Australian Educational Technologies Trends

2018

AETT 2018 Report

The Australian Educational Technologies Trends (AETT) report provides an overview to assist teachers, school leaders, academics and industry, in understanding and planning for the use of digital technologies in Australian schools over the next five years - 2019 to 2023.

The report explores four research categories: 1. Educational technologies that will be used; 2. Challenges schools will face; 3. Trends that will have the most impact; and 4. Approaches schools will take to computer education. The report presents an overall consensus in each research category, and the views of particular contexts: subgroups such as parents, school leaders, teachers, students, etc. whose perspective often varies from the overall consensus. Cost-benefit and professional learning priorities are also identified.

The AETT report has been a collaborative effort from 118 of Australia's leading educational technologies teachers, academics and industry leaders, invited to provide guidance on the trends occurring in the use of digital technologies in Australian primary and secondary schools. The AETT report was supported by the Australian Council for Computers in Education (ACCE), the CSIRO through the Digital Careers Australia program, and Griffith University.

The report used a Delphi consensus research method combined with conjoint analysis, and was developed over four months in five stages: 1. Determining a list of 148 alternatives in the research categories; 2. Completing an extensive survey of over 200 items exploring these alternatives and determining an initial anonymous ranking; 3. Anonymous online discussion of this ranking; 4. Production of a final ranking by anonymous voting on, in total, 15619 conjoint pair combinations, and then 5. Through the analysis of survey, pairing data, and discussions, the report was prepared.

A detailed description of the methodology, analysis, and results will be available in a paper for publication in the summer edition of the Australian Educational Computing journal in 2019.

Dr Jason Zagami from Griffith University led the research process, and while many contributed, it was with the particular authoring assistance of the following academics, leaders, teachers, and industry professionals, that the 2018 Australian Educational Technologies Trends report was produced.

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Educational Technologies

Educational Technologies represent the wide range of digital tools used by teachers for teaching, students for learning, and administrators for managing schools. New tools are continually in development and often repurposed for an educational context from other industries. The following technologies have been considered as the five most significant for schools over the next 5 years, along with cost and professional learning requirements.
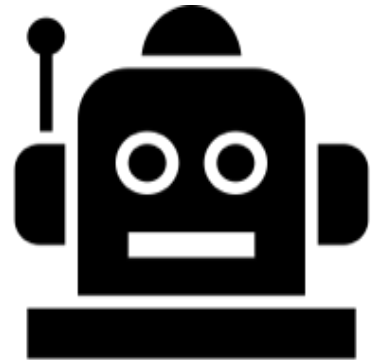
1. Digital Presentations

The use of digital presentations to support teaching and learning will remain dominant with one display to multiple students the norm, with some experimentation of multiple displays and casting to individual student devices. It is expected that an increased use of file sharing of presentations will occur, with some systematic recording of presentations (audio synchronised to slides) but minimal use of presenter recordings (video of presenter and slides) and almost no use of audience recording, reflecting the teacher centred focus of this technology.

2. Maker Spaces

Allocation of space to collections of resources and tools, and making these available for student use, is expected to continue to be showcased by many schools. Library spaces are expected to be co-purposed for Maker Spaces, where librarians can supervise the independent use of the space by students. Whole class use is expected to be common and limited to specific projects mirroring what would otherwise occur in classrooms. While providing independent learning opportunities for some students, there is expected to be minimal change to existing pedagogical practices over the next 5 years with Maker Spaces primarily supporting extra-curricular activities. It is not expected that school-based Maker Spaces will be made extensively available for use beyond the school day or to the community.

3. Cloud Computing

Cloud Computing, where software and services are centralised and accessed remotely are again becoming dominant, but instead of school-based servers, server farms run by large corporations will manage productivity software and store data, increasingly accessed through web browsers. This will decrease IT support requirements and initially permit management and surveillance of student and staff use of these services where subscriptions are provided by schools. Students, however, will increasingly use subscriptions for home use while at school, and the potential cost savings to schools will increasingly encourage this shift. Systems restricting the use of cloud-based services to prioritise managed services will be unable to maintain these restrictions as major productivity suites move to cloud services.

4. Flexible Learning Spaces

Schools will increasingly explore different architectural designs for learning spaces and the pedagogical changes they encourage. Open plan and flexible use will again become dominant, with experimentation of co-teaching, online and independent learning approaches. Where space permits, repurposing of existing teaching spaces will occur, amalgamating rooms into larger multi-use spaces, and new buildings will feature a wide range of independent learning spaces and furnishings.

5. Learning Management Systems

Schools will increasingly make use of content and learning management systems to centralise and manage digital resources. While it is expected that some increase in the use of LMS will continue, particularly to support approaches such as Flipped Learning, primarily they will be used as digital resource filing systems with little use made of their designed purpose for self-paced or guided instruction. Increasingly schools will explore the range of online tools available to perform many of the centralised functions of LMS, particularly those included in online productivity suites such as Office365 and Google Drive.

Costs

The highest costs expected are in establishing flexible learning spaces, providing effective access to 3D printing, supporting one-one device programs, interactive whiteboards and displays, and broadband connectivity. The shift to subscriptions for online services instead of software installation charges is expected to have initial cost savings with increasing opportunities to shift these costs to students via home and school use subscriptions.

Professional Learning

The greatest needs are expected to continue to be in how to effectively teach about specific educational technologies and approaches that are unfamiliar to teachers, and that this will be highly dependent on the technologies available in particular school contexts: computer-aided technologies for manufacturing, robotics, brain-computer interfaces, the effective use of learning management systems, establishing and using maker spaces, and using 3D printing in classrooms.

Specific Contexts

School Leaders will be primarily concerned with school infrastructure, providing effective broadband connections and internet filtering solutions, ensuring digital presentations are possible in classrooms, the installation of interactive whiteboards and displays, and the establishment of one-one, though not necessarily BYOD, programs.

Students will be primarily interested in being able to access online video using effective broadband connections and one-one or BYO device programs. They are also interested in computer gaming infrastructure and facilities for computer-game and video production.

Parents will be primarily concerned with internet filtering provisions, broadband connectivity, school use of digital presentation, interactive whiteboards and displays, and one-one programs.

Teachers will be most concerned about facilities for digital presentations, broadband internet connectivity, effective internet filtering, the use of online video, and Interactive whiteboards and displays.

Trends

Systems, school leaders and teachers must pay attention to all factors influencing education, and these issues are often contextualised to schools and systems, but over the next 5 years, the following are expected to be the focus of attention with respect to educational technologies

1. Funding

The dominant trend evident in educational technology is an increasing allocation as a percentage of available school funds. While most pronounced in one-to-one hardware programs, costs have risen in broadband network charges, software licencing, and in the dozens of peripherals and tools available for school use. This funding expectation has spurred the edutech industry, supporting hundreds of new companies supplying all manner of technologies and services. Despite attempts to shift expenses, such as BYOD programs, It is expected that this trend will continue to dominate.

2. Collaboration

The Australian Curriculum will provide new opportunities for Australian teachers to collaborate on the development of learning activities, assessments, and resources, but challenges exist in the differentiation of how the curriculum is being implemented, variations in the senior curriculum, a reducing membership of professional associations, and balkanisation of sectors, particularly in placing resources and online communities within restricted LMS.
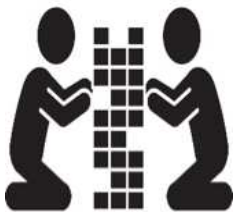
3. Project Based Learning

Educational technology will provide increasing opportunities to support project-based learning and constructivist pedagogies, with many new technologies such as robotics kits designed for such approaches. School environments such as Makerspaces and new architectural layouts will support a wider variety of learning approaches, but the time required to learn how to engage with PBL, for both teachers and students, will remain challenging.

4. Deep Learning

The increasing breadth of the curriculum will continue to work against developing deep levels of understanding about content and concepts. While educational technologies will assist in providing differentiation and individualisation of learning, with opportunities for intensive study, they will also generate more possibilities for learning, further diffusing the curriculum.

5. 21 C Skills

There is an increasing trend towards developing "21st Century Skills" in contrast to traditional subject-based learning, currently structured around the Australian Curriculum General Capabilities, but growing to include new approaches such as entrepreneurship education. This will continue to challenge the siloing of learning within discrete subject domains and encourage integrated approaches.
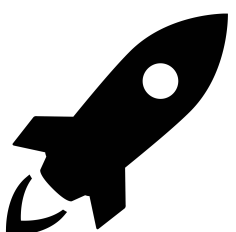
Specific Contexts

Educational systems will be most concerned with overall funding allocations and trends, and the reductions to other areas of funding arising from an increasing allocation to educational technologies. Measurement of school's key performance indicators, most notably student learning outcomes and behaviour management processes, will continue to increase and systems will encourage schools to systematise data collection measures wherever possible to support system-wide initiatives.

School leadership will be concerned with meeting increasing expectations for educational technology resourcing, improvements to managerial and administrative processes, particularly in data collection and reporting measures, with a trend towards centralised and outsourced data analysis. School leaders are expected to increasingly use technology to communicate with the school community and provide feedback on student learning and behaviour. The trend, however, will be towards easily digestible rather than comprehensively detailed communication, with the use of social media, SMS, infographics and digital dashboards, rather than detailed performance databases, trending to the use of multimedia with photo stories and video diaries of school and classroom events. The trend elsewhere towards live video streams from schools and classrooms is not expected to occur in Australian schools over the next 5 years.

IT support staff in schools will be primarily focused on maximising the use, justifying increased expenditures on educational technologies, and supporting infrastructure to maintain an increasing quality of service and uptime. Management and control processes will follow industry trends to enable remote and automated updating of resources, balanced by an increasing educational need for students and teachers to use services and educational technologies previously restricted in schools. The centralisation and specialisation of IT staff are expected to continue as remote and automated processes become widespread, with fewer, more qualified IT support staff employed in secondary schools. It is, however, expected that primary schools will increasingly require more comprehensive IT support services as curriculum and administrative requirements increase. IT staff will support and encourage the development of cultures of innovation in schools, drawing upon innovation models from the IT industry, and how these models can be applied more broadly to school cultures, particularly in developing innovation cultures with school leadership, teachers and students.

Teachers will be concerned with curriculum trend cycles - with the current focus on disciplines, centralised testing and traditional methods of teaching, shifting towards general skills development, school-based assessment, and progressive teaching approaches. Data collection will continue to be an imposed requirement to support analysis processes beyond the classroom, and schools in most instances. Measures to encourage teacher analysis of data will continue with improved analysis tools developed, but the time required for effective analysis will limit student interventions. Use of LMS to support resource management and provide access for students will increase as more resources are produced and made available digitally, but increasingly, online productivity suites will replace much of the functionality of LMS. The automation of school administrative systems will increase, promising to reduce workloads but generally replacing efficiency gains with other administrative requirements. Systems to automate attendance, assessment, progression analysis, behaviour and academic reporting will be explored, but efforts will not generally be made to automate processes for students. Teacher agency will continue to erode and is the trend increasingly of concern to teachers. Where once teachers had a great deal of decision making over what and how they taught, this will continue to diminish through internal and external policies and programs aimed at improving teacher performance. Funding trends will also be a concern for teachers, with expectations from the curriculum, students, parents, and school leadership to engage with educational technologies, increasingly attempts to meet these expectations will be stymied by lack of educational technology resources, maintenance of resources, and support for the use of resources, particularly those requiring internet access or computer system restrictions. This trend is expected to continue as more educational technology options become available and the expectations that educational technology outcomes will lead to employment success remains dominant over the next 5 years.

Challenges

Schools and teachers face many challenges to meet government, society, parental and student expectations. Support for the introduction of new technologies for education reflect expectations that they can help better prepare students for new employment opportunities and changes in society. Within the complexity of school education, the following challenges have been highlighted as of primary concern for schools over the next 5 years.

1. Professional Learning

Increased funding for the implementation of the Digital Technologies curriculum and other educational technologies initiatives are expected to continue, but the proportion of funding dedicated for teacher professional development to effectively use or teach about technologies is expected to remain low. Teachers, schools and systems will continue a trend towards supporting attendance at large commercial and system organised conferences by relatively few teachers, supplemented by internally organised professional development provided by specialist IT teachers employed within schools. Centralised use of system developed online courses to support professional development will increasingly occur to meet the scale required to support all teachers. Attendance at wider teacher organised and professional association events are expected to continue to decline, with teachers relying upon school and system provided professional learning, self-education resources, and learning networks available online. Teacher professional association membership will continue to fall, and higher education participation will remain at very low levels. The minimal professional learning requirements for ongoing teacher registration are expected to continue to have no significant impact.

## 2. Higher Order Thinking Skills

While governments, systems, schools and teachers will increasingly recognise the value of higher-order and 21C skills, the development of these skills is expected to remain marginalised by curricula focused on discipline knowledge, basic skill development, and testing of lower-order knowledge. It is however expected that the continuing focus of employment and industry studies highlighting the need for these capabilities will support a renewed interest in developing higher order and 21C skills, either within the curriculum or as supplementary programs.

3. Change

The rate of change in teaching will continue to increase, in the curriculum, pedagogical approaches, and use of technologies. Educational technologies will continue to be used to encourage pedagogical changes, collect data, and support the management and surveillance of schools, teachers and students. Schools and systems will begin to recognise and address the impact of change on teacher performance and well-being, assisting teachers to develop the ability to be innovative and gain agency over these processes, or resilience to the impact of changes.
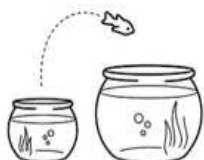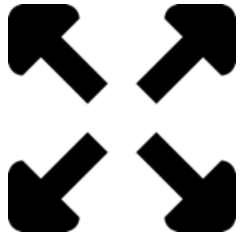
4. Expanding Roles

Teachers and schools will increasingly find the continually expanding expectations of their role a challenge. While education is rightly seen as the key to addressing many of the issues facing society, increasingly the response is to suggest the problem be addressed within an already crowded curriculum, often shifting traditional responsibilities of parents to teachers and schools, reducing the depth achievable within the curriculum.

5. Teacher Professionalism

Professionalisation of teachers is expected to remain in conflict, while increased responsibility will be placed on professional learning and the expanded roles of teachers, performance measures and decreasing agency over the curriculum and in some cases pedagogy will limit the ability of teachers to undertake professional responsibility and make independent decisions.

Specific Contexts

School Leadership concerns will focus on the increasing accountability requirements placed on schools by systems, the media, and parents. This relates to a decreasing trust in schools, school leadership, and teachers, to make managerial, educational and discipline decisions, but despite this, schools will be increasingly expected to expand the role of education to new areas such as mental health care, gender education, financial literacy, etc. in addition to supporting initiatives such as STEM education, entrepreneurship and media literacy.

Parent and Community concerns will focus on schools ability to develop in students, fundamental lower order skills, meet increased accountability requirements focused on child safety, increasing enforcement of student rights, particularly as they relate to data privacy, and equity concerns within schools, within systems, and between system. These concerns will feed a continued erosion of trust in schools because of media and governmental commentary, and increased questioning of school decisions such as tablet, 1:1, and BYOD programs.

Student concerns will increase over the digital disconnect they experience between home and school use and access, between those with greater access at home, and those with greater access at school, this disconnect will be exacerbated as the variety of options available to schools and homes increase, such as robotics, 3D printing, etc. Student rights will be highlighted as they study data security issues, and equity concerns between systems, schools, and teachers, particularly where taught by out-of-field teachers, will increase as students have greater access to comparison data on their performance, and that of their teachers and school.

Teacher concerns will focus on the continually expanding expectations of their role within an already crowded curriculum. Work intensification and increased accountability requirements resulting from data collection expectations are expected to increase as school leaders, departments and governmental bodies seek to make use of data analytics to better understand educational systems. This will continue to increase the administrative expectations on teachers to collect data, and to themselves make use of this data to analyse student performance and behaviour to differentiate learning, and provide increased feedback to students, parents and systems.

Computer Education

With the Digital Technologies subject being introduced into Australian schools as a compulsory subject and continuing media interest on the impact of new technologies such as artificial intelligence and robotics on future employment opportunities, computer education is undergoing significant changes at all school levels. A wide range of local, state and national initiatives are providing funding for resources, and reflect an intensive focus on computer education. Within this environment, trends can be short-lived as focus shifts to other concerns, but the following have been identified as representing the main influencing factors in Australian schools over at least the next five years, along with cost and professional learning considerations.

1. Robotics

Most schools will make use of robotics to engage students with learning about programming, particularly in primary schools, but the limitations of introductory robotic devices to teach more complex programming concepts and solve problems will become evident, gradually shifting to the use of more flexible kits and electronics to develop automation solutions. It is expected that the programming of computer games will continue to be used to engage students despite their limitations for wider problem-solving. Drones are not expected to be more than novelty showcase devices over the next five years.

2. Online Activities

Schools will be making extensive use of existing video and online tutorials to teach computing concepts, particularly for programming languages, and this will support teachers in developing their capacity to teach computing. Despite the proliferation of freely available resources and commercial collections, it is expected use will shift over time to teacher-generated resources as confidence builds and teachers begin to develop more cohesive programs of study.

3. Programming Languages

There will be a strong focus on the teaching of programming languages at all levels in schools, using a combination of block-based, and text-based languages. There will continue to be an overwhelming response from industry to provide introductory coding tutorials and physical resources to support the learning of fundamental programming concepts, but relatively few comprehensive programs and resources to support complex concepts and project-based learning. These resources are expected to remain fragmented as schools slowly establish developmental curriculum programs combining various activities and resources into spiral learning frameworks, integrating coding skills with the concept development detailed in the curriculum.

4. Digital Citizenship

The teaching of Digital Citizenship programs will remain a focus of schools, but this will be almost entirely focused on the appropriate use of social media rather than developing comprehensive programs to support wider computer education concepts and skills related to Digital Citizenship.

5. Information Systems

While not of significant focus, it was deemed important to note that the teaching about data and information systems across most of the curriculum will be focused on the use of spreadsheets and simple databases, and this is expected to remain the least developed and supported area of the computer science curriculum. Linking to live online data collections is expected to develop as this capacity is automated into spreadsheeting tools, but the teaching of structured query languages and information system development will be overshadowed by a focus on programming. As concepts from data science courses in the senior secondary develop, this will highlight areas for development across the primary and lower secondary curriculum.

Costs

While robust broadband internet and personal access to devices will continue to dominate financial considerations, the two specific instructional technologies that are expected to cost schools the most are robotics and drones. Most areas of computer education, however, will incur low costs, making use of freely available online resources and tools.

Professional Development

The two areas of professional development expected to be the focus for the next 5 years are the teaching of text-based programming (moving beyond block-based programming), reflecting a lack of confidence and experience in teaching more complex computer science concepts using text-based languages; and secondly, the area of artificial intelligence will increasingly draw teacher interest, reflecting the wider popularity of this field, and an unfamiliarity of what can be taught in schools. Despite the strong focus on Digital Citizenship, this was not seen as a priority area for professional development.

Specific Contexts

School leadership will be most concerned with ensuring effective Digital Citizenship programs limit the impact of negative publicity resulting from inappropriate social media use, and on the positive publicity that can be obtained by demonstrating leadership in the use of technology, particularly robotics and drones;

Parents will be concerned about effective digital citizenship programs, and on the availability of computing extracurricular programs and competitions. They will be supportive of the use of robotics, reflecting public perception and concern over the role of robots and AI in the workplace;

Students will be most interested in learning about and making computer games, reflecting their recreational interests. They are also interested in robotics, computing projects, extra-curricular opportunities, social media, and competitions, with a preference for block-based programming; and

Teachers will be the least concerned with emerging technologies such as drones, AI, etc. and focused on classroom practicalities - the use of instructional video and online tutorial systems, and technologies they are more familiar with, such as spreadsheets, infographics and block-based programming. They will also be concerned with digital literacy programs and providing opportunities for project-based learning that develop higher order thinking skills.

Conjoint Pair Ranking

Rankings

The following details the final expert consensus ranking of the identified alternatives in the study, but does not reflect the contextual differences, detailed discussion, and many other factors considered in the research process. The % score presented represents the probability that the alternative was considered of greater importance, when compared to other alternatives.

Technologies	%	Technologies (continued)	%	Technologies (continued)	%
Digital Presentations (use or creation)	81	One-to-one Programs (creation)	59	Interactive Displays (Whiteboards/LCD) (use)	41
Makerspaces (creation)	78	Video Publishing (creation)	58	Activity Tracking (use)	39
Cloud Computing (applications) (use)	77	Plagiarism Detection (use)	57	Virtual Assistants / Chatbots (use or creation)	39
Flexible Learning Spaces (creation)	77	Online Data (use)	57	Remote Device Management (use)	38
Learning Management Systems (Local)	75	Broadcasting (podcasts/video)	55	Environmental Monitoring (use)	38
Online Video (i.e. Youtube) (use)	72	IOT (use or creation)	55	Drones (use)	37
Online Learning (Remote) (use)	70	Digital Texts (use)	54	Automated Essay Marking (use)	37
Learning Analytics (use)	68	Adaptive Learning (use)	53	Remote Laboratories (use or creation)	36
Computer Gaming (use or creation)	68	Classroom Polling (use)	53	Video Monitoring (classes)	33
Internet Filtering (use)	68	Mobile (location-based) Learning	52	Digital Signage (use)	33
Visualisations (animations) (use or creation)	67	3D Printing (use)	50	Bluescreening (creation)	32
Robotics (use)	65	Wearables (use)	50	Language Translation (use)	32
Bring Your Own Device (BYOD) (use)	65	Virtual Worlds (use or creation)	47	Telepresence (use)	29
Digital Portfolios (use)	64	360 Video (use or creation)	47	Wireless Power (use)	29
Teacher/Class Websites (creation)	64	Virtual Reality (use or creation)	47	Blockchain (use or creation)	28
Student Websites (creation)	63	Mobile Broadband (use)	46	Video Servers (use)	26
Digital Text Publishing (creation)	63	Videoconferencing (use)	46	Smart Speakers (use)	26
Broadband Connection (use)	62	Digital Badges (use or creation)	44	Audio Augmentation (use)	25
Augmented Reality (use or creation)	61	Social Networks (use)	44	Soundscaping (use)	18
Computer-Based Testing (use)	59	BYON (mobile access) (use)	43	Location Tracking (use)	18
Computer-Aided Technologies (use)	59	3D Video (use or creation)	42	Brain-Computer Interfaces (use)	14

Trends	%	Challenges	%	Computer Education	%
Funding (Schools)	78	Professional Learning (Development)	74	Robots (programming)	82
Collaboration (Connectivist)	75	Higher Order Thinking (21C Skills)	70	CS Learning Activities (websites)	74
Project Based (Constructivist)	73	Change (Resilience & Innovation)	69	CS Learning Activity Collections (websites)	71
Deep Learning (Curriculum Focus)	68	Expanding Roles (Teachers & Schools)	69	Programming Languages (blocks)	71
21C Skills (Curriculum Breadth)	68	Teacher Professionalisation (Agency)	65	Digital Citizenship programs	68
Integration (STEM/STEAM)	65	Differentiation (Personalisation)	64	CS Projects	67
Measurement (Assessment)	60	Work Intensification (Students & Staff)	61	CS Computer Games	66
Innovation (Culture)	60	Equity (Access & Opportunities)	60	Electronics (programming)	63
Feedback (Evaluation)	60	Digital-Disconnect (Home vs School)	57	Wearables (programming)	59
Specialisation (Specialist teachers)	59	Digital Divide (Students/Schools)	57	Programming Languages (Textual)	59
Spaces (Flexibility)	58	Trust (Teachers & IT staff/Admin)	50	Drones (UUV/UAV) (programming)	58
Blended (F2F & Online)	58	Obsolescence (Life Long Learning)	48	CS Simulations	56
Teacher (Agency)	58	Student Rights (Privacy & Access)	45	Artificial Intelligence (programming)	53
Open (Learning Resources/Sharing)	55	Accountability (Plagiarism/Cheating)	45	CS Physical Activities (unplugged)	52
Students (Agency)	55	Accountability (Legal/Moral)	42	Electronics (networks/IOT)	52
Measurement (Cognitivism)	53	Certification (Reputation & Credentialing)	40	Live Data Sources / Collections (online)	52
Globalisation (Connections)	51	Out of Field (Teachers)	39	Electronics (data collection)	51
Timing (Schedules)	47	Lower Order Skills (Basics/Fundamentals)	34	Information Systems (online)	51
Automation (Data Collection)	44	Automation (Assistive & Replacement)	33	CS Infographics/Posters	50
Access (Trust)	41	Scaling (Diffusion)	32	CS Competitions	50
Flipped Learning (Socratic)	41	IP (Restrictions & Commercialisation)	30	CS Extracurricular programs	48
Outsourcing (Courseware/Online Tutoring)	41	Copyright (Fair Dealing)	29	Information Systems (database)	46
Management (Control)	36	Backlash (Waste & Misuse)	25	Information Systems (spreadsheet)	45
Monitoring (Behaviourist)	35			Web Servers (online)	43
Digital Storytelling (Narratives)	34			Markup Languages (e.g. HTML)	40
Centralisation (Digital Ecosystems)	34			CS Video Tapes/Online Video	39
Unplugged (Offline)	31			CS Board/Card Games	36
Bundling (Courseware/Texts)	29			CS Gender inclusion programs	35
Directed (Instructivist)	29			CS Digital Texts/Books	35
Micro-credentialing (Gamification)	27			Information Systems (Non-Relational)	33
Fragmentation (Learning Objects)	25			Database Query Languages	30
				Version Control (online)	30
				Style Sheets (e.g. CSS)	21
				CS Printed Texts/Books	19

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