKeachie & Kulik, 1975).

When to use lecturing

Lecturing is lecturing most appropriate (Brown & Atkins, 1988; McLeish, 1976) when

- purpose is to disseminate information that is not readily available elsewhere
- material is organised and presented in a way that takes account of the specific audience
- it is necessary to stimulate interest in the subject
- students need to remember information briefly
- purpose is to introduce an area or provide directions for a learning task

Lecturing is lecturing least appropriate (Brown & Atkins, 1988; McLeish, 1976) when

outcomes are other than acquisition of knowledge such as analysis, synthesis, evaluation
long term retention is necessary
material is complex, detailed, abstract
learner participation is necessary for achievement of objectives.

Discussion - group teaching

Teacher usually facilitates and guides the interaction. Provides opportunity for
- discussion, problem-solving, debate, negotiation of meaning
- developing critical thinking

Issues to take into account in implementing this type of teaching :

- need for parity, equality in teaching for different groups required to learn the same knowledge, particularly for low consensus subjects.
- management of the public display of opinions, attitudes
- how discovery learning procedures can be incorporated in the teaching
- developing topics in more vs less controversial ways
- encouraging the participation of all students
- need to establish common shared knowledge
- physical arrangement of students, setting
- group size and participation- need to take account of purpose of group, outcomes, homogeneity of students

Clarification of teacher's role ; have a discussion group management plan that indicates

- how to facilitate discussion by using leading and clarifying questions, checking, reviewing, re-directing, supporting, valuing and reviewing the group's work (Jaques, 1991).
- how to monitor the interpersonal interactions and manage group learning
- when to intervene, how to deal with digressions, silence, errors of fact, logical fallacies
- how teacher will take steps to minimise
  - biasing the discussion
  - the possibility of conformity of students
- how teacher will deal with
  - topic exhaustion and death
  - social and emotional factors in the group such as status in the group that lead to
    - non-participation
    - uneven participation

    Status can be affected by characteristics such as verbosity, personality, age, gender and ethnicity (King, 1993; Partington & McCudden, 1993). To increase participation of low status students
    - prepare students for group work, set ground rules, teach students how to work in groups
    - use tasks initially that will allow low status students to participate
    - assign roles in the group that allow the competence of low status students to be enhanced and so that they are seen in a more positive light
    - have high expectations of both high and low status students
    - expect equal participation from both high and low status students.
- how to evaluate the learning effectiveness of the group after the session,
  - student evaluation
  - reflection,
  - listening to tape of session

use of guided reciprocal peer questioning (King, 1990) as a small group learning activity - students learn to use a set of generic questions based on higher levels of Bloom. They each ask another student a question of the topic, respond to the answer and answer a question from another student. This continues until the students are satisfiedwith their understanding of the topic.

student activity - ask questions, receive answers, express experiences and opinions, challenge ideas raised.

Individual learning appproaches

often assume a knowledge of how to learn independently and to direct one's own learning. Three approaches:

- mastery learning - Bloom
- personal systems of instruction - Keller
- programmed instruction - Skinner

Mastery learning defines learning effectiveness in terms of time

- student aptitude - time taken for learning
- student motivation - time student is willing to spend on learning
- task difficulty - time needed to learn a task

Students should have as much time as they need to learn a topic and be able to work on it until they have achieved mastery.

- Conditions for teaching
  - provide initial instruction
  - is mastery oriented
  - help is provided when it is needed.

Effectiveness -
- mastery learning improves achievement at univeristy level and attitude to subject (Kulik, Kulik & Bangert-Drowns, 1990)
- can get the Robin Hood effect - helping slower learners at the expense of faster learners if supplemental mastery teaching is provided by teacher.

Criticisms (Mueller, 1976; Cox & Dunn, 1979)
- takes responsibility for learning from students, may not teach them how to learn independently
- requires non-fixed time instructional units
- may hold up faster learners
- makes large teaching resource demands
- assumes everything must be learnt equally well by all students
- the focus of mastery learning on showing mastery on tests is of concern (Ritchie & Carr, 1992) because tests
  - usually cover only part of what students learn in a unit of work
  - may not distinguish between competence and mastery
  - may foster an attitude to avoid the 'risk of failure'
  - may encouragte rote memorisation
  - usually do not permit monitoring of student thinking skills.
- doesn't develop constructivist approaches to learning, the awareness that knowledge is boundless (Ritchie & Carr, 1992)

When most useful ?
- in primary years with basic skills, and slow learners at all levels

Personal systems of instruction
defines learning in terms of Skinner's operand conditioning procedures - teaching needs to allow students to display what they know optimally and provide effective reinforcement (or feedback). The teaching material is broken into small units.
- Conditions for teaching
  - provide initial instruction
  - is mastery oriented
- help is provided when it is needed

Effectiveness -
- PSI teaching improves achievement at univeristy level and attitude to subject (Kulik, Kulik & Bangert-Drowns, 1990), with the effects greatest in the social sciences, when students had to go at the teacher determined rate, for sequential topics and for low aptitude students.
- components that lead to higher achievement - self-pacing, mastery requirement, immediate feedback, frequent testing over small units (Block & Burns, 1976; Abbott & Falstrom, 1977).

can get the Robin Hood effect - helping slower learners at the expense of faster learners if supplemental mastery teaching is provided by teacher

When most useful ?
- for the more 'objective' aspects of subjects

Programmed instruction Skinner (1954) --->
- the main problem in education is inadequate reinforcement
- students in programmed instruction
  - are provided with brief presentations of content in 'frames'
  - respond actively (display a behaviour repertoire)
  - receive feedback re the correctness of the response

Effectiveness -
- most effective learning particular procedures or narrow areas of knowledge
- helps students become more active in learning

- feedback can produce positive orientation to education

Criticisms - not useful for learning attitudes and values.

Regular classroom

Recitation - more than a combination of the above - it involves - short interchanges between teacher and individual students or small groups and takes up one third of the instructional time in maths and social studies (Perrott, 1988; Stodolsky, Ferguson & Wimpelberg, 1981); usually 4 main types of talk:

- structuring - setting the context for classroom behaviour by starting or ending an interaction and indicating its nature
- soliciting - seeking a response
- responding - fulfilling the expectation set by the soliciting behaviour
- reacting - modifying or evaluating a presious response.

This recitation -allow students to learn 'school speak'- language for interacting in the classroom, the rules fo classroom question- answer exchanges.

Functions of recitation

- review
- introducing new material
- checking answers
- practice
- checking understanding of ideas

Student behaviour during recitations

- attend well
- learn more easily than by seat work
- not highly anxious

Reasons why recitation has endured over this century in teaching (Perrott)

- it is adaptible and can be modified to match different grade levels, etc
- it allows teacher to tap into where students' existing knowledge is
- it is reinforcing to teacher - lets teacher see how students are learning
- it can be used in regular class sizes.

Teacher planning

usually 'naturalistic' cf prescriptive planning - planning to provide learning activities and to set up the most effective learning conditions - objectives are set implicitly - teachers focus on activities and tasks - what they want their students to do and how to get them to do it (Shavelson, 1987).

Planning

- at discipline, management levels
- at pedagogical content level (
- at learning support, scaffolding level

Information technology and instruction

Computer provides opportunity for learner interaction with an information source and with other learners. It provides the opportunity for

- determining how learners learn,

- providing teaching information in steps of a range of sizes, with a richness and breadth that would be difficult to access in other 'classrooms'

- students to respond as often as required and to receive tailored feedback

- learners to communicate with other as an aspect of the learning.This is the notion of a 'distributed learning environment' (Oblinger & Maruyama, 1996) - the learning group or community is not defined or limited by physical boundaries. A network that permits both synchronous and asynchronous (delayed) communication is necessary. The networked computer system provides the opportunity go learning through social constructivist processes (Rogoff, 1990; Davydov, 1995); these processes assume that learning occurs best though social interaction, where the cognitions are distributed between those involved in the interaction (that is, situated cognition (Brown, Collins & Duguid, 1989; Greeno, 1997; Anderson, Reder & Simon, 1997)), the knowledge is 'in between' individual learners (Lave & Wengerm 1991). The computer facilitates the distribution of cognition in two ways
  - by reducing the mental processing users need to use, freeing up processing space for other mental activity
  - by assisting intellectual communication between learners; what any learner knows builds on what the group knew earlier in a 'self-scaffolding' way (Hewitt & Scardamalia, 1991).

Within the classroom the computer can be used as

- an instructor or teacher; the student's learning is controlled by the developer of the computer programme, with the learning at any time determined by immediately preceding student responses (CAI).

- a tool; the computer provides information databases, opportunities for recording knowledge in writing using word processors, ways of organising and processing data, opportunities for drawing.

- a learner; the student 'teaches' or programs the computer to perform in various ways, for example, to use LOGO to explore spatial relationships.

- a facilitator of higher order thinking; because of the ease with which it can simulate aspects of the world and construct 'virtual reality', the computer can present learners with scenarios in which they learn how to manipulate information in ways that would be inappropriate in the corresponding real-world context. They can enhance learners' ability to manipulate increasingly larger amounts of information, to develop strategies for manipulating the information in context-specific ways and to investigate the outcomes of thinking about ideas in particular ways. In particular they can
  - imitate the real world in virtual reality contexts
  - provide for the observation of experts

  In this way provide the opportunity for learning via 'cognitive apprecticeships' (De Corte, 1990).

- a learning -scaffold; the computer can be used to manage particular teaching activities and free the teacher for con-joint work with small groups, that is, 'distributed teaching'.

- a facilitator for co-operative learning through networking - provides a distributed learning environment (Oblinger & Maruyama, 1996). Knowledge is most effectively learnt when learners actively participate (rogoff, 1995; Davydov, 1995) - social vs personal constructivism. The computer distributes cognition in two ways :
  - by reducing the mental space used by learners and freeing ip processing space for higher level activities; mental effort is divided between student and computer
  - by providing a link for intellectual interaction between students; the knowledge of the learners build on each other in a self-scaffolding way (Hewitt & Scardamalia, 1996).

  Within this model, existing knowledge is 'between' individuals.

Branching rather than linear learning

By using hypertext, computers can provide students with multiple pathways through an instructional unit. When several media are included, we have hypermedia. Students come to think in 'non-linear ways that can challenge the more linear, 'systematic' ways of thinking often valued in formal teaching. If the hypertext has infromation organised into multi-relational semantic maps, these can match how ideas are linked in learners' memories and cam facilitate learning and recall.

Is hypertext an effective learning tool ? With the advantages of allowing learners to branch at will through information network there is the danger of getting lost ; the construction of text for one's own purpoess is useful but following one's associations can create such a micro-view that the overall sense of where a particular bit of knowledge fits into the macrostructure can be lost (REynolds et al, 1991).

The WWW on the Internet uses hypertext. Strategies for navigating hypertext can be taught (Rouet, 1990). Hypertext literacy can be taught, with students learning structural cues and making mental effort to find coherence while reading hypertext:

- the structure can be taught by
  - providing the reader with a map of its hierarchical organisation (the key concepts and the links that have been coded by the writer or by
  - the readers keep a running record of their current location and previous steps in the navigation

- coherence is learnt while students interact with the information in different ways, for example, when they make lateral rather than hierarchical moves through the information they can learn to re-establish the context in which they were thinking by going back to where they were before they diverted (Foltz, 1996).

For effective use of hypertext presentations, regular 'linear' reading skills need to be broadened to include making associations by semantic links (Tolhurst, 1993). Useful teaching strategies include

- use off-computer lessons that complement the use of hypertext material and develop conceptual understanding of the topic before students begin to use the hypertext version

- have students compare strategies they used for locating information with hypertext and then plan alternative possible pathways

- teach students to make effective sequencing choices for their learning purposes; this can be done using off-computer tasks

- have students use concept mapping prior to studying topic on computer and predict possible / likely ideas.

Regular 'linear' reading skills do predict the ability to read hypertext. Poor readers who depend on context to decode meaning will be disadvantaged unless they are taught about the structure of the content, for example, they may be provided with a map of the structure. They may not have sufficient attention to invest in processing the unstructured material becasue they are not as good at parallel processing as more able readers.

Multimedia presentations provide multisensory information. To use it effectively, learners
- need a map through the information resource,
- need to learn the analysis skills needed for effective exploration, for example, research skills
- need a means of charting their progession through the hypermedia.

Mere 'cutting and pasting' of information (surface learning) needs to replaced by deeper learning (for example, students represent the information in different ways, question it, predict, etc).

The Internet and learning. Accessing information from the internet requires nonlinear thinking cf tthe more rigid, linear ways of thinking fostered using regular text (Warren, 1996). The Net encourages us to scan information rapidly, jumpoing form one 'hotlink' to another. This may lead to
- a reduction in reflective and higher level critical thinking (Birkerts, 1994)
- a reduction in the ability to engage in a sustained enquiry

To learn to use the Net effective, students need to develop a search strategy and to keep a record of the direction of their search: search steps

reflect : why are you needing to use the Net ? what is the purpose of the search ?
what do you already know aboiut the area of information you are searching ?
choose the doftware that suits the location and type of information sought ? Is the search feasible ?

select key words	begin with broad general terms and refine if too many locations develop lists of successful key words. Use a thesaurus.
search	be purposeful but open to chance locations internet searching is dynaminc and can easily become random 'surfing'.
retrieve	locate, access, download, view and save
reflect	is this the information you sounght ? Should you continue ?

need to be learnt need to be broadened to include making associations by semantic links

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