



Title registration for a review proposal: Virtual Worlds for Students in Secondary and Tertiary Education: Effects on Achievement and Engagement Stewart Martin

Submitted to the Coordinating Group of:

- Crime and Justice
- Education
- Disability
- Social Welfare
- Other:

Plans to co-register:

- No
- Yes
- Maybe
- Cochrane
- Other

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TITLE OF THE REVIEW

Virtual Worlds for students in Secondary and Tertiary education: Effects on achievement and engagement

BACKGROUND

Briefly describe and define *the problem*

Further education colleges and universities are increasingly concerned to demonstrate that they offer attractive opportunities and resources for learning and good educational outputs, especially as pressures increase on their incomes, often sharpened by increasing moves to characterise the learner as a consumer or customer, and as less revenue is available to support the employment of faculty. Drives to make schools more efficient, more accountable to learners and to show their sensitivity to individual learning needs have created similar tensions. Added to this, many countries are increasingly concerned to develop and use information technology as a routine part of the educational process and are concerned to demonstrate benefits from the investments they have made in this technology. Frequently in these circumstances it falls to the individual institution or instructor to show that they are making effective and efficient use of technology in the learning and teaching process.

The increasingly powerful developments in computer hardware and software have in recent years seen a move from the use of flat, two dimensional (2D) images within human-computer interfaces and entertainment platforms through more interactive technologies (i.e. Web 2.0) and towards more realistic interfaces that take advantage of the available computer power and more sophisticated software to produce highly interactive three-dimensional (3D) interfaces and environments that are now common in computer games and the cinema. These developments have gone hand in hand with changes in the way such technologies are consumed and this has been most notable in the emergence of social networking and its application in more open-ended computer environments such as *Facebook* (2D) and *Second Life* (3D).

Accordingly, educational institutions seeking to demonstrate their appeal to contemporary cohorts, to increase efficiencies in instructional pedagogy, to meet imposed performance indicators from government or inspectorial agencies and to develop stronger 'outreach' to non-local learners and audiences have sought to capitalise on the use of technology as an integral part of their strategy. The use of immersive virtual environments increasingly features in these settings and there are now many virtual world sites that have been created by universities around the world, such as in *Second Life* (see <http://secondlife.com/destinations/learning>).

Briefly describe and define *the population*

The population from which relevant studies will draw participants is male and female students in full or part-time education at secondary (school) or tertiary (college and university) level (further or higher education) from all geographical locations.

Briefly describe and define *the intervention*

Interventions using virtual or immersive environments (frequently described under the generic headings of ‘virtual worlds’, ‘virtual environments’ or ‘synthetic worlds’) generally make use of computer generated three-dimensional virtual environments. These environments can depict locations or spaces from across a wide spectrum of visual realism, ranging at one extreme from highly visually realistic depictions of locations from an actual (physical world) place or an imaginary place in order to create an illusion of verisimilitude or ‘reality’, or may at the other extreme depict highly stylised, abstract, symbolic or ‘unreal’ looking environments, e.g. for exploring conceptual ideas or intangible relationships. Within these environments each individual learner is generally provided with a means whereby they may directly influence events and objects - commonly this is an ‘avatar’, or three-dimensional representation of a human form - which can be customised by the user and is endowed with the ability to navigate within the environment to conduct a variety of actions such as interacting with, creating or amending existing or created objects, situations, relationships or other avatars, depending on the instructional context.

Outcomes: What are the intended effects of the intervention?

The adoption of virtual or immersive environments by many educational and training organisations worldwide has grown in recent years and continues to attract interest. Evidence suggests that the appropriate use of technology can produce significant educational outcomes (Martin & Vallance, 2008; 2011) and it is therefore unsurprising that many universities around the world now make use of immersive technologies (such as *Second Life*) in teaching or research and that most UK universities are involved in the development of such platforms for teaching and/or learning.

Interventions making use of such technologies commonly focus on a range of objectives that are desired by institutions or educators such as promoting the attractiveness of the institution to prospective students, enhancing the accessibility of learning opportunities for students, improving the motivation or engagement of learners, enhancing the overall student experience of learning, or improving specific educational outcomes within specific subject domains or disciplines. These factors will form the acceptable outcome variables in the review.

However, the development and deployment of these technologies often consume considerable time and resources but this is not always accompanied by adequate

planning or research and is rarely driven by theoretical understandings of the learning process or what is known about effective pedagogy. This is in part due to the relative newness of the technology, in part to the dispersed nature of research into what is still an emergent field (making it difficult for researchers to easily locate their work within an overview of current knowledge) and in some cases by a more widespread disconnect between the theory and practice of learning with technology (Martin, 2010). The end result is that such applications do not always live up to the hopes and expectations of their creators and researchers may not always adapt methodology appropriately (Martin, 2011). Along with many other scholars the author has conducted research in this area (see references below) and a systematic review of research into this field to date would therefore be timely and of benefit to the community of researchers and practitioners alike.

OBJECTIVES

- To explore relevant published and unpublished empirical research from 2001 onwards.
- To identify and catalogue evidence on the use of virtual worlds and determine if they make a measurable difference to the achievement of institutional and educational objectives.
- To identify comparative studies that report significant gains from the use of virtual world technologies over those achieved by more established approaches.

METHODOLOGY

What types of studies designs are to be included and excluded?

The review would include all eligible published research interventions (see below) but would single out for particular attention publications reporting studies that compare a virtual-world-type intervention with some comparison group and also exploratory studies which attempt to identify useful metrics, in order to compare the outcomes of established/traditional educational approaches that do not rely on the use of immersive virtual technologies with those that do so.

The reviewed literature will include material drawn from published peer-reviewed research papers and also unpublished research to the extent possible. Material from any academic discipline will be eligible for inclusion.

Two kinds of research design are eligible for inclusion and studies will be included if they match either one or both designs described below. Each type of design will be carefully evaluated for the risk of bias and will be examined separately within the review.

1. Experimental and quasi-experimental designs

Where it is available, evidence will be reviewed from quasi-experiments and randomized controlled trials that have used at least 10 subjects per treatment/control group. Acceptable control conditions will be “no treatment,” “treatment as usual,” a placebo treatment, or any similar condition that serves as contrast to the treatment condition but which is not expected to produce a change in the outcomes of interest. Eligible trials (whether experimental or quasi-experimental) must meet at least one of the following criteria:

- i. Subjects were randomly assigned to experimental or control groups; or were assigned using a reasonable substitute for this (such as alternate assigning using an alphabetized list of subjects’ names); or were assigned using a naturalistic (quasi) experimental approach, e.g. using groups of pre-existing teaching classes where there is clear evidence that these were originally constructed using either of the two previously mentioned assignment mechanisms.
- ii. Subjects in the treatment and control conditions were matched and the matching variables included a pre-test for at least one qualifying outcome variable (see above), except where the qualifying outcome variable does not lend itself to meaningful pre-test or pre-test values can be assumed zero (e.g., prior knowledge scores for subjects who have not studied a particular topic previously), but the groups are matched on other variables, the study will be eligible.
- iii. If subjects were not randomly assigned or matched, the study must have both a pre-test and a post-test on at least one qualifying outcome variable (see above) with sufficient statistical information to derive an effect size or to estimate group equivalence from statements of statistical significance.

Interventions not using control groups will be used only to supplement the main review. In view of the early stages of the majority of work in the field quantitative synthesis and meta-analysis will not be undertaken.

2. Pre-test and post-test designs

Evidence will be reviewed from designs measuring at least one eligible outcome variable (see above) before the intervention and after the intervention on the same group of subjects. These designs may be either one-group pre-test/post-test studies where a subject group is pretested, receives treatment, and is post-tested, or where comparative pre-post data are available for at least one eligible outcome variable.

Evidence will also be reviewed from studies using multiple-group, multiple-treatment designs where more than one subject group is involved, each receiving a different treatment and where pre-post comparison data are available for at least one of the groups on at least one eligible outcome variable.

Post-test only non-equivalent comparisons (not randomized or matched) are not eligible for inclusion within the systematic review. Any retrospective designs in which cases are selected only if they completed the treatment and/or the post-test are not eligible.

Designs measuring different subjects at pre-test and post-test (sequential cohort designs) and also those in which data are collected retrospectively from records (retrospective designs) are not eligible for the systematic review, although such designs may be eligible if they simulate one of the eligible designs described above.

SOURCES OF SUPPORT

Internal funding:

None.

External funding:

The review forms part of an already funded EPSRC project into the use of virtual worlds in education.

DECLARATIONS OF INTEREST

The reviewer is currently funded by the EPSRC where he is principal investigator for the project 'What citizenship do we want?', which is using an immersive virtual environment to explore the citizenship identity development of young people in secondary schools in the north east of England. See <http://gow.epsrc.ac.uk/ViewGrant.aspx?GrantRef=EP/H043047/1>

REQUEST SUPPORT

Do you need support in any of these areas (methodology, statistics, systematic searches, field expertise, review manager etc?)

Yes. Following consideration by the Collaboration – and in light of available but limited resources - I would welcome a discussion about these aspects of the proposed review and any help that can be provided in these areas.

AUTHOR(S) REVIEW TEAM

Include the complete name and address of reviewer(s) (can be changed later). This is the review team -- list the full names, affiliation and contact details of author's to be cited on the final publication.

Lead reviewer:

The lead author is the person who develops and co-ordinates the review team, discusses and assigns roles for individual members of the review team, liaises with the editorial base and takes responsibility for the on-going updates of the review

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ROLES AND RESPONSIBILITIES

Please give brief description of content and methodological expertise within the review team. The recommended optimal review team composition includes at least one person on the review team who has content expertise, at least one person who has methodological expertise and at least one person who has statistical expertise. It is also recommended to have one person with information retrieval expertise. Who is responsible for the below areas? Please list their names:

- Content: Stewart Martin
- Systematic review methods: Stewart Martin
- Statistical analysis: Stewart Martin
- Information retrieval: Stewart Martin

PRELIMINARY TIMEFRAME

Approximate date for submission of Draft Protocol (please note this should be no longer than six months after title approval. If the protocol is not submitted by then, the review area may be opened up for other reviewers):

Given the work done to date (please see separate attached documentation) I anticipate that the draft protocol could be submitted within two months of title approval. It is anticipated that the review itself will be completed by May 2012.

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