Network for Information and Digital Access

The impact of Science Literacy delivery methods - what works?

Strengths, Weaknesses and Gaps in impact assessment methodology

GROUP 2. Education and training – including online

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Mechanism	**Strengths & Weaknesses**	**Main gaps in the impact assessment (IA) methodology. Lack of (or insufficient):**	**Possible methodological improvement(s), recommendations and directions for future research**	**Reference**
12. Colloquia				**NO REVIEWS**
13. Courses				**NO REVIEWS**
14. Curricula	**Strengths** - introducing health literacy concepts early in the curriculum can provide students the opportunity to practice and gain confidence throughout the program (Trujillo and Figler 2015) - curriculum integration can be a way to teach science and technology within the constraints of an overloaded curriculum - integrating science and technology with other school subjects can compensate for primary teachers' lack of confidence in science teaching - costs in terms of teacher personal development and support are relatively low (Gresnigt et al. 2014) **Weaknesses** - the more complex the type of curriculum integration is, the higher the required investment (Gresnigt et al. 2014)	None identified	None identified	**Promoting science and technology in primary education: a review of integrated curricula** Gresnigt et al. 2014 **Teaching and Learning Health Literacy in a Doctor of Pharmacy Program** Trujillo and Figler 2015

15. E-learning	**Strengths** - dynamic, highly flexible, adaptable, innovative and rich way to provide learning opportunities (Ruggeri, Farrington, and Brayne 2013; Lahti, Hätönen, and Välimäki 2014; Zafar, Safdar, and Zafar 2014) and an alternative method of education (Lahti, Hätönen, and Välimäki 2014; Zafar, Safdar, and Zafar 2014) - web-based learning allows ideas to be presented in a variety of ways using multimedia components - increasing availability of Internet access allows: • widespread distribution • reduced dependence on geographical or site boundaries • a broad use of content across diverse settings (e.g. home, workplaces, and public places such as libraries, parks, and Internet points) • relative low costs • frequent content updates • personalised instruction in terms of content and self-paced learning • real time participation in lectures and group discussion - e-learning can: • improve access to higher education among lower-income and academically underprepared students • make postsecondary education more affordable • expand geographic access (e.g. to rural areas) • provide needed flexibility for students who cannot attend traditional classes (e.g. because of full-time work and child-care responsibilities) (Bell and Federman 2013), allowing self-directed and self-paced learning by enabling learner centered activities (Ruggeri, Farrington, and Brayne 2013) • provide collaborative learning environment	- sufficient data, breath of focus and improved methodologies are required to make impact assessment relevant and effective (Vaona et al. 2015) - appropriate focus and methodologies (Lahti, Hätönen, and Välimäki 2014) and scope of existing evaluations (Diamond and Irwin 2013; Ruggeri, Farrington, and Brayne 2013) and present methodologies (Brinson 2015) - correct comparison in the instructional methodology (Bell and Federman 2013) - robust quantitative instruments to measure the impact, effectiveness and perceptions of students and educators who are using e-learning and the associated information communication technology (Button, Harrington, and Belan 2014) - scope and contexts of present methodologies (Liu et al. 2016)	- assess outcomes at multiple time points during the study follow- up can determine the persistence of effects - all studies should use predefined data scales and reporting rules in order to improve the account of the research questions under investigation - future trials might focus on additional core components of content, the frequency of delivery, duration and intensity of e-learning, which might modify the effects of e-learning - use randomised designs with appropriate sample sizes - expect the development of studies that can inform practice using quasi-experimental designs, wait-list controls or stepped-wedge implementation (Vaona et al. 2015) - need for a large number of participants and long follow-up. Investigators may take existing educational settings providing training interventions into account as opportunities to override this problem (Vaona et al. 2015) - the evaluation of educational interventions should focus on a variety of outcomes - future studies should use adequate power calculations to be properly weight - randomization process should be conducted and reported in greater detail so that sufficient validity assessment is possible (Lahti, Hätönen, and Välimäki 2014) - research needs to move beyond the "does it work" question toward a better understanding of exactly what does influence the effectiveness of e-learning and thus of the conditions under which e-learning is likely to be most effective - research evaluating the effectiveness of e-learning features such as interactivity and immersion for teaching different content would help curriculum planners decide when e-learning	**E-Learning in Postsecondary Education** Bell and Federman 2013 **Learning Outcome Achievement in Non-Traditional (Virtual and Remote) versus Traditional (Hands-on) Laboratories: A Review of the Empirical Research** Brinson 2015 **E-Learning & Information Communication Technology (ICT) in Nursing Education: A Review of the Literature** Button, Harrington, and Belan 2014 **Using e-learning for student sustainability literacy: framework and review** Diamond and Irwin 2013 **Impact of E-Learning on Nurses' and Student Nurses Knowledge, Skills, and Satisfaction: A Systematic Review and Meta-Analysis** Lahti, Hätönen, and Välimäki 2014 **The Effectiveness of Blended Learning in Health Professions: Systematic Review and Meta-Analysis** Liu et al. 2016

	• build universal communities • standardize course delivery • allow unlimited and private access to e-learning materials • allow knowledge to be updated and maintained in a more timely and efficient manner (Ruggeri, Farrington, and Brayne 2013) - ICT enables students to access their educators rapidly and also receive responses in a timely fashion via email and discussion forums (Button, Harrington, and Belan 2014) - e-learning can increase students' own control over the content, place and time of learning (Lahti, Hätönen, and Välimäki 2014) - video tutorials are playing a role in making students' learning skills in live situations deficient and also in faculty shortage situations (Zafar, Safdar, and Zafar 2014 - the interactivity and ability to link educational programmes with past experiences and specific needs fits the adult learning paradigm (Vaona et al. 2015) - e-learning can allow a reduction in students' personal ecological footprint (Diamond and Irwin 2013)		is appropriate and what type of e-learning should be used to deliver the features critical to learning in a particular course or program - as colleges increasingly seek to make their e-learning courses available to an international audience, it will also be important to conduct research that spans different countries and cultures - future research should use rigorous experimental designs to examine how e-learning programs that vary in terms of content, interactivity, and other important instructional features affect students' ability to acquire different types of knowledge and skills (Bell and Federman 2013) - educators need to administer pretests to learners to prepare well for courses - pre-posttest study design, presence of exercises, and objective outcome assessment in blended courses could improve health care learners' knowledge acquisition (Liu et al. 2016) - advances in e-learning design must also be coupled with efforts to eliminate current barriers to the widespread adoption of online instruction	**A Global Model for Effective Use and Evaluation of E-Learning in Health** Ruggeri, Farrington, and Brayne 2013 **E-Learning for Health Professionals** Vaona et al. 2015 **Evaluation of use of e-Learning in undergraduate radiology education: A review** Zafar, Safdar, and Zafar 2014

	Weaknesses - technology-related costs - cost involved in developing programmes (Vaona et al. 2015) - time for e-learning resources implementation, development and teaching (Button, Harrington, and Belan 2014) - possible technical problems - poor access - language barriers - limited direct interaction - lack of exchanges and relations with other learners - absence of the physical presence of the teacher - attenuation of the desire to compete with other learners - decrease in motivation to learn - need for greater self-discipline (Vaona et al. 2015) - lack of computer and Internet literacy, which could limit or prevent the participation especially in low- and middle-income countries (Vaona et al. 2015) and can impact students' learning progress (Button, Harrington, and Belan 2014) - face to face traditional classroom interaction might be required - increased levels of anxiety when using computers - students can be 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 (e.g. computer screen freezing, online connections dropping out and download time) - access to and the appropriateness of staff development surrounding e-learning - educators might need to improve their own ICT skill base		- academics and institutions need to collaborate to address the challenges surrounding academic integrity in online environments, devise effective support systems for underprepared learners, evaluate the economic models that underlie e-learning, and understand how to deliver e-learning across geographic and cultural boundaries (Bell and Federman 2013)	

	- need for the provision of extra support during course development and the use of incentives to motivate staff who was currently not adopting e-learning teaching strategies (Button, Harrington, and Belan 2014) - e-learning poses problems for students' academic integrity (i.e. fraud and cheating) - can intensify the digital divides, particularly the third generation divide and lead to differences not only in users' cognitive, social, and psychological development but also in their technology skills and confidence - online courses have often significantly higher dropout rates than face-to face courses (Bell and Federman 2013) - the nature of the Internet provides no global safeguards for reliability of material or the protection of data against misuse (Ruggeri, Farrington, and Brayne 2013)			
16. Webinars	**Strengths** - accessible to the general public - open to all on online platform **Weaknesses** - lack of personalization - low rating aspects	None identified	None identified	**MOOCs and Library and Information Science Domain: A Review of Selected Literature** Kaushik 2015

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