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Developing constructs of anatomy education environment measurement: A Delphi study

Siti Nurma Hanim Hadie[a], Asma Hassan[a], Zul Izhar Mohd Ismail[a], Mohd Asnizam Asari[a], Aaijaz Ahmed Khan[a], Fazlina Kasim[a], Nurul Aiman Mohd Yusof[a], Husnaida Abdul Manan@Sulong[a], Tengku Fatimah Murniwati Tengku Muda[b], Wan Nor Arifin[c] and Muhamad Saiful Bahri Yusoff[d]*

[a]*Anatomy Department, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kota Bharu, Kelantan, Malaysia*
[b]*Faculty of Medical and Health Sciences, Universiti Sultan Zainal Abidin, Kuala Terengganu, Terengganu, Malaysia*
[c]*Biostatistics & Research Methodology Unit, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kota Bharu, Kelantan, Malaysia*
[d]*Medical Education Department, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kota Bharu, Kelantan, Malaysia*

Abstract

Inadequate anatomical knowledge due to unsatisfactory anatomy education environment has contributed to poor clinical performance among medical graduates. Unfortunately, no specific environment measurement tool is available. Delphi technique was conducted to identify the anatomy education environment components and their items. It involved identification of possible components and their definitions by nine anatomists which were then appraised and verified, getting critical appraisal from five medical educationists, determining suitable items for each component and finally appraised by content experts. Eleven components with 129 items that might represent the anatomy education environment were proposed. Further validation is required to determine its psychometric properties.

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1. Introduction

Anatomy has the longest timeline in any formalized medical education (McLachlan & Patten, 2006). Being the oldest medical subject, teaching and learning in anatomy education have undergone vast changes due to various reasons. In view of shortage of cadavers and packed schedule in medical curriculum, anatomy teaching by traditional cadaveric dissection and didactic lectures have been replaced by other teaching methods such as demonstration using models, prosected specimens and computer simulation software (Sugand, Abrahams, & Khurana, 2010). Furthermore, reform in medical curriculum from traditional to problem-based learning (PBL) had contributed to significant reduction of anatomical content and number of teaching hour allocated (Prince, Scherpbier, Van Mameren, Drukker, & Van Der Vleuten, 2005; Sugand et al., 2010; Turney, 2007). Being as a preclinical subject, anatomy is often taught during the first year of medical curriculum and is rarely revisited during the clinical years. There is also an ongoing issue on the anatomist teaching quality due to decreasing number of experienced and qualified anatomist (McCuskey, Carmichael, & Kirch, 2005). With heavy teaching load in comparison to lecturers in other basic medical sciences, many anatomy lecturers had given up their undergraduate teaching to concentrate more on their research productivity (Bay & Ling, 2007).

Corresponding Author: Siti Nurma Hanim Hadie Tel: 652342632
E-mail: sitinurmahanimhadie@gmail.com

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Unfortunately, this new anatomy education environment fails to produce medical graduates with adequate anatomical knowledge. Though medical students perceived anatomy as a very important medical subject with high clinical relevancy, yet not all anatomy courses attracted satisfactory comments from them (Clough & Lehr, 1996; Mitchell, McCrorie, & Sedgwick, 2004; Moxham & Plaisant, 2007). Quite a sizable proportions of medical students in clinical years felt that their anatomy knowledge is insufficient to make them understand the relevant clinical problems (Bergman, Prince, Drukker, van der Vleuten, & Scherpbier, 2008). Even some of them feel insecure about their anatomical knowledge which they themselves perceived inadequate (Custers & Cate, 2002). On top of that, there was seven-fold increase in the legal claims associated with anatomical errors submitted to the Medical Defence Union between 1995 to 2000 (Ellis, 2002). These issues reflect that the current anatomy education is not at its optimum level in promoting effective learning thus need to be addressed immediately.

To achieve optimum education environment, feedback from students is crucial because it serves as a very powerful indicator on learning environment (Hattie & Timperley, 2007; Norcini, 2010). Students' perceptions are likely to affect their attitudes towards learning and consequently influence their performance (Ferreira & Santoso, 2008)**.** All the while, modification in medical education is based mainly on the faculty members' experience and opinion. However, obtaining feedbacks from students especially especially to those confined to anatomy education environment is a challenging task since there is no valid, reliable and standard tool that specifically measures such environment.

To address this problem, we have utilized Delphi method to identify suitable components or constructs that might reflect the current anatomy education. It is hoped that these constructs would help the researchers to develop a suitable psychometrically sound tool which can measures anatomy education environment

2. Method

Generally a proper Delphi technique involves four distinct phases. These are 1) exploration of a subject under discussion, 2) reaching an understanding about how a group views about the subject, 3) resolving disagreement if there is significant disagreement and 4) final evaluation based on the gathered information (Linstone & Turoff, 2002). Based on the four Delphi technique principles, this study was conducted in six rounds. These were:

2.1 Identification of possible components or constructs by the anatomist (exploring and reaching understanding phase)

An e-mail requesting for possible components or construct of the environment were sent to nine qualified clinical anatomist. All the suggested components were appraised and 10 common components were identified.

2.2 Verification of the components or construct by the anatomist (resolving disagreement from the previous phase)

All the 10 identified components were e-mailed again to the anatomist for verification. The verification process involved scrutiny of each component with regards to its appropriateness and applicability in the current setting.

2.3 Developing provisional definition for each component or construct by the anatomist (exploring and reaching understanding phase)

The anatomists were requested to provide suitable definition for each components or constructs. The suggested definitions were made based on their literature search and expert opinion. These definitions were critically appraised among themselves via e-mail. At the end of this round, a common definition for each components was coined which was agreed by all the anatomists.

2.4. Critical appraisal of the components and their definitions by the medical educationist (exploring and reaching understanding phase)

A total number of 10 components and their definitions which had been agreed upon by the anatomists were presented to five medical educationists for critical appraisal. As a result, two additional components were suggested and were added.

2.5 Item identification for each component by the anatomist (exploring and reaching understanding phase)

An e-mail was sent again to the anatomists requesting for suitable items that might represent the construct. Both positive and negative items were constructed and were filled in a table provided by the researcher. Item construction was carried out individually by each anatomist and they were encouraged to construct as many items as they could.

2.6 Critical appraisal and verification of the components and their items by the anatomists and medical educationists (final evaluation phase)

An item construction workshop was held and it was attended by all the anatomists and two medical educationists. In this workshop, all items that were constructed in round five were critically appraised. Two components which shared almost similar definition and items were combined thus resulted in a final total number of 11 components. Each component consists of 7 to 16 items, with a total of 129 items.

3. Result

Throughout the six rounds of Delphi technique, 11 components were identified; each component consists of 7 to 16 items, with a total of 129 items (Table 1).

Table 1. The 11 components and their definitions

Components	Definition	Number of items[1]
1) Students perception on anatomy teaching methodologies	Students opinion on approaches, ways or methods used by a teacher while conducting an anatomy teaching session	14
2) Students perception in learning anatomy	Students opinion on the objectives, methodologies, strategies, efficacy & outcomes while learning anatomy	16
3) Students perception on anatomy assessments	Students opinion on both formative & summative assessments with regards to the suitability, relevancy, difficulty levels and the outcomes	14
4) Students perception on anatomy content knowledge	Students opinion on the adequacy and relevance of anatomy syllabus in the curriculum	8
5) Students perception on anatomy teachers	Students opinion on the anatomy teachers with regards to their subject knowledge, delivery methods, communication skills, ability to instil motivation & outcomes of their teaching	15
6) Students perception on anatomy learning atmosphere	Students opinion on the available facilities (conducive or not) commitment/ supports from the teachers and staff & peer supports	14
7) Students perception on teaching and learning tools	Students perception on the availability, adequacy, accessibility and quality of the teaching and learning tools	15
8) Students self-perception on interest in anatomy	Students self-interest towards anatomy and their internal motivation in learning anatomy	8
9) Students self-perception on anatomy comprehension	Students interpretation on their understanding towards the anatomy subject	7
10) Students self-perception on anatomy integration and application	Students self-perception about integration of different components of anatomy and integration with other subjects	8
11) Students self-perception on anatomy learning and revision	Students self-interpretation on their strategies, approaches and methods during anatomy revision	10
	TOTAL	**129**

[1]List of items can be requested from the principal author through email.

4. Discussion

It is widely agreed among medical educators that optimal educational climate is an important factor for effective learning to occur (Dent & Harden, 2009; Newble, Cannon, & Kapelis, 2001). Indeed, evaluation of the educational climate has been highlighted as a key to the delivery of high quality medical education (Dent & Harden, 2009; Newble et al., 2001). Likewise, learning anatomy requires an optimal anatomy educational climate for effective learning to occur too. Thus, this study provides potential constructs for anatomy education environment measurement which are beneficial improving anatomy education environment and future research in this area.

Our results showed that there are several important areas that should be considered for evaluating anatomy educational environment which were teaching and learning methods, assessment method, class atmosphere, teachers and students' study skills. These indicate that the anatomists as well as medical educationists believe that these are the key areas that will promote effective learning in anatomy if appropriate feedbacks are gathered from relevant stakeholders such as medical students. Likewise, these areas correspond with the concerns echoed by many researchers (Bay & Ling, 2007; Bergman et al., 2008; Custers & Cate, 2002; Dent & Harden, 2009; McLachlan & Patten, 2006; Newble et al., 2001; Sugand et al., 2010). One lesson learnt from these findings is that the constructs of anatomy educational climate are similar to the general educational climate, but the items to gather the feedback are specific to anatomy context due to uniqueness of the anatomy subject.

Another interesting finding is that both the anatomists and the medical educationist thought that the feedback should include students' opinion on both external and internal factors. The external factors for example should include their perception toward teachers, surrounding atmosphere, and curriculum design, whereas the internal factors involved self-evaluation related to internal motivation, capability to apply and integrate anatomical knowledge as well as ways of how they do their revision. Similar concerns were widely echoed by anatomists from different parts of the world (Bay & Ling, 2007; Bergman et al., 2008; Clough & Lehr, 1996; Custers & Cate, 2002; McCuskey et al., 2005; McLachlan & Patten, 2006; Moxham & Plaisant, 2007; Prince et al., 2005; Sugand et al., 2010; Turney, 2007). Another lesson learnt is that the evaluation of anatomy education environment should consider both the factors; otherwise, the feedback gathered will not provide utmost impacts to promote effective learning in anatomy. It is worth highlighting that a good measurement tool provides information that is capable of reducing discrepancies between what is known and what is desired to know thus leading to betterment in future education (Hattie & Timperley, 2007). From this notion, we believe, the proposed constructs and items to measure anatomy education environment are capable of reducing the discrepancy.

This study has several limitations that should be considered for future research. Firstly, the study is merely a qualitative study which might not reflect the true constructs of the anatomy education environment. Thus further validation process should be performed to verify the psychometric properties of the constructs as well as their items. Secondly, this study is confined to one medical school and this would limit the generalisability of the results. Therefore, future research should involve other medical schools in order to increase its generalisability. Finally, the Delphi technique was merely depending on the experts judgement which is thus vulnerable to distorted understanding and imprecise interpretation (Albanese, 2000; Linstone & Turoff, 2002). Considering these limitations, the results obtained in this study should be interpreted within context. Apart from that, this study has several strengths. First, the researchers conducted the study in accordance with the four recommended principles of Delphi technique. Second, all of the judges involved in providing information were the experts in the field of study. Last but not least, this is the first study that proposes the constructs and items that can be used to measure anatomy educational environment. Nevertheless, continuous research is required to verify credentials of the constructs and items to measure anatomy education environment.

5. Conclusion and recommendation

This study proposed 11 components that might represent a measurement of the anatomy education environment. Nevertheless, further validation is required to determine its psychometric properties.

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