iCanStudy

Curriculum design overview

Program objectives

The iCanStudy learning system is novel due to its first principles design. Unlike most systems, it is not built on existing norms and traditions around learning. Instead, it is built from deep examination of the latest empirical and theoretical research on learning, alongside heavy practical application and evaluation in real-world learning environments.

Our program achieves the following objectives:

1. High retention of information
2. High level of knowledge mastery (deep application and nuanced multi-relational understanding)
3. The achievement of objectives 1 and 2 in a short period of time
4. Sufficient self-management to engage in objectives 1, 2, and 3 on a consistent, sustainable basis across a diverse range of conditions

Methodology overview

The iCanStudy program is designed with a non-linear, naturally recursive, and pace-layered methodology. As there is a high level of practice required for each associated theory, hybrid learning events in the form of open access office hours, one-on-one feedback tickets, 24/7 question and answer chat services, and a moderated online community are incorporated to give a high level of feedback for all members. Where viable, social learning is encouraged through the online community.

Methodological principles

Non-linear: multiple skills and concepts are taught simultaneously to build a robust knowledge schema that accounts for the important influences that skills and concepts have on understanding or applying other skills and concepts. This contrasts with a linear approach where each skill and concept is taught in isolation, from beginning to end. Linear approaches are inefficient and inconsistent at producing ideal learner outcomes for complex systems of skills and multi-relational knowledge schemas.

Recursive: research on threshold concepts (Meyer & Land, 2005) tells us that learning is a non-linear, back-and-forth process by nature. Repeating and re-processing information is an unavoidable and potentially beneficial feature of effective learning. Research recommends that courses be designed to facilitate this productively, rather than prevent recursive behaviours from occurring (Higgs, 2014; Land et al., 2005).

Pace-layering: pace-layered application strategy is a method most commonly traced to Gartner, an S&P500 information technologies company. It describes a methodology to develop and evolve aspects of IT architecture quickly by simultaneously progressing each individual component at the pace that is ideal for the component. It has now found applications in biology, climate science, and of relevance to education, the design of e-learning programs. The usage of pace-layering principles have been recommended in multiple recent publications as suggested best-practice for skills development (Dirksen, 2015; Moore, 2017; Neelen & Kirschner, 2020). In our program, pace-layering is incorporated to teach skills related to deep processing, active learning, revision strategy, mindset, and self-management in simultaneous, parallel streams. The complexity of skills and concepts advances depending on the predicted ideal pace for development of each skill independently.

Learning system principles

The following table outlines the major principles and skills that are taught with relevance to efficient learning. They are listed against primary effects and relationships with other principles to illustrate the interconnected nature of each principle when used in a system. Where appropriate, stages of development are also outlined, indicating how principles or skills progress to more comprehensive, nuanced, or more advanced variations over time, as the learner develops greater competency and familiarity with the earlier stages.

All of the below principles, except microlearning, are taught in parallel starting from the first 3 stages of the program. For a more detailed account of the principles and relationships, please review the Map of Learning and the Report on Learning.

Principle or skill	*Stages of development*	*Primary effects*	*Relationships*
Chunking	1. Basic group formation 2. Prioritised group identification 3. Prioritised group formation 4. Formation of multiple overlapping prioritised groups	- Improve retention - Increase cognitive load tolerance - Facilitate higher mastery of knowledge	- Quality dependent on cognitive load tolerance - Dependent on modified inquiry-based learning in later stages - Dependent on priming and prestudy in middle to late stages
Note-taking	1. Basic processing of notes instead of passive note-taking 2. Basic segmented non-linear note-taking 3. Basic integrated, non-prioritised non-linear note-taking 4. Basic integrated, prioritised non-linear note-taking 5. Advanced integrated, prioritised non-linear note-taking including relevant fine details	- Reduce extraneous cognitive load - Facilitate higher mastery of knowledge	- Enhance chunking ability - Dependent on chunking quality - Dependent on cognitive load tolerance - Improvement dependent on reflective practice
Effort-as-cue monitoring	1. Basic metacognitive awareness of mental effort while learning 2. Discrimination between intrinsic vs extraneous cognitive load	- Improve metacognition	- Prerequisite for cognitive load self-regulation

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Cognitive load self-regulation	1. Basic modification of studying techniques to optimise intrinsic cognitive load 2. Basic modification of studying techniques to reduce extraneous cognitive load 3. Detailed modification of studying techniques to optimise intrinsic and extraneous cognitive load for diverse variables	- Improve metacognition - Reduce negative impact of external influences on learning efficiency - Reduce intrinsic cognitive overload - Improve functional cognitive load tolerance - Improve higher-order thinking consistency - Improve monitoring judgement accuracy	- Improve chunking - Dependent on effort-as-cue monitoring accuracy - Dependent on metacognition - Dependent on cognitive load tolerance
Reflective practice	1. Accurate critical reflection of learning experiences 2. Basic experiential learning to drive practice improvements based on critical reflection 3. Consistent and habitual engagement with productive experiential learning	- Improve growth mindset - Reduce anxiety and uncertainty around learning - Improve metacognition	- Dependent on growth mindset (positive feedback cycle)
Modified inquiry-based learning	1. Basic ability to utilise curiosity to increase relevance of material 2. Targeted usage of questioning to induce specific cognitive patterns 3. Strategic usage of questioning to develop knowledge schemas and improve chunking quality	- Improve chunking - Reduce extraneous cognitive load - Optimise intrinsic cognitive load - Improve metacognition - Improve self-regulation - Facilitate higher mastery of knowledge	- Improvements dependent on reflective practice - Dependent on cognitive load tolerance - Necessary for later stages of chunking

Rote-memorisation management	1. Basic reduction of rote-memorisation volume through content discrimination 2. Basic usage of memorisation aids and rote-memorisation techniques 3. Fine discrimination of content for rote-memorisation and significant volume reduction	- Reduce workload - Improve efficiency of non-linear note-taking	- Dependent on chunking quality - Dependent on self-regulation - Influenced by non-linear note-taking at late stages
Spacing	1. Basic application of simple spaced retrieval 2. Flexible adjustment of spacing intervals to meet time availability needs 3. Advanced utilisation of spacing alongside priming and rote-memorisation techniques to engage in microlearning	- Improve retention and retrieval performance	- Sustainability dependent on rote-memorisation management - Required for middle and late stages of interleaving
Interleaving	1. Basic variation in retrieval methods 2. Interleaving of retrieval methods reflects assessment or other real retrieval needs 3. Interleaving of retrieval methods is strategic depending on real retrieval needs and time availability for retrieval sessions 4. Systems of learning are fundamentally structured around engaging in early interleaving, based on real retrieval needs and time availability	- Improve retention and retrieval performance - Facilitate higher mastery of knowledge at middle and late stages - Improve initial encoding through calibrating accuracy of chunking and knowledge schemas	- Requires spacing - Influenced by initial chunking quality - Ability to perform some variations dependent on cognitive load tolerance and self-regulation - Sustainability and viability dependent on rote-memorisation management

Microlearning		- Improve time efficiency of learning	- Dependent on high competencies with spacing, interleaving, self-regulation, cognitive load tolerance, priming and prestudying, chunking quality, and rote-memorisation management
Priming and prestudy	1. Basic semantic priming through brief prestudy techniques 2. Targeted prestudy techniques to build higher-order knowledge schemas in early phases of learning 3. Strategic and adaptive usage of various prestudy techniques before any major learning event to accelerate development of high knowledge mastery	- Improve knowledge schema formation - Facilitate higher mastery of knowledge - Improve time efficiency of learning - Improve retention - Increase likelihood for higher quality chunking at middle to late stages	- Dependent on self-management skills - High competencies dependent on reflective practice - Dependent on cognitive load tolerance at late stages - Viability dependent on total system efficiency

References

Dirksen, J. (2015). Design for how people learn. New Riders.

Higgs, B. (2014, January 2014). Threshold concepts: navigating the route. National academy's sixth annual conference and the fourth biennial threshold concepts conference,

Land, R., Cousin, G., Meyer, J., & Davies, P. (2005). Threshold concepts and troublesome knowledge (3): implications for course design and evaluation. In C. Rust (Ed.), Improving student learning: diversity and inclusivity (pp. 53 – 64). OCSLD.

Meyer, J., & Land, R. (2005). Threshold concepts and troublesome knowledge (2): epistemological considerations and a conceptual framework for teaching and learning. Higher education research and development.

Moore, C. (2017). Map it: the hands-on guide to strategic training design. Montesa Press.

Neelen, M., & Kirschner, P. A. (2020). Evidence-informed learning design: Creating training to improve performance. Kogan Page Publishers.