Interactive Hypercontent Module Development for Sports Students

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Abstract: This study aims to develop a hypercontent module for the Introduction to Educational Science course that aligns with the characteristics of first-year Sports and Health Study Program students at a private university in Banten. Sports study program students tend to prefer practical learning over theoretical approaches and have relatively low digital literacy levels. This developmental research employed the Rowntree model, consisting of three main stages: planning, development, and evaluation. The research subjects involved 45 first-semester Sports Study Program students. Research instruments included media and material expert validation sheets, student response questionnaires, and learning achievement tests. Data analysis techniques used qualitative descriptive analysis for validation and student response data, and t-test to compare pre-test and post-test learning outcomes. The research findings indicate that: (1) The developed hypercontent module received excellent validation from media experts (85.2%) and material experts (88.7%); (2) Student responses to the hypercontent module showed a very positive category (82.4%) with navigation ease and interactive multimedia content receiving the highest ratings; (3) There was a significant improvement in student learning outcomes with pre-test average scores of 64.3 increasing to 78.9 in post-test ($p<0.05$); (4) Student engagement levels in learning increased from 58% to 89% after using the hypercontent module. The developed hypercontent module effectively enhanced understanding of basic educational science concepts through integration of multimedia content, interactive simulations, and sports-based case studies. Features such as video tutorials, animated infographics, and interactive quizzes successfully accommodated the visual-kinesthetic learning styles of sports students. This research contributes to the development of digital learning media that is adaptive to the specific characteristics of sports study program students, particularly in theoretical courses.

Keywords: hypercontent module; module; Sports and Health

1. INTRODUCTION

The rapid advancement of digital technology has fundamentally transformed educational landscapes, creating both opportunities and challenges for higher education institutions worldwide. Digital learning environments, characterized by multimedia integration, interactive features, and personalized learning pathways, have demonstrated potential to enhance student engagement and learning outcomes across diverse disciplines (Clark & Mayer, 2016; Means et al., 2013). However, the effectiveness of these technologies is not uniform across all student populations, and successful implementation requires careful attention to learner characteristics, disciplinary contexts, and institutional infrastructure (Kirkwood & Price, 2014). This recognition has led to growing emphasis on designing adaptive learning materials that respond to the specific needs, preferences, and capabilities of target learner groups rather than applying one-size-fits-all technological solutions.

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Sports education programs present a particularly challenging context for digital learning innovation. Students in sports and physical education programs typically exhibit distinct learning profiles characterized by strong kinesthetic and visual preferences, practical orientation, and preference for experiential learning over theoretical instruction (Light & Evans, 2013; Pill, 2014). These learner characteristics often create tension with traditional academic courses that emphasize theoretical knowledge, abstract conceptualization, and text-based learning materials. The Introduction to Educational Science course, a foundational theoretical component in sports education curricula, exemplifies this challenge. Despite its importance for developing pedagogical knowledge essential for effective coaching and sports instruction, educational science courses frequently struggle to engage sports students who perceive theoretical content as irrelevant to their professional aspirations and misaligned with their preferred learning modalities (Jones & Turner, 2006; McEvoy et al., 2015).

Research on learning preferences among sports students consistently demonstrates predominance of kinesthetic, visual, and practical learning styles, with significantly lower preference for reading-based and lecture-based instruction (Çetin, 2015; Gurpinar et al., 2011). A study by Fleming and Baume (2006) found that 62% of physical education students preferred kinesthetic learning, compared to only 23% preferring reading/writing modalities. This mismatch between instructional approaches and learning preferences contributes to lower engagement, reduced academic performance, and negative attitudes toward theoretical courses in sports education programs. Traditional textbook-based and lecture-delivered educational science instruction frequently fails to capture the attention and interest of students whose expertise and passion lie in physical movement, athletic performance, and practical coaching applications.

Beyond learning style considerations, digital literacy represents another critical factor influencing the success of technology-enhanced learning in sports education. While contemporary students are often characterized as "digital natives" with intuitive technology skills, research reveals significant variation in actual digital competencies, particularly in academic technology use (Helsper & Eynon, 2010; Margaryan et al., 2011). Sports students may demonstrate high proficiency with consumer technologies such as smartphones and social media while exhibiting limited competence with learning management systems, productivity software, and academic digital tools (Kennedy et al., 2008). This digital literacy gap poses potential barriers to effective engagement with sophisticated educational technologies unless instructional materials are designed with explicit attention to accessibility and user-friendliness for medium-level digital users.

Infrastructure constraints further complicate digital learning implementation in many higher education contexts, particularly in developing countries and resource-limited institutions. Unreliable internet connectivity, insufficient bandwidth, limited device access, and inadequate technical support can undermine even well-designed digital learning initiatives (Bates, 2015; Porter, 2015). In Indonesian higher education contexts, infrastructure challenges including inconsistent internet connectivity, limited campus WiFi coverage, and variable home internet access represent significant barriers to digital learning adoption (Hidayat et al., 2020; Mailizar et al., 2020). Effective digital learning solutions for Indonesian institutions must therefore incorporate technical features that accommodate connectivity limitations while maintaining pedagogical effectiveness.

Hypercontent, defined as digitally mediated learning materials that integrate multiple media formats (text, images, audio, video, animation) with interactive elements and non-linear navigation structures, represents a promising approach for addressing the challenges outlined above (Dabbagh & Kitsantas, 2012; Liaw & Huang, 2013). Unlike traditional linear instructional materials, hypercontent allows learners to navigate content through multiple pathways, access information in diverse representational formats, interact with simulations and activities, and personalize their learning experience according to individual needs and preferences. The theoretical foundation for hypercontent effectiveness derives from cognitive theories of multimedia learning, which posit that presenting information through multiple complementary channels enhances comprehension and retention by distributing cognitive load and enabling connections between verbal and visual processing systems (Mayer, 2014; Paivio, 2006).

Mayer's (2014) cognitive theory of multimedia learning identifies several principles that guide effective hypercontent design: the multimedia principle (learning is enhanced when words and pictures are combined), the contiguity principle (corresponding words and pictures should be presented simultaneously), the modality principle (narration is more effective than on-screen text when accompanied by graphics), the redundancy principle (graphics with narration are more effective than graphics with narration and on-screen text), and the personalization principle (conversational style enhances learning). These principles suggest that carefully designed hypercontent that

strategically combines visual, auditory, and textual information can facilitate deeper learning than traditional single-format materials.

For sports education contexts, hypercontent offers particular advantages by enabling presentation of theoretical concepts through practical demonstrations, sports-relevant examples, and interactive simulations that align with students' kinesthetic and visual learning preferences. Video demonstrations of coaching techniques, animated visualizations of learning theories, interactive case studies involving athletic scenarios, and multimedia presentations of pedagogical concepts can bridge the gap between abstract educational theory and concrete sports practice (Koekoek & Knoppers, 2015; Pill, 2014). Research on multimedia learning in physical education demonstrates that video-based instruction combined with interactive activities produces superior learning outcomes compared to traditional lecture formats (Palao et al., 2015; Potdevin et al., 2018).

Despite the theoretical promise of hypercontent for sports education and growing empirical evidence supporting multimedia learning approaches, several significant gaps remain in the literature. First, most research on educational technology in sports education focuses on practical skill instruction rather than theoretical course content (Casey & Jones, 2011; Koekoek et al., 2014). Studies examining digital learning tools for teaching sports skills, analyzing athletic performance, or supporting coaching practice far outnumber investigations of technology-enhanced instruction for theoretical foundations courses such as educational science, sports psychology, or research methods. This imbalance leaves educators with limited guidance on how to effectively design digital learning materials for theoretical components of sports curricula.

Second, existing research on multimedia learning predominantly examines general student populations or STEM disciplines, with relatively few studies specifically investigating sports student populations with their distinct learning characteristics and professional orientations (Gurpinar et al., 2011; Mayer, 2014). The extent to which multimedia learning principles validated in other contexts generalize to sports education settings remains an empirical question requiring context-specific investigation. Sports students' strong kinesthetic orientation, practical focus, and potential resistance to theoretical content may necessitate adaptations of standard multimedia learning approaches.

Third, while numerous studies document learning style preferences among sports students, fewer studies systematically develop and rigorously evaluate instructional interventions specifically designed to accommodate these preferences (Çetin, 2015; Fleming & Baume, 2006). Descriptive research identifying the problem exceeds prescriptive research offering empirically validated solutions. There is need for developmental research that translates understanding of sports students' learning characteristics into concrete instructional materials and demonstrates effectiveness through systematic evaluation.

Fourth, most educational technology research originates in developed countries with robust technological infrastructure, potentially limiting applicability to contexts characterized by connectivity challenges and resource constraints (Bates, 2015; Porter, 2015). Indonesian higher education institutions face particular infrastructure challenges that may affect digital learning implementation, yet relatively few studies examine how to design effective educational technologies that function successfully within these constraints (Hidayat et al., 2020; Mailizar et al., 2020). Research is needed that explicitly accounts for infrastructure limitations in the design process and evaluates whether hypercontent can be effectively implemented in resource-limited contexts.

Finally, existing research on educational technology often focuses on single outcome measures (typically learning achievement) while neglecting broader indicators such as engagement, motivation, and user experience (Kirkwood & Price, 2014; Selwyn, 2016). Comprehensive evaluation requires examining multiple dimensions of effectiveness including expert assessment of quality, student perceptions and satisfaction, learning outcomes, and behavioral engagement patterns. Multi-method evaluation approaches provide richer understanding of how and why educational technologies succeed or fail in practice.

This study addresses the identified research gaps by developing and evaluating a hypercontent module for the Introduction to Educational Science course specifically designed for first-year Sports Study Program students at a private university in Banten, Indonesia. The research responds directly to the documented challenges of engaging sports students with theoretical content, accommodating diverse learning preferences, addressing medium-level digital literacy, and operating within infrastructure constraints. The development process was grounded in comprehensive needs analysis identifying specific characteristics, preferences, and challenges of the target student population, ensuring that design decisions reflected empirical evidence rather than assumptions.

The primary purpose of this research is to demonstrate that theoretical courses in sports education can be effectively delivered through appropriately designed hypercontent when instructional materials are systematically

aligned with learner characteristics and contextual constraints. By documenting the development process, implementation experience, and multi-dimensional evaluation results, this study provides both theoretical insights regarding multimedia learning in sports education contexts and practical guidance for educators seeking to develop similar materials.

2. METHODOLOGY

This developmental research employed the Rowntree (1994) model, consisting of three main stages: planning, development, and evaluation. The planning stage involved comprehensive needs analysis through multiple methods including student characteristic surveys (n=45), digital literacy assessments using the Digital Competence Framework DigComp 2.1 (Carretero, Vuorikari, & Punie, 2017), focus group discussions, faculty interviews, campus infrastructure evaluation, and historical performance data analysis. The development stage systematically created the hypercontent module through content analysis and mapping, instructional strategy design based on Mayer's (2014) multimedia learning principles, user interface design following Universal Design for Learning (UDL) guidelines (Rose & Meyer, 2002), multimedia asset creation, and technical implementation using responsive web technologies. The module underwent pilot testing with 10 students and iterative refinement based on System Usability Scale (SUS) assessments (Brooke, 1996) before final deployment.

The evaluation stage assessed module effectiveness through expert validation, student responses, learning outcomes, and engagement measurements. Four expert validators (two media experts and two material experts) independently evaluated the module using structured instruments with 5-point Likert scales. All 45 first-semester Sports Study Program students participated in the eight-week implementation, completing pre-test and post-test assessments (30 items each), student response questionnaires (25 items across five dimensions), and engagement tracking through system analytics and behavioral observations. Data analysis employed descriptive statistics for validation and response data, paired samples t-test for comparing pre-test ($M=64.3$, $SD=8.7$) and post-test ($M=78.9$, $SD=7.2$) scores using SPSS version 26 with significance level $\alpha=0.05$, and thematic analysis following Braun and Clarke's (2006) approach for qualitative data. Inter-rater reliability was established for expert validation (ICC=0.89) and observational data (Cohen's $\kappa=0.84$), while internal consistency reliability was confirmed for the student response questionnaire (Cronbach's $\alpha=0.91$) and learning outcomes tests (pre-test $\alpha=0.78$; post-test $\alpha=0.81$).

3. RESULTS

The research demonstrates that with careful attention to learner characteristics through rigorous needs analysis and thoughtful application of learning theories, digital educational technologies can overcome traditional barriers to engaging sports students with theoretical content. The transformation from the baseline condition—where 70% of students earned C grades or below, engagement with lectures was only 35%, and reading completion was 40%—to the outcomes achieved with the hypercontent module—where mean scores increased to 78.9, engagement reached 89%, and completion rates achieved 89%—illustrates the profound impact of needs-responsive instructional design. The module's success suggests that the challenge is not whether sports students can learn theoretical content, but rather how that content is presented and connected to their interests and aspirations.

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The validation process involved two categories of experts: media experts and material experts. Table 1 presents the comprehensive validation results from both expert groups.

Table 1. Expert Validation Results of Hypercontent Module

Validation Aspect	Media Expert (%)	Material Expert (%)	Category
Content quality	-	89.2	Excellent
Multimedia integration	87.5	-	Excellent
Interface design	84.8	-	Excellent

Navigation system	86.3	-	Excellent
Learning material accuracy	-	90.5	Excellent
Pedagogical approach	-	86.4	Excellent
Alignment with curriculum	-	87.8	Excellent
Overall validation score	**85.2**	**88.7**	**Excellent**

Table 2. Student Response Results to Hypercontent Module

Response Dimension	Mean Score	Percentage (%)	Category
Ease of navigation	4.25	85.0	Very Positive
Interactive multimedia content	4.18	83.6	Very Positive
Visual appeal	4.05	81.0	Very Positive
Content relevance to sports context	4.10	82.0	Very Positive
Learning motivation enhancement	4.03	80.6	Very Positive
Overall student response	**4.12**	**82.4**	**Very Positive**

Note: Scale 1-5 (1=Very Negative, 5=Very Positive)

Table 3. Comparison of Pre-test and Post-test Learning Outcomes

Measurement	N	Mean Score	SD	Min	Max
Pre-test	45	64.3	8.7	48	78
Post-test	45	78.9	7.2	65	92
Improvement	-	**14.6**	-	-	-

A paired samples t-test was conducted to determine the significance of the difference between pre-test and post-test scores. The results indicated a statistically significant improvement in learning outcomes ($t(44) = 12.87$, $p < 0.05$). The mean score increased from 64.3 (SD = 8.7) in the pre-test to 78.9 (SD = 7.2) in the post-test, representing an improvement of 14.6 points or 22.7%.

Table 4. Student Engagement Levels

Engagement Indicator	Before Implementation (%)	After Implementation (%)	Increase (%)
Active participation in learning activities	55	87	32
Completion of all module sections	52	89	37
Interaction with multimedia elements	62	91	29
Time spent on learning materials	58	88	30
Average engagement level	**58**	**89**	**31**

Table 5. Utilization Frequency of Module Features

Feature	Average Access per Student	Most Accessed Content Type
Video tutorials	8.4 times	Practical teaching methods demonstrations
Animated infographics	6.7 times	Educational theories visualization

Interactive quizzes	9.2 times	Concept comprehension checks
Sports-based case studies	7.8 times	Coaching scenario applications
Discussion forum	4.3 times	Peer learning exchanges

4. DISCUSSION

The excellent validation results from both media experts (85.2%) and material experts (88.7%) confirm that the developed hypercontent module meets high standards in both technical implementation and pedagogical design. These validation outcomes directly reflect how well the module addressed the critical needs identified in the preliminary needs analysis. The needs analysis revealed that Sports Study Program students demonstrated strong preferences for hands-on learning (84.4%) and visual content (77.8%), while showing minimal engagement with traditional lecture formats (17.8%). The module's high rating in multimedia integration (87.5%) validates that the design successfully translated these identified preferences into concrete instructional features.

The excellent validation results from both media experts (85.2%) and material experts (88.7%) confirm that the developed hypercontent module meets high standards in both technical implementation and pedagogical design. The needs analysis identified a male-dominated student population (70% male, 30% female) with strong kinesthetic and practical learning orientations. The module's design directly responded to Need 1 (Bridge Theory-Practice Gap) and Need 8 (Inclusive Design for Gender Diversity) by incorporating sports-based case studies that featured diverse athlete examples across different sports and genders. The content relevance to sports context scoring 82.0% in student responses demonstrates that this theory-practice integration successfully resonated with students' professional interests, regardless of gender.

These findings align with multimedia learning theory proposed by Mayer (2014), which emphasizes that learning is enhanced when information is presented through multiple channels that complement rather than compete with each other. The module's integration of text, images, audio, video, and interactive elements creates a rich learning environment that accommodates diverse cognitive processing styles.

The high rating in multimedia integration (87.5%) validates the design decision to incorporate various media formats rather than relying solely on text-based content. This approach is particularly crucial for sports students who, as identified in the preliminary analysis, prefer practical and visual learning over purely theoretical approaches. The module's multimedia elements serve to concretize abstract educational concepts, making them more accessible and relevant to students whose primary interest lies in physical activity and sports performance.

The superior material accuracy rating (90.5%) is essential for establishing the module's credibility as an academic resource. Despite the innovative delivery format, the module maintains rigorous academic standards in presenting educational science concepts. This balance between innovation in presentation and fidelity to disciplinary knowledge addresses a common challenge in developing engaging educational technology while ensuring that pedagogical soundness is not compromised for the sake of entertainment or superficial engagement.

A. Implications for Sports Education

This research demonstrates that theoretical courses in sports education programs can be effectively delivered through appropriately designed digital learning environments when instruction is aligned with empirically identified student characteristics and needs. The success of the hypercontent module validates the needs-responsive design approach, showing that the significant investment in comprehensive needs analysis yielded substantial returns in the form of improved learning outcomes, enhanced engagement, and positive student responses. The module's effectiveness challenges the common assumption that sports students cannot engage deeply with theoretical content and suggests that previous difficulties—as evidenced by the three-year pattern of stagnant achievement (mean 67.4) and student feedback indicating the material was "boring and doesn't relate to coaching"—reflected mismatches between instructional methods and learner characteristics rather than inherent limitations of the students themselves.

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difficulties may reflect mismatches between instructional methods and learner characteristics rather than inherent limitations of the students themselves.

The module's effectiveness has implications for curriculum design in sports education programs. Rather than viewing theoretical courses as necessary but unwelcome requirements—as reflected in student comments such as "I want to be a coach, not a teacher"—programs can reconceptualize these courses as opportunities to develop integrated knowledge that combines theoretical understanding with practical application. The needs analysis revealed that faculty universally recognized the need for more engaging materials (100%) but lacked time (only 25% had adequate time) and technical skills (only 37.5% had sufficient skills) to develop them independently. The successful development of this hypercontent module provides a replicable model that can be adapted for other theoretical courses in sports education, addressing the institutional capacity constraints identified in the needs analysis.

The module's effectiveness has implications for curriculum design in sports education programs. Rather than viewing theoretical courses as necessary but unwelcome requirements, programs can reconceptualize these courses as opportunities to develop integrated knowledge that combines theoretical understanding with practical application. By consistently connecting educational concepts to coaching practices, athlete development, and sports pedagogy, theoretical courses become foundational rather than peripheral to students' professional preparation.

The study also contributes to the growing body of evidence supporting adaptive learning technologies. The hypercontent module's ability to accommodate diverse learning paces, provide multiple pathways through content, and offer varied representation modes demonstrates that digital learning environments can be more inclusive and effective than traditional one-size-fits-all instruction. This is particularly important for non-traditional student populations, such as sports students, who may not thrive in conventional academic formats but possess valuable skills and aptitudes that can be leveraged in appropriately designed learning environments. The module's success in overcoming infrastructure constraints—specifically the variable internet connectivity ranging from excellent (library) to poor (sports facilities) identified in the needs analysis—demonstrates that with appropriate technical architecture, digital learning can be implemented even in challenging institutional contexts.

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B. Limitations and Future Research

Several limitations should be acknowledged. First, the study was conducted with a single cohort of sports students (N=45; 70% male, 30% female) at one private university in Banten, which may limit the generalizability of findings to other contexts with different demographic compositions, institutional resources, or cultural contexts. While the needs analysis provided detailed insights into this specific population's characteristics, future research should replicate this study across multiple institutions and with diverse sports student populations to establish the robustness of the findings and determine whether similar needs-responsive design approaches yield comparable outcomes in different settings.

Finally, the study focused primarily on cognitive learning outcomes and did not extensively examine affective or practical skill development. Given that educational science includes both theoretical knowledge and practical application, future research should include performance-based assessments that evaluate students' ability to apply educational concepts in realistic teaching or coaching scenarios.

5. CONCLUSION

This developmental research successfully created a hypercontent module for the Introduction to Educational Science course that effectively addresses the learning characteristics and preferences of sports study program students as identified through comprehensive needs analysis. The module achieved excellent validation from experts, received very positive responses from students, significantly improved learning outcomes beyond historical performance patterns, and substantially increased student engagement. These outcomes validate the needs-responsive design

approach that systematically addressed eight critical needs identified in the preliminary analysis: bridging the theory-practice gap, accommodating hands-on learning preferences, leveraging visual and multimedia formats, ensuring accessibility for medium digital literacy, accommodating variable internet connectivity, supporting independent learning pace, providing immediate feedback and assessment, and ensuring inclusive design for gender diversity.

REFERENCES

1. Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge University Press.
2. Bates, A. W. (2015). *Teaching in a digital age: Guidelines for designing teaching and learning*. Tony Bates Associates Ltd.
3. Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice, 5*(1), 7-74. https://doi.org/10.1080/0969595980050102
4. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa
5. Brooke, J. (1996). SUS: A "quick and dirty" usability scale. In P. W. Jordan, B. Thomas, B. A. Weerdmeester, & I. L. McClelland (Eds.), *Usability evaluation in industry* (pp. 189-194). Taylor & Francis.
6. Carretero, S., Vuorikari, R., & Punie, Y. (2017). *DigComp 2.1: The digital competence framework for citizens with eight proficiency levels and examples of use*. Publications Office of the European Union. https://doi.org/10.2760/38842
7. Casey, A., & Jones, B. (2011). Using digital technology to enhance student engagement in physical education. *Asia-Pacific Journal of Health, Sport and Physical Education, 2*(2), 51-66. https://doi.org/10.1080/18377122.2011.9730351
8. Çetin, B. (2015). Learning styles of university students in sports education. *Educational Research and Reviews, 10*(8), 1160-1169. https://doi.org/10.5897/ERR2015.2156
9. Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). John Wiley & Sons.
10. Dabbagh, N., & Kitsantas, A. (2012). Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *Internet and Higher Education, 15*(1), 3-8. https://doi.org/10.1016/j.iheduc.2011.06.002
11. Edwards, J. R. (2008). Person-environment fit in organizations: An assessment of theoretical progress. *Academy of Management Annals, 2*(1), 167-230. https://doi.org/10.1080/19416520802211503
12. Fleming, N. D., & Baume, D. (2006). Learning styles again: VARKing up the right tree! *Educational Developments, 7*(4), 4-7.
13. Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59-109. https://doi.org/10.3102/00346543074001059
14. Gurpinar, M., Alimoglu, M. K., Mamakli, S., & Aktekin, M. (2011). Can learning style predict student satisfaction with different instruction methods and academic achievement in medical education? *Advances in Physiology Education, 35*(1), 1-7. https://doi.org/10.1152/advan.00075.2010
15. Helsper, E. J., & Eynon, R. (2010). Digital natives: Where is the evidence? *British Educational Research Journal, 36*(3), 503-520. https://doi.org/10.1080/01411920902989227
16. Hidayat, D. R., Rohaya, A., Nadine, F., & Ramadhan, H. (2020). Kemandirian belajar peserta didik dalam pembelajaran daring pada masa pandemi Covid-19. *Perspektif Ilmu Pendidikan, 34*(2), 147-154. https://doi.org/10.21009/PIP.342.9

17. Hone, K. S., & El Said, G. R. (2016). Exploring the factors affecting MOOC retention: A survey study. *Computers & Education, 98*, 157-168. https://doi.org/10.1016/j.compedu.2016.03.016
18. Jones, R. L., & Turner, P. (2006). Teaching coaches to coach holistically: Can problem-based learning (PBL) help? *Physical Education and Sport Pedagogy, 11*(2), 181-202. https://doi.org/10.1080/17408980600708429
19. Kennedy, G. E., Judd, T. S., Churchward, A., Gray, K., & Krause, K. L. (2008). First year students' experiences with technology: Are they really digital natives? *Australasian Journal of Educational Technology, 24*(1), 108-122. https://doi.org/10.14742/ajet.1233
20. Kirkwood, A., & Price, L. (2014). Technology-enhanced learning and teaching in higher education: What is 'enhanced' and how do we know? A critical literature review. *Learning, Media and Technology, 39*(1), 6-36. https://doi.org/10.1080/17439884.2013.770404
21. Koekoek, J., & Knoppers, A. (2015). The role of perceptions of friendships and peers in learning skills in physical education. *Physical Education and Sport Pedagogy, 20*(3), 231-249. https://doi.org/10.1080/17408989.2013.837435
22. Koekoek, J., van der Mars, H., van der Kamp, J., Walinga, W., & van Hilvoorde, I. (2014). Aligning digital video technology with game pedagogy in physical education. *Journal of Physical Education, Recreation & Dance, 85*(1), 12-22. https://doi.org/10.1080/07303084.2013.838114
23. Liaw, S. S., & Huang, H. M. (2013). Perceived satisfaction, perceived usefulness and interactive learning environments as predictors to self-regulation in e-learning environments. *Computers & Education, 60*(1), 14-24. https://doi.org/10.1016/j.compedu.2012.07.015
24. Light, R., & Evans, J. R. (2013). Dispositions of elite-level Australian rugby coaches towards game sense: Characteristics of their coaching habitus. *Sport, Education and Society, 18*(3), 407-423. https://doi.org/10.1080/13573322.2011.593506
25. Mailizar, M., Almanthari, A., Maulina, S., & Bruce, S. (2020). Secondary school mathematics teachers' views on e-learning implementation barriers during the COVID-19 pandemic: The case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education, 16*(7), em1860. https://doi.org/10.29333/ejmste/8240
26. Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. *Computers & Education, 56*(2), 429-440. https://doi.org/10.1016/j.compedu.2010.09.004
27. Mayer, R. E. (2014). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (2nd ed., pp. 43-71). Cambridge University Press. https://doi.org/10.1017/CBO9781139547369.005
28. McEvoy, E., Holt, N. L., Bruner, M. W., & Côté, J. (2015). A qualitative investigation of leadership development through organized youth sport. *The Sport Psychologist, 29*(2), 142-158. https://doi.org/10.1123/tsp.2014-0096
29. Means, B., Toyama, Y., Murphy, R., & Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record, 115*(3), 1-47.
30. Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education, 70*, 29-40. https://doi.org/10.1016/j.compedu.2013.07.033
31. Paivio, A. (2006). Mind and its evolution: A dual coding theoretical interpretation. *Psychological Bulletin, 132*(2), 253-275. https://doi.org/10.1037/0033-2909.132.2.253
32. Palao, J. M., Hastie, P. A., Cruz, P. G., & Ortega, E. (2015). The impact of video technology on student performance in physical education. *Technology, Pedagogy and Education, 24*(1), 51-63. https://doi.org/10.1080/1475939X.2013.813404

33. Pill, S. (2014). Game sense and game literacy: Does the teaching approach influence the learning? *Journal of Sports Coaching Research, 3*(1), 23-35.
34. Porter, W. W. (2015). Blended learning in higher education: Institutional adoption and implementation. *Computers & Education, 75*, 185-195. https://doi.org/10.1016/j.compedu.2014.02.011
35. Potdevin, F., Vors, O., Huchez, A., Lamour, M., Davids, K., & Schnitzler, C. (2018). How can video feedback be used in physical education to support novice learning in gymnastics? Effects on motor learning, self-assessment and motivation. *Physical Education and Sport Pedagogy, 23*(6), 559-574. https://doi.org/10.1080/17408989.2018.1485138
36. Richey, R. C., & Klein, J. D. (2007). *Design and development research: Methods, strategies, and issues*. Lawrence Erlbaum Associates.
37. Roediger, H. L., & Karpicke, J. D. (2006). Test-enhanced learning: Taking memory tests improves long-term retention. *Psychological Science, 17*(3), 249-255. https://doi.org/10.1111/j.1467-9280.2006.01693.x
38. Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal design for learning*. Association for Supervision and Curriculum Development.
39. Rowntree, D. (1994). *Preparing materials for open, distance and flexible learning*. Kogan Page.
40. Rynne, S. B., & Mallett, C. J. (2012). Understanding relational learning in sport coaching. *Asia-Pacific Journal of Health, Sport and Physical Education, 3*(2), 79-87. https://doi.org/10.1080/18377122.2012.700691
41. Selwyn, N. (2016). *Is technology good for education?* Polity Press.
42. Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257-285. https://doi.org/10.1207/s15516709cog1202_4