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## Sociocultural competence training in higher engineering education: the role of gaming simulation

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### Abstract

The present study focuses on competency-based approach in higher engineering education. Today engineers are required to be socially, culturally and communicatively skilled and able to act in constantly changing sociocultural environment. Presently the development of engineers' sociocultural competency is of great importance, which is seen from the criteria for accrediting engineering programs of numerous international organizations, e.g. ABET.

The paper presents some methods of sociocultural competency training based on the techniques of gaming simulation. Here we describe the educational games "Intercultural communication" and "The art of presentation" for the students of Elite Education Department of National Research Tomsk Polytechnic University. The results of incorporating the gaming technologies in education contribute to the effectiveness of engineers' sociocultural competency training. The paper ends by pointing out gaming simulation which is a cutting-edge pedagogical approach which allows students to participate in realistic scenarios and develop sociocultural competency.

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### 1. Introduction

Modern conditions of economic and sociocultural globalization, rapid technological development, production and education integrity trends lead to the need of training engineers qualification of which lays far beyond instrumental technical knowledge. Today engineers need to acquire social, cultural and communicative skills. This is why up-to-date educational programs naturally include not only specific technical subjects, but a range of humanities, as well.

International standards are designed to train engineers that are able to analyze and assess results of solving engineering problems, to communicate and take responsibility for the acquired results and to think creatively. Criteria for accrediting engineering programs of ABET along with others the following Student Outcomes are present: (d) ability to function on multidisciplinary teams; (f) understanding of professional and ethical

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responsibility; (g) ability to communicate effectively; (h) broad education necessary to understand the impact of engineering solutions in global economic, environmental, and societal context (Criteria for Accrediting Engineering Programs, 2015).

This shows that an engineer needs to acquire not only a range of specific professional competencies, but also to develop socio-humanitarian competency crucial in constantly changing conditions of modern production.

## **2. Competency-based engineering education**

This approach was worked out in the 70-s of the 20<sup>th</sup> century. Professor of Royal Melbourne Institute of Technology (Australia) John A. Bowden notes: “The concept of a competency-based education system is both an old and an evolving idea, details of which are still being worked out, especially in relation to higher education institutions and the professions. The notion of competency-based education programs was first introduced in the USA, beginning in teacher education in the late 1960s, and evolved through applications to other professional education programs in the USA in the 1970s...” (Bowden, 2013)

In Russia competency-based education is becoming especially topical due to its integration in the international and European educational environment and joining the Bologna process. Federal State educational standards of the third generation are based on the competency approach in education. The final destination of education is forming competencies that are coherent with certain actions. This is why while assessing the training results the most important thing is not the amount of acquired knowledge but the ability to get it independently, the ability to think and to solve professional problems basing on social experience. This involves estimating such qualities as mobility, dynamism, creativity, ability to change type of activity, ability to find proper information within a short time period, self-development and self-education.

Forming and developing competencies is becoming an organizing principle of the curriculum in various universities worldwide. A. Brightwell and J. Grant (2013) note: “Competency based training describes progression through training referenced to the demonstrated ability to perform certain tasks. In recent years, this has become the dominant curriculum model” (Brightwell, 2013). Today, knowledge-based approach is giving place to the competency-based approach in higher education. Now we estimate not how students reproduce theoretical knowledge and memorize facts, but how this knowledge is transformed into action, how it is used by a student in practice.

## **3. Developing an engineer’s sociocultural competency**

Sociocultural competency is a combination of certain knowledge and skills formed in the process of social and intercultural communication. It is the ability to build effective relationships basing on the knowledge of one’s native culture and the system of values along with the understanding of the partner’s cultural peculiarities.

As we see it, personal sociocultural competency is understanding basic values of the native culture, accepting multiculturalism, readiness to perceive social and cultural differences tolerantly and respectful attitude to historical and cultural legacy.

Forming the sociocultural competency is possible when a student does not only gain information, but also puts it through their own world perception system getting a certain meaning that is realized in actions. Thus, to grasp and utilize knowledge in practice it is important to fill the knowledge transferred to a student with the understanding of how certain goals are achieved. It is quite obvious that a specialist can’t work effectively knowing only how to get the result, that’s why it is important to form the understanding of their work results.

In this connection, we need to provide the maximum performance and independence of students in choosing sources of information, understanding and forming behavior strategies. Now teacher acts more like a trainer, consultant or tutor organizing group work basing on special teaching methods.

Modern engineering training requirements include forming a personality with broad outlook and profound communicative skills, a personality able to make decisions independently. That is why sociocultural competence of an engineer is of great importance. It includes:

- Ability and readiness to communicate efficiently;
- Ability to function in multi-purpose and multicultural teams;
- Ability to see and analyze sociocultural context of professional activity;
- Understanding of professional and ethical responsibility;
- Ability to assess perspectives and consequences;
- Ability to understand and conduct socio-humanitarian expertise of technical projects;
- Understanding of the basic values of their native culture, tolerant perception of cross-cultural differences;
- Profound leadership.

Sociocultural competency of an engineer is an inherent part of their professional culture that determines the socially acceptable perspective of their scientific and research activity. Modern market trends, growing globalization and rapidly changing sociocultural conditions of professional activity lead to the need of training engineers able to act and to make responsible decisions in dynamic changing world, engineers ready for innovations and able to foresee and solve problems nontraditionally.

We need to note that an engineer with formed sociocultural competency does not only possess the knowledge of the sociocultural context in terms of their profession, but is able to interpret cultural facts and phenomena, to choose communicative strategies while solving personal and professional problems in various communicative situations.

Traditional educational techniques are not efficient enough to form sociocultural competency because it does not involve only understanding of sociocultural trends, but also the ability to solve professional problems in the process of communication. Traditional vision of the education process being the way of acquiring a certain range of facts fails to be adequate in modern conditions. In order to form the readiness to communicate efficiently with other people in various life situations the best thing to do is use the methods of gaming simulation.

#### **4. Gaming simulation methods for sociocultural competency development**

Universal role of gaming in the history of human civilization development, its overall entity were overviewed by J. Huizinga in “Homo Ludens” (1980). He writes: “In culture we find play as a given magnitude existing before culture itself existed, accompanying it and pervading it from the earliest beginnings right up to the phase of civilization we are now living in. We find play present everywhere as a well-defined quality of action which is different from “ordinary” life” (Huizinga, 1980).

Today gaming techniques are actively used in education. Teaching with the use of gaming simulation techniques brings action into knowledge and skills being acquired.

Gaming technologies in education allow students act in simulated situations, practice certain role models in reality. Thus, forming the sociocultural competency happens through analyzing data, choice of the acting strategy and solving communicative problems. In the course of action students don’t just get the knowledge needed, they get it through the perspective of their own world vision and incorporate them in different behavior models.

We have performed an experiment on developing the sociocultural competency of an engineer through the gaming process with the TPU students. They were offered to take part in two educational games: “Intercultural communication” and “The art of presentation”. The specialists of “Educational bureau “Soling” were the attending reviewers ([www.soling.su](http://www.soling.su)).

The following game scheme was presented:

1. Preparation (game scenario workout, role description and task formation);
2. Explanation (presentation to participants, presenting the problem, setting the goal, presenting the handouts);

3. The game (doing tasks, capturing precedents for further analysis to determine the competency level);
4. Game analysis (reflexion and self-analysis, feedback by presenters, scoring, giving advice).

#### 4.1. “Intercultural communication”

This game is topical for today’s international market rapid development and growth of global connections in science, politics and culture which lead to the need in deepening mutual understanding by different national cultures. Growing business globalization, international labor market and professional mobility, building up international teams bring up the problem of dialogue and coordination of different types of world vision. In these conditions, an engineer has to have the understanding of the peculiarities of intercultural communication, to have the skills of interpreting the processes and foreign interaction results.

The goal of the game is to form the knowledge and skills of efficient intercultural communicative processes.

The aims are:

- to show the existence of national and cultural differences in the context of professional communication and international business;
- to simulate the situation of building personal contacts in foreign environment;
- to form the skills of objective interpretation of verbal and nonverbal behavior by representatives of different cultures;
- to figure out the peculiarities of Russian national character and communicative behavior.

In the course of the game students learn about the already formed behavior stereotypes of various national cultures and analyze them discussing every aspect in small groups. The determining part is the role play “Stand-up party” where the participants get the roles representing different nations and cultures immersing into the intercultural communication zone at a business reception. Their main goal is to make business contacts for their further cooperation. In order to do so they don’t only need to know things, but also act in accordance with the behavior patterns and the world perception system of this or that culture representative taking cross-cultural communication issues into consideration. Finally the participants share their experience and knowledge, estimate their partners analyzing the game.

Competencies formed in this game are the following:

- ability to take nationally specific psychological and sociocultural traits of the communicants into account;
- ability to overcome communicative barriers and social, ethnic and cultural stereotypes;
- ability to work with multi-purpose and multinational teams;
- ability to build up conditions for efficient communication considering cross-cultural issues.

#### 4.2. «The art of presentation»

This game is topical for the determining factor of career today is not only professional qualification, but softskills, as well, which contribute to success regardless of speciality. This includes the persuasion skill, the ability to make contact and to appeal to the audience, the ability to build a relationship with your client. It is well-known that most successful specialists in addition to professional knowledge are able to speak clearly, act confidently in public, are persuasive, make people agree with their point of view and promote their ideas. All that forms the need in forming the public performance skills most topical. Engineers will find those skills quite useful in business negotiations, consulting, scientific discussions and briefings, preparing technical documents and presentations of engineering projects.

The goal of the game is to form the knowledge and skills of presenting information using presentation related technologies that meet the requirements of modern market and practical professional activity.

The aims are:

- to reveal psychological difficulties that one faces during making a presentation, a self-presentation or a public performance;

- to describe optimal methods and techniques of making an effective presentation, the requirements concerning its verbal and nonverbal aspects;
- to form the assessment skills regarding the correspondence of the used technologies to the goals of a presentation, situational requirements and the audience expectations;
- to teach how to set correct goals for a presentation and how to achieve them.

In the course of the game the participants present themselves, discuss pros and cons of each other's presentations and difficulties they face during public performance. Further on the students split into 4 teams. The goal of every team is to present cutting-edge innovative technologies to a group of investors.

Competencies formed in this game are the following:

- skills of practical declamation and using modern presentation technologies;
- techniques of verbal and nonverbal communication able to help achieve professional goals efficiently;
- ability to discuss professional problems, form and protect their opinion, ability to give arguments, explain the core of facts and phenomena.

## 5. Conclusion

The experiment being over the participants were offered to fill out polls. The polling results showed that all students would suggest other students taking part in such a class. In the course of those games a tutor has the chance to see and estimate not only students' knowledge, but also the level of the needed competencies.

Thus, using those games we can form the ability to understand things independently and to evaluate professional knowledge. Through the game we shape the ability to analyze the information given, express one's point of view, formulate thoughts clearly, foresee possible consequences of various solutions, compare the level of understanding and perceiving with others. Gaming simulation raises interest in study and helps a teacher motivate students. This is how this method proves effective in forming and developing sociocultural competency.

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