The impact of Science Literacy delivery methods - what works?

Strengths, Weakness, Costs and Feasibility

GROUP 2. Education and training – including online

V 1.0 | 25 April 2019

NOTES
n.d. = no data provided

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Mechanism	**Content of use**	**Strengths**	**Weaknesses**	**Costs and feasibility**	**Notes**	**Reference**
12. Colloquia						**NO REVIEWS**
13. Courses						**NO REVIEWS**
14. Curricula	Science education [Social science]	Integrated curricula seem promising for the increase of attention on science and technology in primary education. The higher and more complex the type of integration (see the integration staircase), the greater the expected gain will be in terms of the expected learning outcomes, such as curriculum knowledge and higher-order skills; 21st-century skills; the enthusiasm generated within the students and the teachers; and the teacher commitment generated. Regarding what factors contribute to or hinder the success of integrated science and technology in primary school, teachers were found to value the aims and positive effects on student motivation of the integrated science projects. This also raised their self-efficacy and commitment. They have also recognised integration as a way to teach science and technology within the constraints of an	The more complex the type of integration is, the higher the required investment must be in order to overcome tensions with the normal curriculum in terms of teacher commitment, the critical scale and duration of the project, the volume and comprehensiveness of teacher personal development, the volume and quality of the teacher support, and the support on the school level.	Apart from the effort put in by the teachers, the costs in terms of personal development and teacher support are relatively low.	Authors expect that the positive reinforcement that teachers and students exert on each other during an integrated curriculum is emphasised in primary education where students are instructed by only one teacher who teaches all subjects. Certain rewards of integration, such as a positive classroom atmosphere, are within easy access because of day-to-day interactions. This situation probably makes the dissolution of the boundaries between the subjects in primary education easier than it is in secondary education.	**Promoting science and technology in primary education: a review of integrated curricula** Gresnigt et al. 2014

		overloaded curriculum. In line with Keys (2003), the researchers found that integrating science and technology with other school subjects can compensate for primary teachers' lack of confidence in science teaching due to perceived low self-efficacy and a possible lack of knowledge. This argument is specific for primary schools where the teachers are non-specialists.				
14. Curricula		Introducing HL concepts early in the curriculum allows students the opportunity to practice and gain confidence throughout their program. (Trujillo and Figler 2015) (...) embedding mental health literacy into the standard school curriculum may be an effective and sustained anti-stigma approach for young people. (McLuckie et al. 2014)		New curriculum cannot be placed in any situation and be expected to work. Student influences, teacher knowledge of instructional design, environment, and views of community and policy must all be taken into consideration before designing curriculum. (Paulsen et al. 2017) (...) past research indicates that teachers need to receive formal education on the topic, be provided with access to teaching materials, and be encouraged to teach the topic (...) Thirdly, professional development time constraints (i.e., only a one-day workshop) may have limited observed nutrition education		**Implementation of a Food-Based Science Curriculum Improves Fourth-Grade Educators' Self-efficacy for Teaching Nutrition** Carraway-Stage et al. 2016 **Sustained improvements in students' mental health literacy with use of a mental health curriculum in Canadian schools** McLuckie et al. 2014 **Introducing a Precision Soil Conservation Curriculum: A Pre-and Post-Evaluation** Paulsen et al. 2017 **Teaching and Learning Health Literacy in a Doctor of Pharmacy Program** Trujillo and Figler 2015

				teaching self-efficacy gains among intervention teachers. (Carraway-Stage et al. 2016)		
15. E-learning	Nursing [Healthcare and Medicine]		The use of ICTs affected time management, time spent for patient care, and documentation time.			**Impact of Information and Communication Technologies on Nursing Care: Results of an Overview of Systematic Reviews** Rouleau et al. 2017
15. E-learning	Radiology Health education [Healthcare and Medicine, Social science]	- E-learning is inclusive of a variety of learning interventions - Web-based learning is beneficial because of its easy access and ability to present ideas in a variety of ways using multimedia components - blending online educational techniques with face to face traditional methods has several advantages in radiology education - the development of a wide range of customized tools, designing of highly interactive educational games and highly interactive audience response systems that support the intense imaging nature of radiology education are bringing revolutions - video tutorials are playing an important role to enable students learn interventional radiology skills where the live environment is deficient and there are faculty shortage situations		Internet learning is best when blended with traditional learning techniques but it is less utilized in undergraduate radiology education. This is because of the difficulty of evaluating outcomes in blended environments where complex learning packages are involved.	It cannot be said that one way of learning is better than another but rather the way how technology is used under different circumstances.	**Evaluation of use of e-Learning in undergraduate radiology education: A review** Zafar, Safdar, and Zafar 2014

15. E-learning	Health, health education [Healthcare and Medicine, Social science]	Applying the latest information technologies to education takes advantage of the increasing availability of Internet access (via optical fibres, Wi-Fi and 3G/4G mobile phone technology), allowing a broad use of content across diverse settings (home, workplaces, and public places such as libraries, parks, and Internet points). Moreover, the interactivity and ability to link educational programmes with past experiences and specific needs fit the adult learning paradigm. As a result of these advantages, online learning is becoming more popular, and online courses worldwide are rapidly increasing in number, offering many specialty modules in their portfolios.	Potential disadvantages include technology-related costs, cost involved in developing programmes, possible technical problems, limited direct interaction, lack of exchanges and relations with other learners, absence of the physical presence of the teacher, decrease in motivation to learn, need for greater self-discipline, and attenuation of the desire to compete with other learners. Moreover, equity should be considered carefully: poor access, language barriers, and lack of computer and Internet literacy could limit or prevent the participation of some health professionals, especially in low- and middle-income countries. These limitations might prevent e-learning from becoming the norm.	The delivery advantages of an e-learning programme are obvious: some of their most cited benefits include lower costs, widespread distribution, increased accessibility to information, frequent content updates and personalised instruction in terms of content and pace of learning.	E-learning is gaining in popularity, and programmes are rapidly increasing in number. Their relatively low costs, high flexibility, and reduced dependence on geographical or site boundaries are attracting the investments of stakeholders (countries, networks, and universities) and increasing the demands of learners. The results suggest in broad terms that e-learning does not itself result in major benefits for patient or health professional outcomes. Opting for traditional or e-learning approaches entails complex judgments, relating to the relative efficacy of the methods but also dimensions such as accessibility, usability, retention and costs. Traditional learning may be preferable in some instances, e.g. to improve knowledge or skills in small groups of health professionals when physical attendance is feasible, while e-learning programmes may be a better choice when the aim	**E-Learning for Health Professionals** Vaona et al. 2015

					is to reach a large number of health professionals at a limited cost. Blended courses potentially balance the benefits of the two learning strategies.	
15. E-learning	Nursing, health education [Healthcare and Medicine, Social science]	E-Learning has been described as a dynamic, innovative and rich way to provide learning opportunities. Students can access a class through a website and participate in lectures and group discussion in real time. Materials may also be provided asynchronously; students access the website, follow lectures or complete assignments according to their own schedules. In general, the benefits reported for e-learning are flexibility, accessibility, satisfaction and cost-effectiveness. A meta-analysis by Cook et al. (2010a) showed that e-learning can increase students' own control over the content, place and time of learning. Furthermore, it can help students gain knowledge and skills faster than traditional instructor-led methods.				**Impact of E-Learning on Nurses' and Student Nurses Knowledge, Skills, and Satisfaction: A Systematic Review and Meta-Analysis** Lahti, Hätönen, and Välimäki 2014
15. E-learning	Nursing, health education [Healthcare and Medicine, Social science]	Information communication technology enabled students to access their educators rapidly and also receive responses in a timely fashion via email and discussion forums. The flexibility afforded by the online learning environment and the ability to be self-paced	The review found that, while students enjoyed many of the aspects offered by E-learning, they still wanted the face to face more traditional classroom interaction offered in blended learning. Increased levels of anxiety when	One of the greatest concerns for educators was the amount of time that E-learning resources took to implement, develop and teach. Educators were also concerned about access to and the appropriateness of		**E-Learning & Information Communication Technology (ICT) in Nursing Education: A Review of the Literature** Button, Harrington, and Belan 2014

		when studying also were important. The positive aspects of E-learning for students included the increased flexibility that this style of learning offered to them.	using computers were identified in three studies. In six studies students stated that their lack of skills associated with ICT was impacting their learning progress. Two studies recounted that students were frustrated by unreliable university computer systems, the lack of technical support and the amount of time wasted when computer applications did not work as expected. For example, issues such as computer screen freezing, online connections dropping out and download time. In a further four studies students reported that the link between ICT use in the university and how ICTs were used in the health care workforce was not made explicit in the curriculum.	staff development surrounding E-learning. Educators required staff development that focused on online course development, assessment and monitoring the quality of online courses in addition to improving their own ICT skill base. In addition, there was a need for the provision of extra support during course development outside of the normal teaching workload and the use of incentives to motivate staff who were not currently adopting E-learning teaching strategies.		
15. E-learning	Education, sustainability [Social science, Interdisciplinary science]	Flexible access to information, supporting communication, valuing e-learning simply as pedagogic innovation, reducing the footprint of LTA, or evidencing reductions in students' personal ecological footprint.			Widening out the application of e-learning to encompass the development of skills, identity, and confidence would contribute immensely to the development of graduates who are capable of contributing to achieve more sustainable futures.	**Using e-learning for student sustainability literacy: framework and review** Diamond and Irwin 2013
15. E-learning (vs Experiments)	Education [Social science]				Studies supporting higher achievement in NTL seem to place a lot of emphasis on content knowledge and understanding (and thus	**Learning Outcome Achievement in Non-Traditional (Virtual and Remote) versus Traditional (Hands-on) Laboratories: A**

					quizzes and exams were used as the instrument of assessment), whereas studies supporting higher achievement in TL seemed to rely heavily upon qualitative data related to student and/or instructor perception (and thus surveys were used as the instrument of assessment). The disagreement among science educators regarding the means and instructional purpose of the laboratory (i.e. learning outcome preference) appears to be a large factor in the debate regarding the efficacy of NTL versus TL.	**Review of the Empirical Research** Brinson 2015
15. E-learning	Education [Social science]	- E-learning can be an effective means of delivering postsecondary education. - one argument in favour of e-learning is its potential to improve access to higher education among lower-income and academically underprepared students. Online learning, supporters say, makes postsecondary education more affordable, expands geographic access (for example, to rural areas), and provides needed flexibility for students who cannot attend traditional classes because of full-time work and child-care responsibilities. Realizing that potential, however, will not be	- As evidence accumulates about how to make online learning effective, concerns are growing about problems that e-learning poses for students' academic integrity (i.e. fraud and cheating) - the digital divides, particularly the third generation divide, can lead to differences not only in users' cognitive, social, and psychological development but also in their technology skills and confidence. - Online courses, in fact, often have significantly higher dropout rates than face-to face courses. One primary reason students give for dropping out is technical problems—problems that students	Some analysts believe that e-learning can reduce the cost of education.	The use of e-learning in postsecondary education has expanded rapidly over the past decade, and all indicators suggest that growth will continue in the years to come. E-learning has also attracted intensive research interest, with thousands of studies over several decades examining its effectiveness. Although the dominant paradigm in this area—comparing e-learning with classroom instruction—has long been faulted, research is only now beginning to move	**E-Learning in Postsecondary Education** Bell and Federman 2013

		easy.	without access to broadband Internet may be especially likely to experience.		away from the "does it work" question toward a greater focus on understanding the role of different instructional features and supports in determining the effectiveness of e-learning.	
15. E-learning	Health, health education [Healthcare and Medicine, Social science]	Compared with traditional learning, blended learning allows students to review electronic materials as often as necessary and at their own pace, which probably enhances learning performance and compared with e-learning, blended learning learners are less likely to experience feelings of isolation or reduced interest in the subject matter			Blended learning could be promising and worthwhile for further application in health professions. The difference in effects across subgroup analyses indicates that different methods of conducting blended courses may demonstrate differing effectiveness.	**The Effectiveness of Blended Learning in Health Professions: Systematic Review and Meta-Analysis** Liu et al. 2016
15. E-learning	Health, health education [Healthcare and Medicine, Social science]	E-learning has potential to address needs in Health through the dissemination of flexible and adaptable medical educational packages. Proponents of e-learning have advanced several ostensible benefits deriving from both electronic-only and blended forms of e-learning, including the following: 1. Time and location flexibility and accessibility 2. Lower training costs and time commitment 3. Self-directed and self-paced learning by enabling learner-centred activities	The nature of the Internet provides no global safeguards for reliability of material or the protection of data against misuse.	It is surprising that although online education methods may have a benefit in relation to time or potential audience, cost-effectiveness has gone essentially unreported, with the limited exception of private business. More information is needed to develop a robust understanding of potential gains. Also, the introduction of e-learning can represent an intrusion into personal time and resources of a trainee in addition to institutional costs.		**A Global Model for Effective Use and Evaluation of E-Learning in Health** Ruggeri, Farrington, and Brayne 2013

		4. Collaborative learning environment 5. Builds universal communities 6. Standardized course delivery 7. Allows unlimited access to e-learning materials 8. Private access to learning 9. Just-in-time learning 10. Workforce training monitoring 11. Allows knowledge to be updated and maintained in a more timely and efficient manner				
16. Webinars	Information science	Massive Open Online Courses (MOOCs) become very popular, similar to any other online instructions in the US, due to their accessibility to the general public and for their feature of open to all on an online platform.	MOOCs are gaining in popularity and have different potential, but fail to deliver quality education owing to lack of personalization and low rating aspects.		Massive Open Online Courses will change the face of online education, assist in upgrading skills, knowledge and fulfil the mission of knowledge society by supporting long life learning modes.	**MOOCs and Library and Information Science Domain: A Review of Selected Literature** Kaushik 2015

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