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Students' experiences of flipped classrooms to improve learning outcome in undergraduate health professional students: a systematic review

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Background

The advent of the digital technologies, the digitally-empowered learners, prolific growth of biomedical knowledge, investment into the scholarship of teaching and learning, and advancement in healthcare disciplines have led to newer delivery systems in health professional education (HPE) complemented to the traditional teaching. Thus far, a number of blended learning initiatives (a combination of classroom and online education) has emerged in HPE.

One innovative approach in deliver system is 'flipped classroom', an educational technique that consists of two parts such as interactive group learning activities inside the classroom and direct computer-based individual instruction outside the classroom (Bishop et al., 2013). Put simply, the activities carried out during traditional class time and self-study time are reversed or 'flipped' (Veeramani et al., 2015). It is, therefore, also known as 'reversed classroom'. Historically, in early 1900s, General Sylvanus Thayer created a system at West Point in USA, where a set of materials was given to engineering students so that they were obtaining core content prior to coming to class. The classroom space was then used for critical thinking and group problem solving (Musallam et al., 2011). Many credit the rejuvenation of this idea with the development of, and increased access to, educational technologies (Moffett, 2015). For instance, the School of Business at the University of Miami proposed an 'inverted classroom' that events, traditionally taken place inside the classroom now take place outside the classroom and vice versa (Lage et al., 2000). In 2000, a conference paper called 'The Classroom Flip' was presented by J Wesley Baker (Baker et al., 2000) and the phrase 'flipping the classroom' was coined there, and he described how flipping the classroom could allow the trainer to become the 'guide on the side' rather than the 'sage on the stage". The four Pillars of flipped classroom are flexible environment, learning culture, intentional content, and professional educator (Pearson & Flipped learning network, 2013)

In a sense, this reversal also flips Bloom's revised taxonomy because the lower level of cognitive work/knowledge acquisition is done by the students, while educators work interactively with the students to develop the higher forms of cognition. To date, this approach has attracted a large amount of attention in the HPE and subsequent surge of literature. The theories backup for 'flipped classroom' are Zone of Proximal Development (ZPD) theory (Vygotsky et al., 1978), self-determination theory (Cole et al., 2004) and intrinsic motivation (Ryan et al., 2000).

There is an array of potential advantages of flipped classroom, including increased opportunities to provide individualized education to learners and to incorporate evidence-based teaching techniques into existing courses (Kachka, 2012; Johnson et al., 2013), increased students engagement with course material (Gross et al., 2015), increased educator-student interaction, rather than just 'performing' lecture, stimulation of students interest in learning and guided self-study (Moraros et al., 2015), opportunities to be actively engaged in students self-directed learning and encourages progressive improvement (Bergmann et al., 2012; Moraros et al., 2015) in assessment performances. On the other hand, flipped class will not support effective learning, if students fail to engage with the assigned pre-class or in-class activities, for whatever reason. (Kachka, 2012), poorly designed educational materials, and unsettledness amongst students (a feeling of being "lost") (Moffett, 2015).

There are individual studies evaluating flipped classroom in medical education, allied health education and health science education, using a pre-and post-test design or comparative designs. These include flipped classroom compared to traditional learning or pre-post flipped classroom and assessed how students attain improved learning outcomes. Some studies showed positive outcomes with flipped classroom, while others showed the opposite. Moreover, these studies varied in design, sample size and outcome measures. A systematic review, combing the results of intervention, using flipped classroom compared with alternative learning or traditional learning, will help us in making recommendations for developing and implementing successful flipped classroom amongst health professionals. This will assist us in formulating recommendations on teaching methods for undergraduate health professional students.

Objectives

Primary objective

To assess the student's experiences and the effectiveness of flipped classrooms in improving learning outcomes in undergraduate health professional education.

Secondary objectives

To assess how educational context influences the effectiveness of flipped classroom among undergraduate health professional students.

To assess how implementation approaches influence the effectiveness of flipped classroom among undergraduate health professional students.

Existing reviews

There is a systematic review, which address the evidence for flipped the classroom pertinent to a nursing programme in higher education and the outcomes associated with this approach to teaching and learning (Betihavas et al., 2016). A narrative review on this field is available (Hamdan et al., 2013). There are reviews published on flipped classroom strategies focusing on flipped learning methods (Aliye et al., 2017). Moreover, there are narrative reviews on the

flipped classroom (Zuber et al., 2016; Jacqueline et al., 2015). These reviews did not follow the state-of the- art guideline for a systematic review.

Intervention

Any educational intervention that includes Flipped classroom as a teaching and learning activity in undergraduate programmes, regardless of type of healthcare streams (e.g. medical, dentistry, nursing care, pharmacy practice) will be considered.

To be included, the studies must explicitly indicate that the teaching/ learning activities for undergraduate students included flipped classroom, reversed classroom or flipping class, aiming for student learning, student satisfaction or student competency and/or any combination of these.

Any educational interventions not having at least 20% of flipped content will not be eligible.

Standard lecture and subsequent tutorial formats will not be considered.

Studies on flipped classroom method among undergraduate or postgraduate students who are not from the healthcare streams (e.g. engineer, economics, computer science) will be excluded.

Comparisons

No educational intervention

Any alternative educational intervention (e.g. traditional lecture-based learning, problem-based learning, E-learning).

Population

Specific types of population will include primarily undergraduate health professional students, regardless of type of the healthcare streams or duration of learning activity (e.g., 1 semester, 2 semesters).

Outcomes

We want to explore the impact of interventions, reflecting the Kirkpatrick's model of educational outcomes (Kirkpatrick, 1994; Issenberg et al., 2005). This model comprises 'learners' reaction' (to the educational experience); learning (modification of attitudes/perceptions and acquisition of knowledge and skills); behavior (self-reported changes in practice and observed changes in practice, including new leadership positions); and results (which refer to change at the level of the organization). Specific to this review, we explore the impact of interventions, pertinent towards 'learners' reaction' to the educational experience.

Primary outcomes:

Change in student performance for the flipped classroom, using pre-post test scores or other formal assessment methods

Change in student performance for the flipped classroom using the final scores obtained in that particular module.

Secondary outcomes:

Student satisfaction, utilizing the flipped classroom, measured by using a five-point Likert scale (1 = "very dissatisfied" and 5 = "very satisfied") or any other validated scale (may include the training institutions own format of assessing student satisfaction)

Study designs

We will considered the following study designs for inclusion in the review, as defined by the Effective Practice and Organization of Care group of the Cochrane Collaboration (http://epoc.cochrane.org/epoc-specific-resources-review-authors).

Randomized controlled trials (RCTs)

Controlled before- after studies (CBAs)

Cluster randomized controlled trials

Non- randomized controlled trials (NRCTs)

We will exclude qualitative studies without any comparisons/comparators

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Roles and responsibilities

Give a brief description of content and methodological expertise within the review team. It is recommended to have 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.

Please note that this is the *recommended optimal* review team composition.

- Content: MAW;DKC;WSF;CN
- Systematic review methods: MAW; CN
- Statistical analysis: CN
- Information retrieval: WSF, DKC & CN with an assistance of librarian

Funding

Do you receive any financial support, and if so, from where? What are your deliverable deadlines for the review? If not, are you planning to apply for funding, and if so, from where?

- Planning to apply for a small grant at the relevant organization/agency.

Potential conflicts of interest

For example, have any of the authors been involved in the development of relevant interventions, primary research, or prior published reviews on the topic?

None. However, the two authors (MAW, CN) have a published systematic review on medical education and both are the Cochrane review authors, another author (WSF) is a programme director and has publications in non-Cochrane reviews and another author (DKC) has experiences in introducing flipped classroom in teaching students in pharmacy programme.

Preliminary timeframe

Note, if the protocol or review is not submitted within six months and 18 months of title registration, respectively, the review area is opened up for other authors.

- Date you plan to submit a draft protocol: 27 August 2017
- Date you plan to submit a draft review: 9 July 2018