نتیجه‌گیری: تکرار آزمایش‌های انجام‌شده و با ثابت کردن شرایط نمونه‌برداری و طراحی این تحقیق کم‌کننده‌تری به بیان نتایج به وقوع نخستی باعث شد.

در نهایت، این مطالعه نشان داد که برای افزایش میزان اعتقادات و تجربه‌های تجربی، می‌کنند، و آینده جدایی بین دانشجویان و بیکاران به نوبه‌ی خود این روشهای علمی را به کار بگیرند.

کلمات کلیدی: مهارت کارآگاهی، اعتقادات، تجربه‌های تجربی، تغییرات، اثرات

A Report on the First C-map Design Contest

ORIGINAL ARTICLE

Title: A Report on the First C-map Design Contest

Background: Educational achievement is highly important in the higher education and universities' system in all countries. Critical thinking and problem solving skills are the main outcomes of higher education and the accreditation criteria. Happiness is one of the fundamental emotions of human beings that has a crucial role in the health of individuals and society. It could be the catalyst and facilitator in the development of critical thinking. The purpose of the present study was to compare critical thinking skills and happiness among the students of different universities.

Methods: This is a descriptive analytical study conducted on 244 students of different universities of Ghaen that entered the study by multistage cluster sampling. Rasas questionnaire of critical thinking 2003 and Oxford Happiness questionnaire were used and the data were analyzed by SPSS (ver. 14), Pearson's correlation, independent-test, and ANOVA and the statistical significance level was 0.05.

Results: 163 participants (66.8%) were male and 81 students (33.2%) were female. The results presented that there is a significant difference between the mean of critical thinking and happiness among the students based on universities (p < 0.05).

Furthermore, there is a significant difference between critical thinking and happiness (r(214) = 0.24).

Conclusions: Educational programmers should concern critical thinking and the methods to upgrade it. Moreover, the teachers should use new teaching methods in the curriculum in order to increase happiness in the students.

Keywords: Critical thinking, Happiness, Students.
INTRODUCTION
Concept maps (C-maps), developed by professor Novak and his team, are graphical tools designed to facilitate the process of organizing, representing, and learning different aspects of knowledge. The theory underlying the C-maps is based on the learning psychology of David Ausubel which states that learning transpires by the assimilation of new ideas and conceptions into existing cognitive structure of the learner (1). Concept maps are efficient tools for learning and creating knowledge which try to answer a focus question and are comprised of two pivotal parts: 1. Concepts (perceived regularities in events/objects designated by labels); and 2. Propositions (statements about some objects or events in the universe, either naturally occurring or constructed) (2).

Based on many studies performed on infection prevalence, despite the presence of different guidelines and measures for infection prevention, healthcare-associated infections (HAIs) are still considered a major peril for patients. One of the key concerns in this regard is the compliance of healthcare workers (HCWs) with preventive methods and strategies. Studies have shown that the length of healthcare experience has a negative correlation with the adherence to preventive measures, and suggested that participating in educational interventions may increase the adherence (3). Concept maps are considered not only as a powerful method of meaningful learning, but also as an instrument for evaluating the efficiency of learning and accuracy of thinking process. In recent years, concept maps are being employed mostly as tools for planning and evaluation of healthcare services. Different inquiries suggest that concept maps by promoting critical thinking and clinical reasoning may play a significant role in increasing adherence to infection prevention methods and therefore reduce healthcare-associated infections (4). Based on this idea, we held “the First Concept Map Design Contest on Infection Prevention and Control” with two goals. Our first goal was to promote infection prevention and control (IPC) basics and to motivate people, especially students in different healthcare associated fields to expand their knowledge on IPC and our second goal was to obtain new ideas on IPC in order to find new solutions for healthcare-associated infections prevention. In this paper, we aim to discuss our experiences of this contest.

METHODS
In January 2015, Mashhad Medical Microbiology Student Research Group (MMMSRG) invited all academics from all over Iran, especially students, who were interested in infection prevention and control, to design concept maps trying to answer this focus question: “How can we reduce the Healthcare-associated Infections?”

We received about 40 concept maps, from which 29 met our inclusion criteria:
1. C-maps were preferred to be designed in English.
2. C-maps should have contained at least one of the 5 basic concepts of infection prevention and control (including: 1-CDC standard precautions, 2-Hand hygiene, 3-Isolation standards, 4-Environmental cleaning and 5-Surveillance).
3. All concepts and links should be referenced appropriately (According to the Vancouver referencing style).
4. All C-maps should be designed as 100 * 70 cm landscape posters.
5. Approved fonts were: Times New Roman, Calibri, Arial and Arial Black (font size should be at least 35 pt.)
6. The logos of ‘The first International Congress on Prevention Strategies for Health care-associated Infections’ and ‘The first Concept Map Design Contest on Infection Prevention and Control’ should be included.
7. The author’s affiliation and e-mail should be mentioned in the poster.
8. All the references should be mentioned separately at the end of the poster.

All the attendees presented their C-maps on April 14th and 15th as posters during a poster section in the “First International Congress on Prevention Strategies for Healthcare-associated infections”. All the C-maps were judged based on the designed rubrics, which were adapted from Novak (5) and Cronin’s (6) scoring criteria with some modifications (Table 1).

Table 1. The grading rubrics of the first Concept Map Design Contest on Infection Prevention and Control

| Inclusion Criteria                                                                 | Yes □     | No □     | (-5 points) | *including:  
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the Presenter in attendance?</td>
<td>Yes □</td>
<td>No □</td>
<td>(-5 points)</td>
<td>1. CDC standard Precautions</td>
</tr>
<tr>
<td></td>
<td>(+0.25 points for each; +1 if all the 5 concepts are mentioned)</td>
<td>(-2 points)</td>
<td>2. Hand Hygiene</td>
<td></td>
</tr>
<tr>
<td>The C-map contains at least one of the 5 basic concepts of infection prevention</td>
<td>Yes □</td>
<td>No □</td>
<td>(-2 points)</td>
<td>3. Isolation Standards</td>
</tr>
<tr>
<td>and control*?</td>
<td>(+0.25 points for each; +1 if all the 5 concepts are mentioned)</td>
<td></td>
<td>4. Environmental cleaning</td>
<td></td>
</tr>
<tr>
<td>Are Concepts and links referenced appropriately?</td>
<td>Yes □</td>
<td>No □</td>
<td>(-0.5 points for each link without a reference*)</td>
<td></td>
</tr>
<tr>
<td>Are Hypothetical links specified with a symbol or a color?</td>
<td>Yes □</td>
<td>No □</td>
<td>(-0.5 points for each link without a reference*)</td>
<td></td>
</tr>
<tr>
<td>The map contains hypothetical valid links?</td>
<td>Yes □</td>
<td>No □</td>
<td>(-2 point for each)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(+2 point for each)</td>
<td></td>
<td>*If the reference is mentioned in a higher segment and the lower links are adopted from that reference, No negative points should be given.</td>
<td></td>
</tr>
</tbody>
</table>
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Table 1. Continued

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Yes □</th>
<th>No □</th>
<th>*+0.5 points for each reference after 2013</th>
<th>(-0.25 points for each more)</th>
</tr>
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<tbody>
<tr>
<td>At most 5 references are used?</td>
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<tr>
<td>At most 30 nodes are used?</td>
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C-map Construction

Propositions

*Is the relationship between two concepts indicating by a connecting line and linking words? How many?
*For each meaningful, valid proposition shown, score 1 point

Hierarchy

*Does the map show hierarchy? How many?
*Score 5 points for each valid level of the hierarchy.

Cross links

*Does the map show meaningful connections between one segment of hierarchy and another segment?
*Score 10 points for each cross link that is both valid and significant, and 2 points for each cross link that is valid but does not illustrate a synthesis between sets of related concepts or propositions

Examples

*1 point for each specific event or objects that are valid instances of those designated by the concept label.

C-map Design

Appropriate Fonts (size and Format) Score from 1 to 5
Appropriate color Score from 1 to 5
Concepts and links are clearly illustrated? Score from 1 to 5
References are mentioned in a separate box, numbered and in Vancouver style Yes □ | No □ (-2 points)
The poster number is mentioned in the right upper corner of the poster Yes □ | No □ (-0.5 points)


RESULTS

We received about 40 concept maps from different parts of Iran. Among the accepted concept maps, four maps, which had achieved the most scores and proposed some new ideas in infection prevention and control were chosen as the best concept maps (Figure 1-Figure 4).

All the C-maps presented in the first Concept Map Design Contest on Infection Prevention and Control are available in https://goo.gl/8I6A7i.

DISCUSSION

Finding the optimal learning method in education and science is not a new challenge in teaching-learning process (7). There are many teaching methods including lectures, discussions, jigsaw puzzle maps, flashcards, media, role-playing and concept maps, which facilitate the learning process. C-maps have a great potential to lead the students
Figure 1. Healthcare-associated Infections: Super Detectors: a Concept Map; designed by Kosar Shabani Varaki
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Figure 2. Infection Prevention and Control: a Concept Map; designed by Mohammad Koohsarian and Samira Kor

Figure 3. Strategies for Effective Hand Hygiene: a Concept Map; designed by Alizadeh M et al.
Figure 4. Surgical Site Infection Prevention: a Concept Map; designed by Mahla Rahmani and Sara Jangjoo

References
4. NICE clinical guideline for preventing and treating surgical site infections
5. A power point about “Prevention of Surgical Site Infections: Considerations in Measuring Effectiveness” by Michele L. Pearson
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Figure 5. Role of Concept Maps in Infection Prevention and Control; designed by Arash Arianpoor

and trainers to creative and critical thinking (8-10). Although the idea of using concept maps as a learning material may back to mid-twentieth century, but they did not become of interest until recent two decades (11). During these years, foundation of C-maps has been gradually developed and therefore, it has now some general accepted features and characteristics. Along with the progressive evolution of information technology in new century, many research groups work on softwares such as C-map Tools, Knowledge Manager, and Smart Idea to facilitate the construction of C-maps (11).

One of the interesting features of concept maps is that they are not limited to a special scientific field or even a special graduation level. They can be simple diagrams for high school students or even elementary school students or complicated illustrative presentations for university students (12). In any condition, it is modifiable and effective.

Regarding the use of C-maps in infection prevention and control, the study performed by Anderson et al. was aimed to evaluate the use of concept mapping learning strategy as an educational intervention to improve critical thinking and prioritization skills regarding infection prevention in novice graduate nurses. Their results showed noticeable improvements in the critical thinking and prioritization skills of the participants regarding the nursing assessments and interventions related to infection prevention (4). We can summarize the role of concept maps in infection prevention and control in a c-map designed by the author (Figure 5).

“The First Concept Map Design Contest on Infection Prevention and Control” was held based on the idea that concept mapping could be an effective way not only to teach infection prevention and control strategies but also to develop new strategies, which may be more effective. Accepted C-maps were designed by different students majoring in different fields (medical, nursing, midwifery, and basic sciences). We also received some C-maps developed by experts in IPC, which indicates the ability of our contest to attract young minds to this field.

Although the basic concepts were similar in many of accepted C-maps, each of them were developed genuinely and showed a different point of view. However, some of the C-maps pointed out unique novel ideas in IPC, which may be considered a basis for new studies in this field.

The main limitation of this study could be the fact that concept map is a new learning method which many are not familiar with; this lead to relatively low participation in this contest. However, it should be mentioned that this was the first concept map contest in Iran. After this contest, the student research committee of Mashhad university of medical sciences have hold two other concept map contests (Stem Cell and Nastaran) which revealed that there is a growing attention toward concept maps as a method of

References:
4. Schoder PM: Concept mapping: A critical thinking approach to care planning; FA Davis; 2013.

Role of Concept Maps in Infection Prevention and Control
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teaching, learning and idea development. In conclusion, our experience indicates a promising role for concept mapping in IPC. We suggest using C-maps as a method for faster and easier learning of infection prevention and control. We would like to thank Dr. Mahboubeh Naderinasab and Dr. Farzad Akbarzadeh, who encouraged us to take this step.

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We would like to thank Dr. Mahboubeh Naderinasab and Dr. Farzad Akbarzadeh, who encouraged us to take this step.

REFERENCES