



Working together
www.rcis.ro

Revista de Cercetare si Interventie Sociala

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

AN INVESTIGATION OF THE EFFECTS OF USING AUDIO-VISUAL LANGUAGE EDUCATION INTEGRATED ART TEACHING ON STUDENTS' LEARNING MOTIVATION AND OUTCOME

Yuan YUAN, Jianfei YANG

Revista de cercetare și intervenție socială, 2024, vol. 87, pp. 252-264

<https://doi.org/10.33788/rcis.87.15>

Published by:
Expert Projects Publishing House



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

An Investigation of the Effects of Using Audio-Visual Language Education Integrated Art Teaching on Students' Learning Motivation and Outcome

Yuan YUAN¹, Jianfei YANG²

Abstract

Many school classrooms currently possess a sufficient amount of equipment and wireless network. This can change teachers' instruction styles as well as students' learning styles. Especially, through the teaching policy to promote information integrated instruction, teachers can present the lessons more clearly. This study was designed as experimental research. This quasi-experimental study comprised 206 Chinese students, who were randomly assigned to either an experimental group (n = 103) or a control group (n = 103). The experimental group received instruction through an integrated audio-visual language and art teaching methodology, while the control group underwent traditional print-based instruction. The intervention spanned 20 weeks, with participants receiving three hours of instruction per week (total intervention time = 60 hours). Findings revealed that 1. the audio-visual integrated teaching approach demonstrated statistically significant superiority over traditional print-based methods in two key domains: art learning motivation and learning outcomes. 2. The use of audio-visual language education integrated art teaching, with teachers' situated guide, leads to an increase in the students' art learning interests. It enables absorbing and comprehending the learning content more easily and in a pleasant and relaxing learning climate which can promote the practical use in life, and 3. Using audio-visual language education integrated art teaching encourages students to engage in independent practice and creates dialogue situations. It is expected that this study will enhance students' self-confidence in art learning and promote students' learning outcomes. Through these, the learners are expected to achieve the objectives of art teaching.

Keywords: audio-visual language; learning outcomes; learning motivation; analysis of variance; movie white snake.

¹ International College, Krirk University, THAILAND. E-mail: 15180009@qq.com; ORCID: 0009-0000-5444-3083

² International College, Krirk University, THAILAND. E-mail: 81711533@qq.com; ORCID: 0009-0006-8744-4510

Introduction

Most students are bored of learning English with textbooks. Some students even express textbook content being extremely boring, and they say that it does not attract their attention and reduces their art learning motivation and outcomes (Ketut Sudarsana *et al.*, 2019). Many classrooms are equipped with sufficient equipment and wireless network that can gradually change teachers' instruction and students' learning style. Especially, in terms of an innovative teaching policy to promote instruction, many people claim that school education should not stay in the times in which textbooks are the sole source of information (Gagnon *et al.*, 2021). audio-visual language education can be quickly updated, it can provide real-time and more diverse learning materials, reduce the weight of students' schoolbag, decrease the consumption of paper resource, and present various learning assistive tools that help teachers conduct lessons more clearly and promote students' willingness to learn as well as the effectiveness of their learning. audio-visual language education is therefore gradually emphasized and it has come to be widely used in classrooms (Sung *et al.*, 2019).

The distinctive aesthetic composition and performative intensity characteristic of operatic cinema represents a significant medium for the dissemination of operatic cultural heritage within the context of audio-visual pedagogy. The increasing presence of Chinese opera films at both domestic and international film festivals has catalyzed substantial market recognition, signaling a renaissance in this cinematic genre. This commercial vibrancy has fostered favorable sociocultural conditions for the preservation and propagation of traditional Chinese operatic arts. Furthermore, the confluence of cinematic and operatic elements has created an innovative platform for cultural transmission, particularly within contemporary audio-visual educational frameworks. *White Snake-2021*" (released May 20th, 2021) represents a significant technological milestone in Chinese cinematic history as the nation's inaugural 4K Cantonese operatic production incorporating Atmos sound technology. This adaptation reinterprets the traditional narrative structure of its 1980 predecessor through a contemporary lens, employing romantic relationships as its primary narrative framework. The film's narrative architecture effectively illustrates the societal manifestations of romantic pursuit and emotional conflict, while simultaneously achieving a sophisticated synthesis between traditional Cantonese operatic artistry and contemporary technological innovation in educational contexts. *White Snake-2021*, using old story for new, conserved the subtlety of conventional Cantonese operas and made contemporary audio-visual language education with opera films to win young audience's craze. It provided precious experience and education for passing down and developing conventional opera culture as well as expanding the communication way and route of operas. The present study examines the efficacy of integrating audio-visual language education within art instruction, specifically investigating its impact on student motivation and academic outcomes. This pedagogical approach aims to enhance

students' self-efficacy in artistic endeavors while concurrently developing their auditory comprehension and textual analysis capabilities. The ultimate objective is to optimize art education outcomes through the systematic implementation of multimodal instructional methodologies.

Literature Review

Audio-visual language education is gradually developed into a unique education style. With filmmakers' exploration and efforts for century, audio-visual language education, through each excellent director's interpretation with different styles, becomes a type of communication education and social information communication education. Akar (2020) regarded Audio-visual language education as textbooks presented in digital or electronic forms. The contents of e-textbooks can be read on various devices or e-book platforms. According to Peters *et al.* (2021), audio-visual language education has fundamentally transformed traditional pedagogical paradigms. This methodological shift has served dual purposes: enhancing student engagement and facilitating more effective content acquisition and assignment completion. The integration of audio-visual elements into language instruction has demonstrated significant potential for optimizing learning outcomes through increased accessibility and motivational support. The government started to provide more equipment and planning for information integrated instruction in schools. After that, schools are able to benefit from digital devices (e.g., electronic whiteboard, tablet PCs) in classrooms more. To cope with the requirements - of information age, many publishers provide electronic materials in a CD in addition to original teacher's handbooks or teaching guide. These electronic materials include guidance for teachers to conduct the lesson effectively, recording, examination, and interaction with electronic whiteboard. In comparison with traditionally fixed, static, and hard-copy textbooks, the electronic materials can better reflect the teaching trend and the learning traits in e-generation that promote students' learning motivation (Liu *et al.*, 2020). Accordingly, the following hypothesis can be proposed in this study.

H1: The implementation of audio-visual language education integrated into art instruction will demonstrate a statistically significant positive effect on student learning motivation compared to traditional instructional methods.

In their conceptual framework, Hsieh and Huang (2020) operationalized audio-visual language education as a binary system comprising textual and pictorial elements. The textual component encompasses written, visual, and oral-expressive linguistic patterns, while the pictorial dimension incorporates both static representations (including illustrations, coordinate maps, diagrams, photographs, and cartographic materials) and dynamic visual media (such as animations and cinematographic content). Building upon this framework, Raes

et al. (2020) characterized audio-visual language education through the lens of text-picture integration, introducing parallel terminology such as dual-code learning and double-channel learning to describe this pedagogical approach. Their analysis further crystallized the definition of multimedia instruction as the systematic integration of textual and pictorial information delivery systems. This conceptual convergence establishes audio-visual language education, or multimedia instructional presentation, as fundamentally rooted in the synthesis of textual and pictorial modes of information transmission. E-textbooks are more flexible and fulfill the needs of the time better than traditional textbooks. Audio-visual language education can be updated anytime which enables them to present more recent information. The multimedia presentation can improve students' learning interests as well as guide teachers to implement teaching strategies to reach better learning outcomes (Braad *et al.*, 2020). Mailizar *et al.* (2021) stated that current Audio-visual language education mostly enable teachers to use electronic discs in the suitable computer software/hardware equipment, LCD projector, electronic whiteboard, computer, or TV screen. In these devices it can be possible to display text content, supplementary materials, and relevant multimedia resources for instruction. They also stated that students concentrate on learning better through lively teaching materials which can facilitate their learning interests and promote the learning outcome. Lobova *et al.* (2020) explained that the use of e-textbooks with learning resources such as multimedia, animation, game, and test for elementary school students can result in lively performance through images on textbooks and it can improve students' learning to a great extent. Besides, e-textbooks' pages are consistent with students' hard-copy textbooks so that the interactive links between students and teachers can be established. Teachers' instruction can be smoother through the zooming, annotation, and automatic page turning functions. On the other hand, students' concentration can be improved. Consequently, the use of Audio-visual language education in instruction to promote learning outcome is an quite useful strategy for teachers. Based on the aforementioned theoretical framework and empirical evidence, this study proposes the following hypothesis:

H2: Using audio-visual language education integrated art teaching has significantly positive effects on learning outcome.

A substantial body of empirical research has demonstrated the intrinsic relationship between learning motivation and academic outcomes. Lee *et al.* (2019) established a positive correlation between students' motivational levels and their learning achievements, while Elenein (2019) identified enhanced learning motivation as a significant predictor of improved academic performance. Students exhibiting higher levels of engagement demonstrate more positive attitudes toward learning activities and deeper content comprehension. This understanding suggests that instructional design should prioritize motivational factors to optimize both engagement and learning outcomes.

Further empirical evidence from Odell *et al.* (2020) indicates that highly motivated students exhibit more clearly defined learning objectives and stronger academic drive, resulting in superior learning outcomes and enhanced self-efficacy. Cahapay's (2020) research corroborated these findings, additionally revealing that intrinsically motivated students demonstrated significantly higher performance levels compared to their extrinsically motivated counterparts.

Concurrent with these motivational findings, the educational landscape has undergone substantial digital transformation. The integration of e-textbooks has become a pedagogical imperative, with educators increasingly developing technological competencies to facilitate their implementation. Lorenzo-Lledó *et al.* (2021) note that the incorporation of digital hardware and software infrastructure has become standardized in contemporary educational environments, leading to increased adoption of technology-integrated instructional methodologies.

Based on this theoretical and empirical foundation, the following hypothesis is proposed:

H3: Learning motivation has significantly positive effects on learning outcome.

Methodology

Measurement of variables

Learning motivation. Following Li *et al.* (2021), learning motivation can be described with interest in knowledge and external expectation.

- 1) Interest in knowledge: The process of maintaining and guiding learning activity, being able to automatically involve in efforts and maintain learning motivation during learning.
- 2) External expectation: Participating in learning in terms of obeying the instructions or satisfying the expectations. The other forces that obeyed are generally authorities such as parents, family members, employers, and even other adult learners.

Learning outcomes. Following Chen's (2021) conceptual framework, learning outcomes were measured across two dimensions:

- 1) Learning Effect Quantitative metrics including: (a) academic test performance; (b) task completion efficiency, and Terminal course achievement;
- 2) Learning Gain Qualitative indicators encompassing: (a) learning satisfaction indices; (b) achievement perception; (c) subject matter preference

Research Design and Sample Selection

This quasi-experimental study employed a between-subjects design with random assignment. The sample comprised 206 Chinese students, equally distributed between experimental ($n = 103$) and control conditions ($n = 103$). The experimental

group received instruction through audio-visual language education integrated art teaching utilizing e-textbooks, while the control group underwent traditional print-based instruction. The intervention spanned 20 weeks, with participants receiving three hours of instruction weekly (total intervention time = 60 hours).

Analysis method

Statistical analyses were conducted using SPSS software, employing the following methods: (1) Factor analysis for construct validation; (2) Reliability analysis for instrument validation; (3) Analysis of variance (ANOVA) to examine between-group differences in learning motivation and outcomes; (4) Regression analysis for hypothesis testing.

Results

Reliability and validity analysis

- Learning motivation. Factor analysis revealed a two-factor structure for the learning motivation construct: (1) Interest in Knowledge: Eigenvalue = 3.162; Cronbach's $\alpha = 0.87$; (2) External Expectation: Eigenvalue = 2.752; Cronbach's $\alpha = 0.91$. The two-factor solution accounted for 75.463% of the total variance, demonstrating robust construct validity.
- Learning outcome. Factor analysis yielded two distinct factors: (1) Learning Effect: Eigenvalue = 2.836; Cronbach's $\alpha = 0.89$; (2) Learning Gain: Eigenvalue = 2.421; Cronbach's $\alpha = 0.91$

The extracted factors explained 78.552% of the total variance, indicating strong construct validity.

Effects of using audio-visual language education integrated art teaching on students' learning motivation and outcome

Effects on Learning Motivation: Analysis of variance was conducted to examine the differential effects of instructional modalities on student learning motivation. Table 1 shows significant differences of teaching model and interest in knowledge in terms of learning motivation. The use of audio-visual language education integrated art teaching (4.06) can stimulate higher interest in knowledge than traditional hard-copy instruction (3.61). In addition, the use of audio-visual language education integrated art teaching (4.14) can show higher external expectation than traditional hard-copy instruction (3.73). As a consequence, H1 is supported.

Table 1: Difference analysis of the use of audio-visual language education integrated art teaching in students' learning motivation

variable		F	P	Scheffe post hoc
Using audio-visual language education integrated art teaching	Interest in knowledge	21.162	0.000**	Using audio-visual language education integrated art teaching (4.06)>traditional hard-copy instruction (3.61)
	External expectation	27.583	0.000**	Using audio-visual language education integrated art teaching (4.14)>traditional hard-copy instruction (3.73)

** $p < 0.01$

Effects of Audio-Visual Language Education Integration on Learning Outcomes: Analysis of variance revealed significant differences between instructional modalities in both dimensions of learning outcomes (see Table 2). (a) Learning Effect Students exposed to audio-visual language education integrated art teaching demonstrated significantly higher learning effectiveness ($M = 3.97$) compared to those receiving traditional hard-copy instruction ($M = 3.34$); (b) Learning Gain Similarly, the audio-visual integration group exhibited superior learning gains ($M = 4.23$) relative to the traditional instruction group ($M = 3.59$).

Table 2: Difference analysis of using audio-visual language education integrated art teaching in learning outcome

variable		F	P	Scheffe post hoc
Using audio-visual language education integrated art teaching	Learning effect	23.752	0.000**	Using audio-visual language education integrated art teaching (3.97)>traditional hard-copy instruction (3.34)
	Learning gain	31.925	0.000**	Using audio-visual language education integrated art teaching (4.23)>traditional hard-copy instruction (3.59)

** $p < 0.01$

These findings provide robust support for Hypothesis 2, demonstrating the superior efficacy of audio-visual language education integrated art teaching across both outcome measures.

Correlation analysis of learning motivation and learning outcome

Learning Motivation's Effect on Learning Performance: The analysis results to test H3 can be seen in Table 3. According to the results, it can be stated that interest in knowledge ($\beta = 2.024^{**}$) and external expectation ($\beta = 2.163^{**}$) have significantly positive effects on learning effect.

Learning Motivation’s Impact on Learning Gain: The analysis revealed robust positive relationships between motivational dimensions and learning gain: (a) Interest in Knowledge exhibited a strong positive effect ($\beta = 2.275$, $p < .01$); (b) External Expectation demonstrated the strongest positive association ($\beta = 2.432$, $p < .01$)

These findings provide strong support for Hypothesis 3, indicating that both intrinsic (interest in knowledge) and extrinsic (external expectation) motivational factors significantly predict learning outcomes across both performance and gain dimensions.

Table 3: Multiple Regression Analysis of Learning Motivation Dimensions on Learning Outcomes

Variables	Learning Effect		Learning Gain	
	β	p-value	β	p-value
Learning Motivation				
Interest in Knowledge	2.024**	.000	2.275**	.000
External Expectation	2.163**	.000	2.432**	.000
Model Statistics				
F-value	33.762		37.617	
p-value	.000***		.000***	
R ²	.258		.341	
Adjusted R ²	.241		.328	

Note. ** $p < .01$, *** $p < .001$ Data source: Primary data collected and analyzed by the authors

Discussion

The use of audio-visual language education integrated art teaching along with teachers’ guide and assistance ensures a gradual rise in students’ language performance levels and lead them show excellent performance on art learning (Harjono *et al.*, 2020). This can facilitate art learning interests and motivations of students and promote their art learning motivation and outcome. Language teachers who are able to use audio-visual language education integrated art teaching as a part of art teaching course can enable students improve their reading to reach fast, correct, and efficient reading performance through information technologies. In addition, their reading fluency can be promoted, and listening and reading skills can be reinforced (Tsai, 2019). When making teaching plans or designing teaching contents, a language teacher can utilize audio-visual language education integrated art teaching for art teaching to enhance students’ art learning motivation and make use of existing teaching resources to conduct the language courses with the help of multimedia, electronic whiteboard, and reader’s theater. It explains that increasing students’ language speaking and reading opportunities can enhance their self-confidence and willingness to learn language (Tan & Hew, 2019). Using audio-visual language education integrated art teaching requires employing rich

teaching resources and mutual communication and coordination among students. Frequently discussing and sharing problems with colleagues and providing professional opinions about the use of audio-visual language education integrated art teaching can help teachers' growth in the professional fields and promote the quality of situated instruction (Troussas *et al.*, 2020). In this respect, teachers who are able to use audio-visual language education integrated art teaching can exchange experiences and information with other colleagues and even regularly exchange opinions with peers to enhance the success.

Along with the advance of technology, a lot of art teachers apply opera films to classes to provide distinct learning experience. There are also various opera film-based Chinese language materials in the market. The Speaking, Listening, Viewing materials of Rahmatika *et al.* (2021) used a part of short opera films for teaching, guided students through pictures and replay, and helped students build oral expression ability with thinking questions. Lestari and German (2021) regarded "speaking" as the teaching point when using opera films for instruction that teachers did not need to spend too much time on "listening", but could prepare materials of new words and phrases for students' reference and learning. Lin (2020) selected language teaching for interpreting specific sentence patterns in parts and preceded content related questions and language tests. Regarding culture learning, the material provided sufficient interpretation and history annotation; art and new words were offered for students' reference (Mahmud *et al.*, 2020).

Conclusion

Through the observation, it is discovered in this study that using audio-visual language education integrated art teaching can promote art learning motivation and outcome compared traditional hard-copy instruction in language classes (Chou *et al.*, 2021; Liu *et al.*, 2020; Hsieh & Huang, 2020; Braad *et al.*, 2020). Apparently, using audio-visual language education integrated art teaching, under teachers' situated guide, allows students to experience language interaction in a pleasant and relaxing atmosphere, through role play, simulation exercise, and team discussion. These techniques along with e-textbooks can enhance their art learning interests and enable them more easily absorb and comprehend the course content to further apply the acquired knowledge in their life (Tusmagambet, 2020). Students who receive language instruction through e-textbooks as a part of multimedia integrated art teaching, through teachers' guidance and the dialogue situations can get involved in independent practice according to the dialogue situation, in which students are provided opportunities for self-directed learning. This can help them learn to solve problems through a student-centered learning environment. In this way, students' self-directed art learning opportunities will be increased and chances for automatic art learning will be created. In the use of audio-visual language education integrated art teaching, students must understand the dialogue

content to fluently present the language conversation. In this respect, teachers first interpret the dialogue content and then let students do repeated exercise. When students do not understand the dialogue content, they can ask their classmates or teammates. It enables students to learn how to search solutions for problems in addition to reinforcing the reading and comprehension skills. As a result, they can express the text in dialogues through the tone and body movements. The use of audio-visual language education integrated art teaching therefore can effectively enhance students' language reading skills (Zhang *et al.*, 2021). Students in the control group, with traditional hard-copy instruction, are mainly led the reading and interpretation of dialogue content by teachers. This caused a lack of continuous practice and learning autonomy. Their overall performance on art learning motivation and outcome was not observed to be as good as the performances of those in the experimental group.

White Snake-2021, under audio-visual language education, is made daring innovation, where visual and auditory attempts matching social characteristics and taking care of conventional social art characteristics are made. In the film, actors' makeup, hair accessories, and clothing become the special tools to create roles, deliver emotions, and reinforce narrative as well as important elements to promote the plot development. Environmental variations in cinematographic composition serve as critical devices for heightening dramatic tension, whereby strategic manipulation of external elements functions to amplify the aesthetic impact and narrative resonance of pivotal sequences. This intentional modulation of environmental factors substantially contributes to the film's overall visual rhetoric and emotional depth, enhancing its comprehensive aesthetic cohesion. The director selects an elegant arch bridge for the encounter and fight of figures in the film. Broad temple and turbulent lake satisfy audience' visual needs for the entire scenery and symbolize the tininess of figures in the reality but the spirit to do the best. Such aesthetics changes matching social characteristics present stronger lessons on the integration and development of Chinese operas and movies. Meanwhile, it contributes to the possibility of Chinese opera films under audio-visual language education as well as the inheritance and development of Chinese conventional culture under new social background.

Suggestions

- Curriculum and material design could help students comprehend specific teaching objectives. The strategies of replay and targeted teaching as well as the arrangement and promotion of material theme allow students knowing and comprehending special Chinese culture and society. Teaching with definite subjects and aims as well as suitable curriculum design are complementary (Agustin, 2021).

- Using movie clips for instruction allows students intuitively and specifically feel the existence of “culture” and the presentation of society. Besides, teaching strategies, such as “comparison”, allow students knowing and comprehending the evolution of Chinese culture to consciously compare with the traditional culture, rebuild value, and cultivate the social ability and attitude for culture exchange.
- Along with time change, new movies emerge to satisfy audience’s taste. The production of film-based teaching materials also emerges in endlessly. The production of film-based teaching materials is closely related to the generation change. The increasing demand for contemporary and engaging pedagogical resources underscores the imperative for timely film-based instructional materials. To maintain pedagogical relevance and effectiveness, systematic monitoring of cinematic developments and market trends is essential for the continuous refinement and enhancement of film-based teaching resources. This ongoing evaluation and updating process is crucial for optimizing the efficacy of film-integrated Chinese language instruction, thereby advancing the field’s methodological sophistication and pedagogical outcomes.

References

- Agustin, R. W., & Ayu, M. (2021). The impact of using instagram for increasing vocabulary and listening skill. *Journal of English Language Teaching and Learning*, 2(1), 1-7.
- Akar, H. (2020). The Effect of Smart Board Use on Academic Achievement: A Meta-Analytical and Thematic Study. *International Journal of Science and Mathematics Education*, 8(3), 261–273; DOI:10.46328/IJEMST.V8I3.908.
- Braad, E., Degens, N., & IJsselsteijn, W. A. (2020). Designing for Metacognition in Game-Based Learning: A Qualitative Review. *Transl. issues psychol. sci*, 6(1), 53-69; DOI: 10.1037/tps0000217.
- Cahapay, M. B. (2020). Rethinking Education in the New Normal Post-COVID-19 Era: A Curriculum Studies Perspective. *Aquademia*, 4(2), ep20018; DOI:10.29333/AQUADEMIA/8315.
- Chen, H. (2021). The Application of Computer Multimedia Technology to the Informatization of Linguistic Content. *Lecture Notes on Data Engineering and Communications Technologies*, 98, 583–589; DOI:10.1007/978-3-030-89511-2_75.
- Chou, Y.S., Hou, H.T., Chang, K.E., & Su, C. L. (2021). Designing cognitive-based game mechanisms for mobile educational games to promote cognitive thinking: an analysis of flow state and game-based learning behavioral patterns. *Interactive Learning Environments*, 29, 1-18; DOI: 10.1080/10494820.2021.1926287
- Gagnon, E., Johannsen, B. K., & López-Salido, D. (2021). Understanding the New Normal: The Role of Demographics. *IMF Economic Review*, 69(2), 357–390. DOI:10.1057/S41308-021-00138-4.
- Harjono, A., Gunawan, G., Adawiyah, R., & Herayanti, L. (2020). An Interactive e-Book for Physics to Improve Students’ Conceptual Mastery. *International Journal of Emerging Technologies in Learning*, 15(5), 40-49. DOI: 10.3991/ijet.v15i05.10967.

- Hsieh, Y., & Huang, S. (2020). Using an E-book in the secondary English classroom: Effects on EFL reading and listening. *Education and Information Technologies*, 25(2), 1285-1301; DOI: 10.1007/s10639-019-10036-y.
- Ketut Sudarsana, I., Ratih Nakayanti, A., Sapta, A., Satria, E., Saddhono, K., Daengs, A. G., Putut, E., Helda, T., & Mursalin, M. (2019).. Society, and Technology *Journal of Physics: Conference Series - IOPscience*, 1363, 12061; DOI:10.1088/1742-6596/1363/1/012061.
- Lee, S. Y., Wang, T. J., Hwang, G. J., & Chang, S. C. (2019). Effects of the use of interactive E-books by intensive care unit patients' family members: Anxiety, learning performances and perceptions. *British Journal of Educational Technology*, 50(2), 888-901; DOI: 10.1111/bjjet.12611.
- Lestari, D.E. & German, E. (2021). Incorporating Instagram Features in EFL Learning Environment. *Metathesis: Journal of Language, Literature and Teaching*, 5 (2); DOI:10.31002/metathesis.v5i2.4192.
- Li., F.Y., Hwang, G.J., Chen, P.Y., & Lin, Y.J. (2021). Effects of a concept mapping-based two- tier test strategy on students' digital game-based learning performances and behavioral patterns. *Journal of Computers in Education*, 173, 104293; DOI:10.1016/j.compedu.2021.104293.
- Lin, C.H. (2020). An Exploration of Proper Multimedia Arrangement for Chinese Character Learning Based on Cognitive Load Theory: An Example with Preschool Students. *International Journal on Digital Learning Technology*, 12(1), 1-22.
- Liu, Y., Chou, P.L., & Lee, B.O. (2020). Effect of an interactive e-book on nursing students' electrocardiogram-related learning achievement: A quasi-experimental design. *Nurse Education Today*, 90, 104427; DOI: 10.1016/j.nedt.2020.104427.
- Lobova, O., Ustymenko-Kosorich, O., Zavialova, O., & Stakhevych, O (2020). Professional performance and methodological training of future musical art teachers: A theoretical approach. *Journal of History Culture and Art Research*, 9(4), 37-46; DOI: 10.7596/taksad.v9i4.2822.
- Lorenzo-Lledó, A., Lledó, A., Gilabert-Cerdá, A., Lorenzo, G., Uzunboyly, H., Stošić, L. S., Belén, A., & Martín, B. (2021). The Pedagogical Model of Hybrid Teaching: Difficulties of University Students in the Context of COVID-19. *European Journal of Investigation in Health, Psychology and Education*, 11(4), 1320–1332; DOI: 10.3390/EJIHPE11040096.
- Mailizar, M., Burg, D., & Maulina, S. (2021). Examining university students' behavioural intention to use e-learning during the COVID-19 pandemic: An extended TAM model. *Education and Information Technologies*, 26(6), 7057–7077, DOI:10.1007/S10639-021-10557-5/TABLES/8.
- Mahmud, M., Ammade, S., Halim, A., & Amin, F. H. (2022). Students' Voices of the use of Facebook and Instagram in Teaching English in the University Context. *International Journal of Language Education*, 6(2), 113-127; DOI: 10.26858/ijole.v6i2.24757.
- Odell, B., Cutumisu, M., & Gierl, M. (2020). A scoping review of the relationship between students' ICT and performance in mathematics and science in the PISA data. *Social Psychology of Education*, 23(6), 1-33; DOI:10.1007/s11218-020-09591-x.

- Peters, H., Kyngdon, A., & Stillwell, D. (2021). Construction and validation of a game-based intelligence assessment in minecraft. *Computers in Human Behavior*, 119, 106701; DOI: 10.1016/j.chb.2021.106701.
- Raes, A., Vanneste, P., Pieters, M., Windey, I., van den Noortgate, W., & Depaepe, F. (2020). Learning and instruction in the hybrid virtual classroom: An investigation of students' engagement and the effect of quizzes. *Computers & Education*, 143, 103682; DOI:10.1016/j.compedu.2019.103682.
- Rahmatika, R., Yusuf, M., & Agung, L. (2021). The Effectiveness of Youtube as an Online Learning Media. *Journal of Education Technology*, 5(1), 152; DOI:10.23887/jet.v5i1.33628.
- Sung, H.Y., Hwang, G. J., & Chen, S. F. (2019). Effects of embedding a problem-posing-based learning guiding strategy into interactive e-books on students' learning performance and higher order thinking tendency. *Interactive Learning Environments*, 27(3), 389-401; DOI:10.1080/10494820.2018.1474235.
- Tan, C.Y., & Hew, K.F. (2019). The impact of digital divides on student mathematics achievement in Confucian heritage cultures: A critical examination using PISA 2012 data. *International Journal of Science and Mathematics Education*, 17(6), 1213-1232; DOI:10.1007/s10763-018-9917-8.
- Troussas, C., Krouska A., & Sgouropoulou C. (2020). Collaboration and fuzzy-modeled personalization for mobile game-based learning in higher education. *Computers & Education*, 144, 103698; DOI:10.1016/j.compedu.2019.103698.
- Tsai, C.-C. (2019). A Study of Taiwanese Elementary School English as a Foreign Language: Teachers' Beliefs, Advantages, and Difficulties of Using Interactive Whiteboards. *Asia-Pacific Social Science Review*, 19(4), 87-99.
- Tusmagambet, B. (2020). Effects of Audiobooks on EFL Learners' Reading Development: Focus on Fluency and Motivation. *Teach English in Taiwan Teaching English and Living in Taiwan*, 75(2), 41-67; DOI: 10.15858/engtea.75.2.202006.41.
- Zhang, Y., Li, H., Ye, P., Chen, G., Huang, Y., Yao, J., & Huang, G. (2021). Application of Intelligent Information Technology in the Reform of Hybrid Teaching Courses in Colleges and Universities. *Journal of Physics: Conference Series*, 2, 022065; DOI:10.1088/1742-6596/1852/2/022065.