

ANALYSIS OF USA CYBERSECURITY TEACHING METHODOLOGY IMPLEMENTATION AT VINNYTSIA NATIONAL TECHNICAL UNIVERSITY

Vinnitsia National Technical University

Анотація

Представлено аналіз та особливості побудови програми кібербезпеки в університетах США на прикладі Purdue University. Розглянуто методики формування мети та задач дисциплін на прикладі дисциплін з моніторингу та аудиту кібербезпеки. Наведено структуру дисципліни та методику до формування завдань для точного та підсумкового контролю знань.

Ключові слова: кібербезпека, педагогіка, мета дисципліни, задачі дисципліни, контроль знань, класифікація Блума.

Abstract

The analysis of cybersecurity curricula development at USA's universities using one implemented at Purdue University as an instance was performed. Techniques of outcomes and objectives determination were presented on the example of cybersecurity monitoring and audit curriculum. A structure of the discipline and methodology of current and final assessments development implementation were presented.

Keywords: cybersecurity, pedagogics, course outcome, course objectives, assessments, Bloom's taxonomy.

Introduction

Ukrainian educational policy was an object for drastic changes during recent years. Most changes were implemented towards making educational system more compatible with ones of OECD countries. One of the most successful and developed educational models according to number of Nobel prizes winners [1] is USA's educational system. Consequently, it should be carefully analyzed and the most impacting factors are to be integrated within Ukrainian universities, institutes and colleges. The field of cybersecurity should be considered to be one of the most important due to combined impacts of natural human need in safety and overwhelming integration of information technologies into human's life. This process still needs to be reduced to some stable model, because each university at each country possess it unique peculiarities, so it is impossible to follow all of them simultaneously. Purdue University's cybersecurity program is considered as one of the USA's most advanced [2]. Therefore its experience at least should be considered to be used at VNTU.

The goal of this research is to improve cybersecurity curricula at information protection department of VNTU according to the methodology used at Purdue University.

To reach the goal the following tasks are to be solved:

- analyze methodology and general view of an educational process;
- design curriculum according to the methodology;
- analyze experience of its development and integration.

The current report is focused on the solution of former two tasks.

Research results

One of the most obvious differences in courses designing approach is that USA's approach is more outcome-oriented: the main theme of whole course development is never losing discipline's learning outcomes focus. It is considered more preferable for student to be competent in tasks solving, than have knowledge of theory, that is not applied and is preferable, but not crucial for further materials comprehending. It is argued through different approach of study motivation. Ukrainian education institutions still use mostly teacher-driven approach, so they kind of forcing students into studying process, while Purdue University's approach is much more student-driven [3]. This provides students ability for practical tasks solving even if they appeared to be not the most determined ones.

Another difference bounded with systematic approach is usage of the following chain at the curriculum development:

Outcomes → Objectives → Assessments → Activities.

It is more beneficial, than traditionally used approach

Outcomes → Objectives → Activities → Assessments.

The former approach provides assessments development straight after objectives, so each and every objective is to be evaluated, while the usage of the former one tends to miss something, because activities development is very time-consuming process, which can "blur" developer's focus at the assessments development stage. Moreover, assessments should be developed bearing in mind Bloom's taxonomy [4] or its modern revised variant [4, 5]. This aids teacher to make more accurate evaluation of student's abilities as well as to design activities, which provide students with complete skill set after their implementation.

The analysis of the curricula [6] showed that it is not focused barely on knowledge areas, but on way of thinking as well. Thus the curricula are to develop specific mindset, which is direly needed in cybersecurity field.

The methodology was applied during cybersecurity monitoring and audit curriculum development and partially at other courses delivered at the information protection department of Vinnytsia National Technical University.

Conclusion

Despite imperfectness of any educational methodology, one used at Purdue University proved to be more successful, than traditional ones, owing to its more outcome-oriented approach for both student and teacher. The first steps of the methodology implementation showed, that it is possible to integrate it into current Ukrainian higher education system provided support from university higher management, but it meets a lot of obstacles caused by legislative regulations and their permanent changes towards different directions. The other major task, that is to be solved, is necessity for students to adapt to new approach and reevaluate thier cause during studying process. USA's educational model demands from students to be much more deeper involved into process of their education.

REFERENCES

1. All Nobel Prizes. URL: <https://www.nobelprize.org/prizes/lists/all-nobel-prizes> (accessed 09.03.2020)
2. Cybersecurity URL: <https://polytechnic.purdue.edu/degrees/cybersecurity> (accessed 09.03.2020)
3. K. Neubauer and others. Teamwork Makes the Dream Work: Purdue' s IMPACT Course Transformation Faculty Learning Community. Purdue University Purdue e-Pubs. 2018. URL: <https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1036&context=impactpres> (accessed 09.03.2020)
4. Anderson and Krathwohl Bloom's Taxonomy Revised : Understanding the New Version of Bloom's Taxonomy. 2016. 7 p. URL: https://quincycollege.edu/content/uploads/Anderson-and-Krathwohl_Revised-Blooms-Taxonomy.pdf (accessed 09.03.2020)
5. David R. Krathwohl. A Revision of Bloom's Taxonomy: An Overview. Theory into Practice, Volume 41, Number 4, Autumn 2002. P. 212-218. URL: <https://www.depauw.edu/files/resources/krathwohl.pdf> (accessed 09.03.2020)
6. Cybersecurity Curricula 2017: Curriculum Guidelines for Post-Secondary Degree Programs in Cybersecurity. A Report in the Computing Curricula Series Joint Task Force on Cybersecurity Education. URL: <https://www.slideshare.net/MatthewRosenquist/cybersecurity-curricula-guidelines-for-postsecondary-degree-programs> (accessed 09.03.2020)

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