Impact of Convergence of Smart-Technology as Compared to Traditional Methodological Tools on Fostering Cognitive Aspects of Leadership Competencies in the Process of Vocational Training of Students

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Abstract: The main objective of this research is to explore how effective and efficient the convergent use of traditional and smart technology tools could be when deployed in fostering leadership competencies of the students in the settings of tertiary vocational education. The experiment involved the students of two universities doing the elective course "Do Better Your Leadership Skills Up". Having been split up into two halves, the first part of the focus group used the traditional forms of educational process, while the second one additionally used the software like CogniFit, Lumosity, BrainHQ, NeuroNation, Brain Metrix, Eidetic, Fit Brains, BrainExer 2.0. At the entry stage, the pedagogic surveys had been used as well as the cognitive function test to study the cognitive capabilities of the focus group students. We used a multi method approach of combining the close-ended and open-ended questions to get the feedback and the above cognitive test to measure the output of the study. Quantitative methods had been used to analyze the data and such Covariance-based Structural Equation Modeling (SEM) software as SPSS AMOS had been applied to evaluate the results because cognitive function of a person includes sub-components of latent constructs. *Textalyzer* software had been used to process the students' responses to open-ended questions of the questionnaire for the most commonly used positive words in the texts, which helped us to identify broad categories of responses. Here, the most commonly used words we had distinguished were "involvement", "improvement", "gamification", "motivation", "speed", "concentration", "memory", "current studies", "future job". Then we distributed the answers by the frequency of the identified words. The responses, which fell under no category, had been analyzed manually. The experimentally obtained data shows that integration of the smart technology into traditional learning environment increases students' involvement by 23%, personal transformation by 18% and motivation by 17%. Our study proves that the convergent mode of instruction brings more benefits to the students in terms of fostering cognitive aspects of leadership competencies in the process of vocational training than the traditional mode. We found that the converged pedagogical mode enhances the collaboration and involvement of all the stakeholders of educational process. It makes students achieve the greatest personal satisfaction through enhanced self-esteem, efficiency gains, a sense of continuous personal achievement and enhanced autonomy and experimenting with their own learning strategies. We suggest universities (of Ukraine, specifically) to provide training to the teachers with all the latest technology, which seems essential for teaching. Academic institutions (of Ukraine) should also invest into research in the area of the educational-purpose use of smart technology.

Keywords: Cognitive skills of leadership, smart technology, traditional mode of education, vocational training, tertiary institution.

INTRODUCTION

Teachers have been integrating the smart educational technology into the traditional mode of study to draw attention to each student, help the learner to know himself/herself and his/her field of professional expression since the beginning of the 21st century [1]. The smart educational technology increasingly influences university teachers' pedagogical and methodological practices. This leads teachers and students to acquiring new competencies that create new teaching and learning perspectives [2]. Vocational teachers use different techniques, which depend on the subject and settings in which training takes place [3]. Fostering cognitive skills is considered essential for the students in the process of vocational training [4].

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Psychological science suggests that the top cognitive skills significant to student learning are processing speed, working memory capacity [5, 6], and fluid reasoning [7]. In this regard, the trait theory concept of leadership seems significant to our study as it specifies the leadership traits comprising cognitive skills, personality-related (behavioural) features, interpersonal skills accompanied by tacit knowledge and leader expertise.

Having been inspired by the studies in organizational behaviour and psychology [8-10], the trait theory concept of leadership, we conducted this study in cognitive aspects of leadership focusing on them being developed in the setting of tertiary institution through application the convergence of traditional methods with smart technology tools.

Although different aspects in organizational behaviour and psychology, as well as leadership phenomenon have been experimentally tested in many psychological studies, we found that the studies on fostering cognitive leadership skills by means of convergent use of traditional and smart technology tools are still limited.

In the view of the above, our key objective in this research will be to experimentally determine how the convergent educational environment combining the traditional and smart technology contributes to fostering leadership competencies of the students in the settings of tertiary vocational education.

The purpose of this article is to examine and evaluate (1) the factors for improving the cognitive aspects of leadership competencies when smart technologies are integrated with traditional methods of educating students in the process of vocational training and (2) the factors for low-level students' performance in cognitive aspects of leadership competencies development, though the supportive environment has been created.

Convergence of Technology and Education

Convergence of technology and education is identified through two approaches: technical and pedagogical. First, convergence of technology and education is often addressed as technical merging of digital media (e-cloud solutions, software, video games, social media, electronic books, etc.), and print media [11, p. 47] with the educator's approaches and methods of engaging of and interacting with the students. Admittedly, while accelerating learning, it brings both opportunity and challenge to the instruction and learning [12]. Either individually or through student-owned devices ("bring your own device" (B.Y.O.D.) policy), it allows students to access multiple sources of information as easily as it allows for access to information that may disrupt learning. Second, convergence of technology and education is related to a blended learning concept and we have chosen it to foster cognitive aspects of leadership competencies for a number of reasons. First, using both psychological and pedagogical content knowledge to mediate vocational learning fits well within the existing e-learning content interoperability framework. Our experiment was based on the open content. Second, it is flexible and comes in many shapes and types combining learning through information with learning through collaboration and learning through face-to-face instruction interaction (either online or offline). This means that convergence of technology and education involves the appropriate blend of different components, which includes courses, contents, feedback, and many other things.

MATERIALS AND METHODS

We developed and piloted a course during 2016 and 2017, titled "Do Better Your Leadership Skills Up" based on a blended design. The learning process instructional design approach for the course was based on what they call the "flipped classroom" model [13] and the majority of work had been done by the students as home assignments. While doing so, students and teachers/tutors met face-to-face once/twice a week for the meetings, minding sessions or trainings offline to get involved in developing the projects.

Prior to the experiment, we had obtained the expert approval for the research procedure and materials from Sergii Markov, PhD holder in Psychology, Associate Prof., Head of GeniusRevive Group. Following this, the University Board of Academics acting as ethics committee gave consent to run the research as they considered it worthwhile and as the one which might have beneficial effects. In addition to this, we had provided the focus group students with sufficient information so that they could make an informed decision as to whether to get involved in the research or to withdraw from it freely.

The experiment had been conducted with the group of 136 undergraduate students, who had been studying the "Do Better Your Leadership Skills Up" elective

course as a part of their professionalism-related curriculum at International University of Business and Law, Ukraine. The course had been divided into two parts where half of it had been delivered offline only and the other half was face-to-face teaching accompanied by online support through application of the means of smart technology tools. The first half had used *traditional forms* of educational process, which were as follows: events, leadership labs, collaborative leadership projects, leadership challenges (competitions), workshops, trainings, and face-to-face tutorials. The second half of the course involved the use of the *software* (brain training programmes and memory and brain games) such as CogniFit, Lumosity, BrainHQ, NeuroNation, Brain Metrix, Eidetic, Fit Brains, BrainExer 2.0. At the entry stage, we had used pedagogic surveys, cognitive function test [14] to study the cognitive capabilities of the focus group students.

After the experiment had been done, we used a multi method approach of combining the close-ended and open-ended questions to get the feedback and the above cognitive test to measure the results of the experiment. The students fulfilled the questionnaire either offline or online. The questionnaire consisted of 15 questions and 13 of them were focused on the student perception of the interaction, instruction, course design and 2 questions required students' comment. They were as follows:

Interaction

1. Convergence of technology and traditional learning modes kept me always alert and focused.

2. I am satisfied with the quality of interaction between all involved parties.

Instruction

3. The use of convergence of technology and traditional learning modes in this course encouraged me to learn independently.

4. The course has encouraged me to manage my own learning.

5. My understanding has improved compared to similar courses I studied before.

6. I am satisfied with the level of effort this course required.

7. The instructor made me feel that I am a true member of the class.

8. Learning activities encouraged me to research for additional material.

9. The instructor uses the convergence of technology and traditional learning modes appropriately.

Course Design

10. The online activities made studying the course interesting and engaging.

11. The online activities helped me to relate different course elements.

12. The workload for the online activities was manageable.

13. This course helped me to develop problem-solving skills that will be useful for me professionally.

Open-Ended Questions

14. My reasons for my high learning achievements are:

15. My reasons for my low learning achievements are: …

Doing questions 1 to 13, the participants were supposed to express their view of their satisfaction with course applying a six-grade scale (Likert-type scale) of measurement with 1 meaning "Agree Strongly", 2 corresponding "Agree Moderately", 3 supposing to be "Agree Slightly", 4 – "Disagree Slightly', 5 – "Disagree Moderately' and 6 "Disagree Strongly". Open-ended questions section of the questionnaire was optional but desirable.

We used quantitative methods to analyze the data obtained through pedagogic surveys, cognitive function test, and we applied such Covariance-based Structural Equation Modeling (SEM) software as SPSS AMOS to evaluate the results because cognitive function of a person includes sub-components of latent constructs.

To deal with the other data, we used *Textalyzer* software to process the students' responses to open-ended questions of the questionnaire for the most commonly used positive words in the texts, which helped us to identify broad categories of responses. Here, the most commonly used words we distinguished were "involvement", "improvement", "gamification", "motivation", "speed", "concentration", "memory", "current studies", "future job". Then we distributed the

answers by the frequency of the identified words. The responses, which fell under no category, were analyzed manually.

It was important for our study to be able to assess any change, whether it had been an improvement or decline in teaching and learning effectiveness in terms of some assessable outcomes. Accordingly, we proposed to assess the influences of the various teaching and learning approaches in terms of the following dimensions of comparative and contrastive analysis: a) learning process improvement in respect of teaching and learning efficiency as measured by appropriate tests and evaluations; b) quality of experience of the stakeholders – teachers and learners; c) degree of stakeholder involvement in the virtual and physical spaces as a further evidence of a) and b) above.

RESULTS

The focus group involved 136 undergraduate students for the International University of Business and Law. The demographic data for the group was as follows: year of study: 2nd year – 28% 3rd year – 31% 4th year – 41%; median age – 20; enrolment status: full-time – 92%, part-time – 8%; gender: males – 47%, females – 63%. Both qualitative and observational data had been yielded from the focus group. In addition to this, we had selected quotations from students, which seemed the most illustrative of the student experience.

Overall, the students had expressed favourable views of the course format and content.

The majority of the students involved in the experiment had reported improvement in their concentration, memory, speed of thinking, flexibility in solving problems.

For instance, one of the students said: “It is my professional orientation that remains in my life for a longer time than just concentration on theory”. The others enjoyed gamification in NeuroNation and methods of training mental athletes in BrainHQ.

Graphical Representation of the Results

Overall, it is noteworthy and it is illustrated by the figures that the Quality of the Experiment mattered a lot for both learning modes being either traditional or smart technology supported ones. As Figure **1** suggests, the crucial factor for fostering cognitive aspects of leadership competencies in the process of vocational training of students seemed to be the teaching method design to involve the students in the learning process and its effectiveness. From this, we can assume that the mode of study impacts on the students’ outcome. Ineffective teachers’ attempts can lead to a low-level performance from the students.

The second important factor in this regard was motivation, which is likely to grow as smart technology is integrated into the learning process. This might be

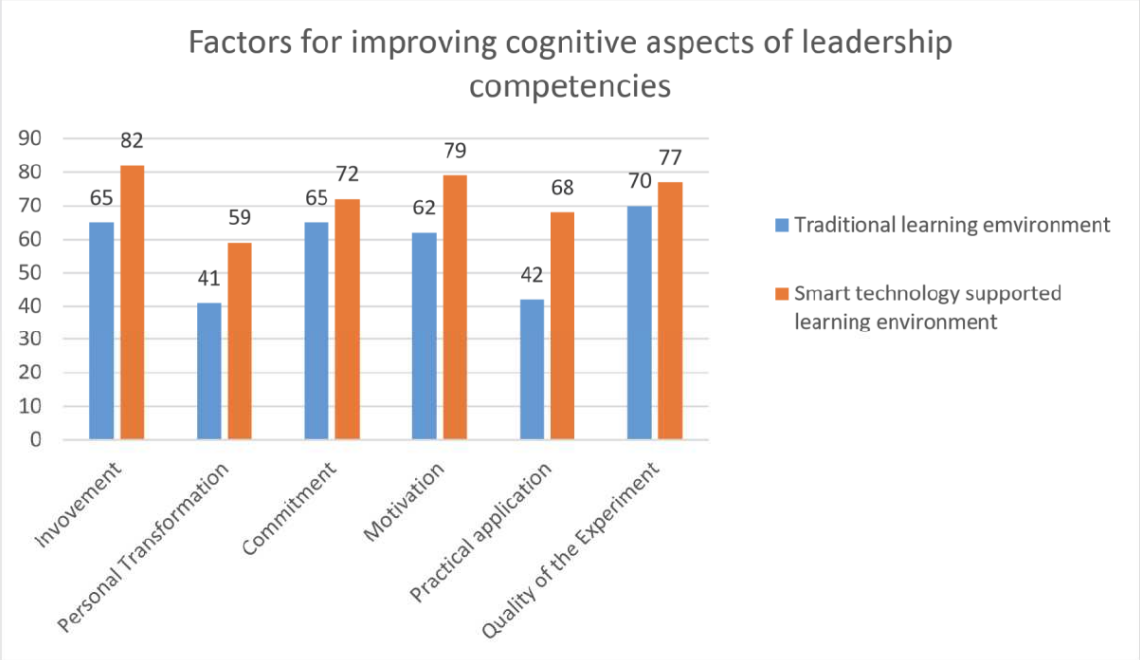

Figure 1: Factors for improving in cognitive aspects of leadership competencies.

related to the practical applicability of the cognition development software combined with the classroom learning experience of the students.

Figure **2** proves that it has still been a challenge for the Ukrainian vocational teachers to communicate and collaborate with their students using smart technology, specifically to foster cognitive aspects of leadership competencies in the process of vocational training of students, which prevents students from both gaining benefits and succeeding in learning. Teachers mostly rely on classroom activities, which, they believe, correspond to the students' professional experience and the cognitive learning potential. Despite the fact that there was observed transformation to online materials, we found that paper-based materials, though less commonly used, had been popular. In addition, the teachers/lecturers of tertiary institutions in Ukraine were forced to use reproductive cognitive techniques, because their students had lacked study motivation and the level of higher vocational education was not high. Additionally, the students in the traditional mode had reported more workload, which influenced their motivation substantially.

LIMITATIONS

This study examined the results of the elective course based on the convergence of smart technology and face-to-face learning in fostering leadership competencies of students in the settings of vocational training. One of the major limitations of this research was institutional involvement – the study had been conducted in a single institution. Another limitation is related to the age of the focus group – the second and the third year students of Bachelor programmes. And, as some of the members of our research group had been involved in the course design, we assume that the researcher bias could have been a kind of a limitation as well.

DISCUSSIONS

As discussed in the Materials and Methods section, a framework for assessment of the impact of different modes to Teaching and Learning leadership competencies in the process of vocational training had been envisaged as involving an improvement, or alternatively a decline.

The teaching and learning process efficacy corroborated by an either a heightened or a lowered Quality of Involvement and Quality of the Experiment with associated Physical Participation Evidence or Virtual Participation Evidence of the stakeholders as appropriate.

With regard to the impact factors of traditional and smart technology had supported teaching and learning modes on the resulting of both stakeholders' experiences our findings have permitted the following assessment:

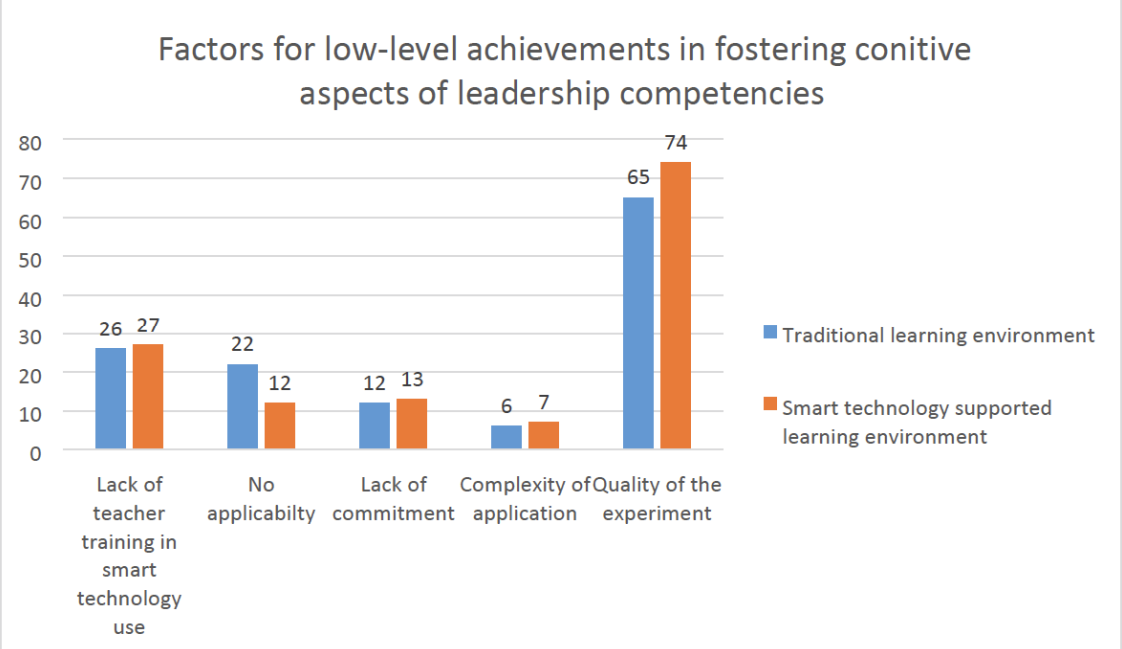

Figure 2: Factors for low-level achievements in fostering cognitive aspects of leadership competencies.

I) With purist traditional approaches to teaching and learning cognitive aspects of leadership competencies, that is instructor-led teaching and learning, the learning efficacy is relatively low.

II) However, with integration of smart-technology tools which can be used in either traditional class-room or virtual environment allowing various teaching and learning approaches and spaces (physical and virtual) to teaching and learning cognitive aspects of leadership competencies, the efficacy of the learning process can be higher which in turn is associated with higher physical and virtual participation evidence.

Our findings extended in [15] research and showed that the professional competence of a teacher, their knowledge and skills determines students learning outcomes.

The development of a competency-based approach, which is currently used at universities in Ukraine, mainly depends on existing institutional conditions and capacities of a vocational education and training provider. For this reason, if smart technology-enhanced fostering cognitive aspects of competencies, and leadership skills in particular, in the process of vocational training of students is to be deployed on a greater scale, it will require teacher (re)training, distribution and personalised delivery of learning materials to provide a supportive environment (Figure **3**) for this convergent pedagogical model.

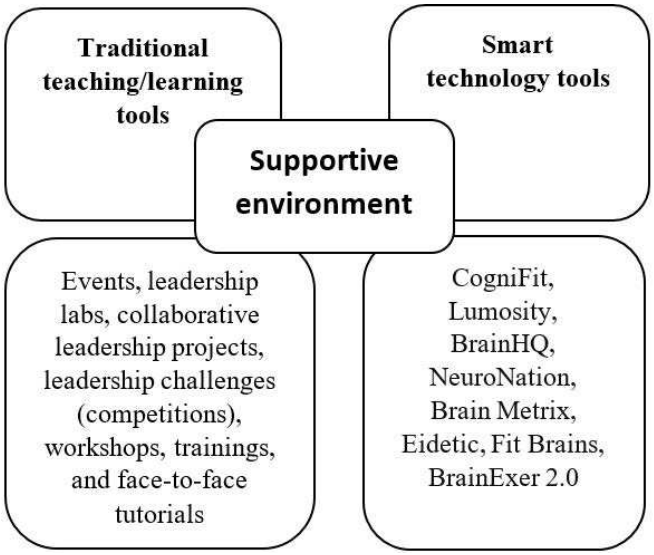

Figure 3: Supportive environment for the convergent pedagogical model of fostering cognitive aspects of leadership competencies.

It is important for the above model to ensure that the learning process should involve the activities that may intrigue and retain the attention of the learner and sustain a motivated interest to learn.

This model improves performance in cognitive aspects of leadership competencies, increases motivation and commitment of the students in the process of their vocational training. Moreover, it develops the learner's habits and skills for life-long learning involving a personalised-balance, to suit individual learning styles, alongside with the various educational dimensions, from instructor-led ones to autonomous learning.

This confirms the [16] research revealing, that the teacher-learner collaboration is enhanced when smart education technology is integrated with the instruction process. However, there are three main aspects impacting crucially on the success of the above collaboration enhancement: a) teachers'/tutors' motivated use of the technology; b) proficiency level of teachers and tutors in technology use; c) preparedness of teachers'/tutors' to use educational innovations. If the teachers'/tutors' fail to ensure the above, it causes learners to face hardships, challenges and problems, which are often discouraging for the students.

Overall, our experimental output had proved that the students, while involved in a convergent mode of fostering cognitive aspects of leadership competencies, had gained more benefits compared to their studying traditionally. In addition to this, the learning mode had offered both stakeholders - academic institution and instructors – an increased flexibility in providing learners with opportunities to satisfy their increasing learning needs.

CONCLUSIONS

This study had specified and assessed both the factors which positively influence cognitive aspects of leadership competencies and the factors leading to underperformance in fostering cognitive leadership competencies through the integrated use of the smart technologies and traditional methods of educating students in the process of vocational training.

We had found that the crucial factor influencing positively on cognitive aspects of leadership competencies was enhancement of the collaboration and involvement of all the stakeholders of educational process. This was due to the fact that it had been

based on the added-value principle of learning and intended to encourage the learner as it provided the intellectual and motivational challenge to the student and made him/her achieve the greatest personal satisfaction through enhanced self-esteem, efficiency gains, a sense of continuous personal achievement and enhanced autonomy and experimenting with own teaching and learning strategies. The second factor bringing positive effect had been the converged pedagogical mode of fostering cognitive aspects of leadership competencies in the process of vocational training of students that had the potential to update and create a cutting-edge educational program that equipped students with convergence experiences and skills needed to be successful professionals.

With regard to the factors leading to underperformance in fostering cognitive leadership competencies, we had found that the first and the uppermost one was that universities (of Ukraine, specifically) did not manage to provide necessary training to the teachers with all the latest technology, which seems essential for teaching. Teachers did not show enthusiasm to learn about new technology (smart technology tools) and how to use them in the teaching process. The research in the use of smart technology appeared to be underinvested by government and academic institutions (of Ukraine).

Given the above, we suggest launching the award programmes to further motivate teachers to design and implement the creative technology involving models of teaching and learning enabling co-learning and knowledge co-creation. We foresee a good prospect for the further study of co-learning and knowledge co-creation through the utilisation of the creative technology.

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REFERENCES

[1] Dawson S. 'Seeing' the learning community: An exploration of the development of a resource for monitoring online student networking. Br J Educ Technol 2010; 41(5): 736-752. https://doi.org/10.1111/j.1467-8535.2009.00970.x

[2] Hämäläinen R, Cattaneo A. New TEL Environments for Vocational Education–Teacher's Instructional Perspective. Vocations and learning 2015; 8(2): 135-157. https://doi.org/10.1007/s12186-015-9128-1

[3] Billett S, Choy S. Learning through work: Emerging perspectives and new challenges. J Workplace Learn 2013; 25(4): 264-276. https://doi.org/10.1108/13665621311316447

[4] Engle RW, Kane MJ, Tuholski SW. Individual differences in working memory capacity and what they tell us about controlled attention, general fluid intelligence, and functions of the prefrontal cortex. In: Miyake A, Shah P, editors. Models of working memory: Mechanisms of active maintenance and executive control. New York, NY: Cambridge University Press 1999; pp. 102-134. https://doi.org/10.1017/CBO9781139174909.007

[5] Cowan N, Elliott EM, Scott Saults J, Morey CC, Mattox S, Hismjatullina A, Conway AR. On the capacity of attention: Its estimation and its role in working memory and cognitive aptitudes. Cogn Psychol 2005; 51(1): 42-100. https://doi.org/10.1016/j.cogpsych.2004.12.001

[6] Gathercole SE, Pickering SJ, Knight C, Stegmann Z. Working Memory Skills and Educational Attainment: Evidence from National Curriculum Assessments at 7 and 14 Years of Age. Appl Cogn Psychol 2004; 18(1): 1-16. https://doi.org/10.1002/acp.934

[7] Engle RW, Tuholski SW, Laughlin JE, Conway ARA. Working memory, short-term memory, and general fluid intelligence: A latent-variable approach. J Exp Psychol Gen 1999; 128(3): 309-331. https://doi.org/10.1037/0096-3445.128.3.309

[8] Dries N, Pepermans R. How to Identify Leadership Potential: Development and Testing of a Consensus Model. HRMJ 2012; 51(3): 361-385. https://doi.org/10.1002/hrm.21473

[9] Yukl G. Managerial Leadership: A Review of Theory and Research. Journal of Management 1989; 15(2): 251-289. https://doi.org/10.1177/014920638901500207

[10] Zaccaro SJ. Trait-based Perspectives of Leadership. Am Psychol 2007; 62(1): 6-16. https://doi.org/10.1037/0003-066X.62.1.6

[11] Gundelsweiler F, Filk C. Future media platforms for convergence journalism. At the interface/Probing the Boundaries 2012; 83: 45-57.

[12] Mumford MD, Zaccaro SJ, Harding FD, Jacobs TO, Fleishman EA. Leadership Skills for a Changing World: Solving Complex Social Problems. Leadersh Q 2000; 11(1): 11-35. https://doi.org/10.1016/S1048-9843(99)00041-7

[13] Kim M, Kim S, Khera O, Getman J. The experience of three flipped classrooms in an urban university: An exploration of design principles. Internet & Higher Education 2014; 22: 37-50. https://doi.org/10.1016/j.iheduc.2014.04.003

[14] Food for the Brain. The Cognitive Function Test. [cited 2018 Oct 8]: Available from: https://cft.foodforthebrain.org/

[15] Deutscher V, Winther E. Instructional sensitivity in vocational education. Learn Instr 2017; 53: 21-33. https://doi.org/10.1016/j.learninstruc.2017.07.004

[16] Lin KY, Lu HP. Why people use social networking sites: An empirical study integrating network externalities and motivation theory. Comput Human Behav 2011; 27(3): 1152-1161. https://doi.org/10.1016/j.chb.2010.12.009

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