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## **Revista de Cercetare si Interventie Sociala**

ISSN: 1583-3410 (print), ISSN: 1584-5397 (electronic)

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*Yufeng CHEN, Zhengtao XIANG, Dengliang CHENG, Jieren XIE*

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Revista de cercetare și intervenție socială, 2019, vol. 64, pp. 223-234

<https://doi.org/10.33788/rcis.64.18>

Published by:  
Expert Projects Publishing House



On behalf of:  
„Alexandru Ioan Cuza” University,  
Department of Sociology and Social Work  
and  
HoltIS Association

REVISTA DE CERCETARE SI INTERVENTIE SOCIALA  
is indexed by Clarivate Analytics (Web of Science) -  
Social Sciences Citation Index  
(Sociology and Social Work Domains)

# A Study on Information Multimedia Integrated Introductory Course of Internet of Vehicles to Students' Self-Efficacy and Learning Effect

Yufeng CHEN<sup>1</sup>, Zhengtao XIANG<sup>2</sup>, Dengliang CHENG<sup>3</sup>, Jieren XIE<sup>4</sup>

## Abstract

Along with the rapid development of information technology, the information technology education trend is emerged. The enhancement of quality becomes the cross-century direction of education reform. To grasp the trend of time and integrate information multimedia into traditional teaching courses for enhancing teaching quality are the primary issues for professional teachers. With an experimental design model, Total 100 students of Hubei University of Automotive Technology, as the research objects. The class is an 8-week experimental instruction every Thursday (32 hours in total, 16 hours in class, another 16 hours are for out-of-class activities). The research results reveal that information multimedia instruction shows higher self-efficacy than general instruction and achieves the significance, information multimedia instruction reveals higher learning effect than general instruction and reaches the significance, and self-efficacy appears notably positive effects on learning effect. According to the results to propose suggestions, it is expected, through the integration of information multimedia, to induce and maintain students' interests in the curricula and even the willingness to make efforts towards the learning goal for better learning effect.

*Keywords:* information multimedia, Internet of vehicles introduction course, self-efficacy, learning effect.

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<sup>1</sup> School of Electrical and Information Engineering, Hubei University of Automotive Technology, Shiyan, CHINA. E-mail: xzcyf2002@163.com

<sup>2</sup> School of Electrical and Information Engineering, Hubei University of Automotive Technology, Shiyan, CHINA. E-mail: xzt74@163.com (Corresponding author)

<sup>3</sup> School of Electrical and Information Engineering, Hubei University of Automotive Technology, Shiyan, CHINA. E-mail: cdengl@qq.com

<sup>4</sup> School of Electrical and Information Engineering, Hubei University of Automotive Technology, Shiyan, CHINA. E-mail: xie\_hbqy@163.com

## Introduction

The time change in the globalization and the rapid development of information technology has deeply affected modern society. In addition to the enhancement of popularity and importance, the impact is comprehensive. In the wave of reform, the information technology education trend also appears in education, which is generally considered as not being easily changed. The pursuit of excellence and the enhancement of quality are the directions of the cross-century education reform. School education is no longer the simple relationship among schools, teachers, and students, but is the close connection among parents, teachers, students, communities, and societies. When the school orientation moves from elite towards popularity and from local towards comprehensive as well as adds technology elements, school functions are re-positioning. The clarification and change of teacher role as well as the development and delivery of course contents are rapidly changing. The change in teaching approaches could enhance teaching quality. When education reform is progressively preceded, traditional didactic teaching model could no longer satisfy students' needs for learning. To grasp the trend of time and to integrate information multimedia into traditional teaching courses for enhancing teaching quality are important issues for professional teachers. Information multimedia instruction, by matching different software with the functions provided by computer hardware facilities, combines teachers' teaching ideas and teaching material contents, which are presented with lively, vivid, diverse, and changeable effects through various media patterns of texts, graphs, sound, video, and animation, to improve the teaching quality.

Automobile industry is an important national fundamental industry that it has to follow national development positioning and talent cultivation goals to fully develop the background advantage of major constructions, tightly surround "automobile industrial train", optimize professional structure, and expand specialties. It accords the professional construction and development paths of "adjusting structure, outstanding characteristics, developing advantages, stressing on contents, and enhancing quality" to develop professional construction with levels and classifications. Besides, it focuses on "automobile industrial train" to actively cultivate the development of automobile industry and new specialties urgently required for local economic development, such as national strategic emerging industry related specialties or the directions like new materials and new energy automobiles. Aiming at information multimedia integrated Internet of vehicles courses to study students' self-efficacy and learning effect, it is expected that the integration of information multimedia could induce and maintain students' interests in the learning curricula and willingness to working harder to move towards the learning goal for better learning effect.

## Literature review

### *Information multimedia instruction*

Chan *et al.* (2016) explained information multimedia integrated instruction as integrating information technology into curricula, materials, and instruction to have information technology become an inevitable teaching and learning tool and the use of information technology become a part of daily teaching activities in classrooms. Ubbink *et al.* (2015) indicated that, when practicing information multimedia integrated instruction, it could not definitely distinguish the curricula being to learn the use of information technology or simply to learn other subjects or domains. In other words, Clark & Mayer (2016) explained that information technology was actually integrated into other learning domains, rather than being an independent subject. Abuzour, Lewis, & Tully (2018) mentioned that “information technology” in information multimedia integrated instruction referred to computer multimedia or network technology, which presented the functions of digitalization, multiple stimulation of video, sound, and light, easy access, rapid processing, convenient communication. “Implementation of integration”, on the other hand, was the instructional integration and application, i.e. becoming an instruction tool. Mavhu *et al.* (2018) simply described the meaning of information technology integrated instruction as teachers matching the instruction contents and approaches, applying the characteristics of computer multimedia, and regarding information technology as an instruction tool. Barry *et al.* (2016) therefore indicated that information technology integrated instruction did not simply refer to teachers being able to use computers; more precisely, it referred to teachers being able to use computers for more effectively achieving the teaching goals. Niknejad & Rahbar (2015) mentioned that, to acquire the maximal effectiveness of computer integrated instruction, it was necessary to mutually treat computer subject and other subjects as the body, i.e. integrating proper knowledge of other subjects into the instruction with computer as the subject. Meanwhile, the most suitable computer related functions were selected in the instruction of various subjects for the integrated instruction.

### *Internet of vehicles course*

Internet of vehicles, as a kind of Internet of Things being able to collect, identify, transmit, integrate, and utilize in-vehicle information, could realize intelligent identification, positioning, tracking, monitoring, and management and is regarded as the application of Internet of Things being able to easily form the system standards and present industrial potential applications. Internet of vehicles courses are interpreted from cognition, transmission, support, and application to have students majoring in electronic information science and technology (Internet of vehicles engineering) preliminarily understand the basic concept, technology

framework, and application coverage of Internet of vehicles as well as make the foundation for successive learning of relevant courses. Based on cognition, transmission, support, and application, Internet of vehicles courses correspond relevant professional courses and Internet of vehicles system structure by terms so that students could clearly understanding the positions of the learned professional courses in Internet of vehicles.

Students are also cultivated the comprehensive quality in the Internet of vehicles course instruction on the following dimensions.

- (1) Cultivation of students' literature search and technological writing ability. It involves in essay format, essay organization, reference, as well as the writing requirements for abstract, introduction, and conclusion. Similarly, presentation seems to be easy, but students would understand the basic requirements for technology writing and lay the foundation for the graduation essays and technology data writing.
- (2) Cultivation of students' expression ability. Students, for this course, are requested a 10-min PPT report that they have to prepare formal class reports. It does not simply ask students to clearly express the course content, but to meticulously design the report content, class process, and demeanor.
- (3) Cultivation of students' teamwork. Students, for this course, are requested to complete the class report and course report with groups, which could be freely grouped. In the task distribution process, students have to select the principal and distribute individual tasks. The course evaluation could be outstandingly completed merely with cooperation.

### *Self-efficacy*

Chang *et al.* (2015) regarded self-efficacy as individual belief in personal ability; in other words, an individual was confident of the performance achieving the expectation, as the motive of behaviors. Howard & Navarro (2016) defined self-efficacy as the subjective evaluation of individual ability to engage in certain work and to complete the work. Saelao, Tubsree, & Markwardt (2016) further explained that individual judgment of personal efficacy would affect the set goals, engaged energy, and persistence in facing difficulties and frustration. Ahmad & Khan (2017) stated that the intensity of human belief would determine the effort to cope with difficulties; the higher expected self-efficacy would result in more active action. McCann & Marek (2016) indicated that self-efficacy was not the skill which could be possessed, but referred to individual belief in dealing with events with self-owned skills.

Referring to Huang & Chuang (2016), self-efficacy in this study contains three dimensions.

- (1) Cognition effect: People with higher self-efficacy would present higher ambition and longer points of view, more thoughtful, and more willingness to accept difficult challenges and would insist in devoting to such challenges.
- (2) Motivation effect: Personal self-efficacy belief in completing certain events would affect people's goal setting, action strategies, efforts to make, persistence in facing challenges, and recovery from frustration.
- (3) Mood effect: When encountering dilemmas or threats, the pressure which people could bear relies on the degree they could complete the events.

### *Learning effect*

Chang, Lai, & Hwang (2018) referred learning effect as various evaluations aiming at learners after completing certain learning activities for a period of time and the achievement of expected effect. In other words, it could be learners' changes in knowledge, skills, behaviors, and attitudes after the completion of instruction. Mullis & Martin (2015) regarded learning effect as the indicators for teaching evaluation and measurement of learners' learning outcome. Zarshenas *et al.* (2017) proposed to measure with various indicators, including learning satisfaction, self-evaluation, learning interests, performance, experience, and the learning behaviors and learning outcome of the evaluation and participation in the learning activity process. Santangelo *et al.* (2016) proposed the consistent idea of academic performance, learning effectiveness, or academic achievement as students' learning effect on school subjects or the persistent results through learning process. Abdullah & Ward (2016) indicated that the indicator to evaluate students' learning effect was a major item to evaluate teaching quality, learning effect would be affected by curriculum design, teaching approaches, and learning behaviors, and students' learning aimed to monitor self-learning, reflect learned knowledge, and learn how to learn; accordingly, learning effect was the direct presentation of learning outcome. Learning effect aimed to test the achievement of learning or teaching goals and timely correct or feedback to the improvement of next courses. Terrazas-Arellanes *et al.* (2016) pointed out learning effect as learners' learning performance, including formative and summative evaluation. Referring to Chan & Sy (2016), learning effect in this study is measured by test performance, completion time, and term performance.

### *Research hypothesis*

Chan *et al.* (2016) proposed that the rich resources in information multimedia provided auxiliary materials for courses and constructed diverse, rich, lively, and interesting learning situations with different learning activities to effectively promote students' self-efficacy. Alvarez-Nieto *et al.* (2018) mentioned that vivid and interesting contents in information multimedia could be the guiding situations for learning activities, information multimedia group learning could cultivate critical

abilities required for students, and information multimedia assisted instruction software could be used for individual remedial teaching to enhance students' self-efficacy. Abuzour, Lewis, & Tully (2018) stated that information multimedia allowed learners presenting immersed perception and users repeatedly practicing. The combination of visual reality technology with traditional computer assisted instruction could provide learners with a more flexible, authentic, and better-effect learning environment to effectively enhance students' self-efficacy. Mavhu *et al.* (2018) indicated that the development of information multimedia into information multimedia materials allowed students directly interacting in virtual and real worlds to promote the learning motivation and self-efficacy as well as to enhance the learning effect. Accordingly, the following hypothesis is proposed in this study.

*H1: Information multimedia instruction presents higher self-efficacy than general instruction and achieves the significance.*

Chang *et al.* (2015) pointed out the great effect of information multimedia instruction on the promotion of students' learning effect that it was a practicable teaching approach to promote students' learning effect and enhance students' learning interests and attitudes. Ahmad & Khan (2017) mentioned that the application of information multimedia integrated instruction should be able to help students transfer actual experiences to iconicity representation and to symbols or abstract experiences. In other words, Howard & Navarro (2016) indicated that using more than two media, e.g. animation, language, and texts, in instruction could positively assist in learners' teaching content learning, reflection, and search as well as promote the learning effect. Huang & Chuang (2016) stated that the application of information multimedia integrated instruction could better assist in the realization of cooperative learning, constructive learning, synchronous learning, and asynchronous learning than traditional instruction. The ubiquitous characteristics of information technology allow instructors creating a real-time interactive environment for learning activity being diversified and more efficient so as to promote learning effect. For this reason, the following hypothesis is proposed in this study.

*H2: Information multimedia instruction shows higher learning effect than general instruction and reaches the significance.*

Chang, Lai, & Hwang (2018) discovered that learners with higher self-efficacy could more actively solve learning difficulties with learning strategies; however, students with lower self-efficacy would require the assistance of teachers or peers to solve learning difficulties. Higher self-efficacy therefore would result in better learning effect. Zarshenas *et al.* (2017) considered that self-efficacy could predict learning performance. According to past research, self-efficacy was correlated with learning outcome. Abdullah & Ward (2016) mentioned that some studies pointed out the effect of learners' self-efficacy on the learning behaviors

and effect in network-based education. Chan & Sy (2016) also discovered that students with higher self-efficacy presented more active learning attitudes and better learning performance on network-based education and learners with high self-efficacy would show higher-quality learning strategies. Accordingly, the following hypothesis is proposed in this study.

*H3: Self-efficacy reveals remarkably positive effects on learning effect.*

## **Methodology**

### *Measurement of research variable*

(1) Self-efficacy: Referring to Huang & Chuang (2016), self-efficacy in this study is divided into (1)cognition effect, (2)motivation effect, and (3)mood effect.

(2) Learning effect: Referring to Chan & Sy (2016), learning effect in this study is measured with test performance, completion time, and term performance.

### *Research object and research design*

To effectively achieve the research objective and test the research hypotheses, experimental design model is applied in this study. Total 100 students of Hubei University of Automotive Technology, as the research objects, are divided into the experimental class (65 students) with information multimedia instruction and the control class (35 students) with general traditional didactic teaching for the 8-week (4 hours per week for total 32 weeks) experimental instruction, where 16 hours are for in-class and another 16 hours are for out-of-class activities.

The course integrates information multimedia and the application into the curriculum teaching to integrate various information multimedia into class teaching as well as requests students for applying information multimedia technology to course reports and class reports in the out-of-class hours. The evaluation of the course contains “course report (60%) and class report (40%)”. It request students to develop the subjective initiative after class, fully apply information multimedia technology, complete course reports corresponding to a subject with formal technology literature formats, and report the course report with PPT presentation.

### *Analysis method*

Analysis of Variance is applied in this study to discuss the difference of Internet of vehicles courses with information multimedia instruction in self-efficacy and learning effect. Regression Analysis is further used for understanding the relationship between self-efficacy and learning effect.



## Results

### *Effects of information multimedia instruction on self-efficacy and learning effect*

Variance analysis of information multimedia instruction on self-efficacy

According to Analysis of Variance, the application of information multimedia instruction is discussed the difference in self-efficacy. Table 1 shows that different teaching approaches reveal significant differences on cognition effect; information multimedia instruction (4.11) appears higher cognition effect than general traditional instruction (3.42). Different teaching approaches present remarkable differences on motivation effect; information multimedia instruction (4.32) shows higher motivation effect than general traditional instruction (3.23). Different teaching approaches reveal notable differences on mood effect; information multimedia instruction (4.06) appears higher mood effect than general traditional instruction (3.37). H1 is therefore supported.

*Table 1: Variance analysis of information multimedia instruction on self-efficacy*

variable		F	P	Scheffe post hoc
information multimedia instruction	cognition effect	429.516	0.000*	information multimedia instruction>general traditional instruction
	motivation effect	802.359	0.000*	information multimedia instruction>general traditional instruction
	mood effect	333.373	0.000*	information multimedia instruction>general traditional instruction

\* stands for  $p < 0.05$

### *Variance analysis of information multimedia instruction on learning effect*

According to Analysis of Variance, the difference of applying virtual reality to information multimedia instruction in learning effect is discussed. Table 2 shows that different teaching approaches reveal significant differences on learning effect; information multimedia instruction (4.26) appears higher learning effect than general traditional instruction (3.52) that H2 is supported.

Table 2: Variance analysis of information multimedia instruction on learning effect

variable		F	P	Scheffe post hoc
information multimedia instruction	learning effect	427.355	0.000*	information multimedia instruction>general traditional instruction

\* stands for  $p < 0.05$

### Correlation analysis of self-efficacy and learning effect

To test H3, the analysis results, Table 3, reveal remarkable effects of cognition effect ( $\beta=0.827^{**}$ ), motivation effect ( $\beta=0.049^*$ ), and mood effect ( $\beta=0.104^*$ ) on learning effect that H3 is supported.

Table 3: Analysis of self-efficacy to learning effect

dependent variable → independent variable ↓	learning effect	
self-efficacy	$\beta$	Beta
cognition effect	0.827**	0.850
motivation effect	0.049*	0.049
mood effect	0.104*	0.103
F	4809.636	
significance	0.000***	
R2	0.997	
adjusted R2	0.993	

Note: \* stands for  $p < 0.05$ , \*\* for  $p < 0.01$ .

Data source: self-organized in this study

## Conclusions

The research findings show that teachers, in information multimedia education situations, are not simply the instructors, but also the guides, that the role in students' learning process would not disappear, but simply change, in the open

and diverse learning environment. In this case, to create learning situations for inducing learning motivation, to attract learners focusing on the learning subjects in Internet of vehicles courses with information multimedia instruction strategies, and to constantly give encouragement and feedback would enhance students' self-efficacy and learning effect. The application of information multimedia assisted instruction could excite learners' learning motivation, induce learners' curiosity, interests, and concentration, and facilitate learners establishing self-confidence in motion skills through a series of learning and practice. In this case, it would provide positive affection for learners' achievement and learning experience to better maintain learners' learning motivation and enhance the learning effect.

### *Recommendations*

Aiming at above research results, the following suggestions are proposed in this study.

(1) In order to continue learning interests, a teacher, when designing Internet of vehicles courses, should pay attention to the content picture conforming to the instruction objectives. In addition to attracting students' attention, challengeable activities and games should be added to the presented contents on the information multimedia and the prompts in the teaching process to guide the students exploring the learning experience or the prior ability as well as the learning value and the effect and importance of the teaching activity to individuals.

(2) Students' individual differences should be noticed in the setting of learning goals for Internet of vehicles courses. For the provision of successful cases and to encourage students establishing self-expectation according to personal abilities, a teacher could set objectives which can be more easily achieved by students to enhance the success rate. The objectives could be enhanced when higher self-efficacy is established; otherwise, students might lose the learning interests because of not immediately achieving the objectives to affect the learning motivation.

(3) In the application of information multimedia instruction, a teacher should not shorten the contents or ignore students' feedback. In addition to personal demonstration and emphasis on students' feedback, a teacher being good at applying information multimedia, utilizing the video characteristics, and creating an alternative interaction with students for the complementary application of traditional instruction would present positive effects on instruction.

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