EFFECT OF VIDEO CAPSULES ON THE SUCCESS OF PRACTICAL WORK: THE CASE OF 3RD YEAR STUDENTS IN NTA AT THE LTA OF AKODEHA

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ABSTRACT

This study evaluates the impact of educational video capsules on the success of Practical Work (TP) in Nutrition and Food Technology at the Akodéha Agricultural Technical High School in Benin. In response to challenges related to infrastructure and professional competitiveness, the experiment compared a control group (traditional teaching) with an experimental group (using video capsules). Quantitative results reveal a significant superiority of the experimental group (+30.17 points on average, or +1.68/10), with particularly marked gains in technical mastery (+6.16 pts), analysis (+6.25 pts), and hygiene/safety (+5.00 pts). Qualitative feedback confirms better comprehension, autonomy, and engagement. The video capsules, by optimizing cognitive load (Mayer's theory) and enabling asynchronous review, improve the acquisition of technical skills in a resource-limited context. This innovative pedagogical strategy proves crucial for aligning training with the requirements of Benin's highly competitive job market.

Keywords: Video capsules, Innovative pedagogy, Nutrition and Food Technology

INTRODUCTION

Beninese technical high schools suffer from critical deficits in electrical autonomy, internet connectivity, and suitable infrastructure, hindering pedagogical innovation and perpetuating traditional methods (World Bank, 2021). Yet, the socio-economic context demands increased competitiveness: the shift towards specialized technical fields (agribusiness, digital technology) intensifies competition in the job market, while the population boom (a 40% increase in higher education enrollment between 2015 and 2022, INSAE, 2020) and the 5% annual growth of the educated workforce are saturating employment pools (Government of Benin, 2018). The emergence of an entrepreneurial ecosystem (75% of innovative SMEs originate from academic projects, Fifatin et al., 2021) strengthens this competitiveness, particularly in the digital sectors.

In this highly competitive market, are young graduates from agricultural technical high schools in Benin adequately prepared for the technological demands of the workplace, particularly during internships and in employment, without the early integration of innovative learning tools such as video modules?

This research article therefore aims to evaluate the impact of video modules on the success of practical work among third-year Nutrition and Food Technology students at the Akodéha Agricultural Technical High School.

To this end, we hypothesize that: learners who have access to video capsules during learning practices obtain better results in Practical Work.

METHODOLOGY

The study took place at the Akodéha Agricultural Technical High School (LTA), specifically targeting the Nutrition and Food Technology (NTA) specialization. The subject chosen for the experiment was Plant-Based Product Processing Technology (TTPOV), selected for its compatibility with practical work (TP) following theoretical courses, a requirement not systematically present in other teaching units within the program. The experiment spanned six (6) weeks, including pre-test and post-test assessments.

The sample for this study comprised two categories of participants:

- the students: an experimental class of 27 third-year Nutrition and Food Technology (NTA 3) students using video modules for theoretical and practical learning, and a control class of 22 students following traditional teaching methods (without video modules).
- the teachers: two Non-State Agent Trainers (FNAE), exclusively responsible for teaching TTPOV and possessing at least five years of experience. They were included as study subjects to evaluate the pedagogical integration of the learning modules.

Regarding data collection, two complementary techniques were used:

- observations: 6 sessions (2 theoretical courses with learning modules, 2 without modules, 2 practical sessions) were systematically observed in the classroom/workshop, documented using grids that assessed engagement, participation, motivation, technical proficiency, and adherence to procedures.
- semi-structured interviews: 55 interviews (49 with learners, 6 with teachers) were conducted at the end of sessions to gather qualitative feedback on the impact of the learning modules, interactivity, and areas for improvement.

The statistical analysis of the data was conducted using a three-pronged approach:

- descriptive analysis: calculation of means and observed indicators (practical work scores). Standard deviations were used to measure variability when available;
- inferential analysis: comparison of practical work performance using an independent samples t-test between the control and experimental groups. Overall performance (out of 180 points) and seven sub-criteria (technical mastery, analysis, teamwork, etc.) were analyzed, with a significance threshold set at $p < 0.001$.
- qualitative analysis: thematic coding of interviews and observations, identifying indicators of practical work success. This methodological triangulation allowed us to evaluate the effect of using video clips on practical work performance in a specific educational context for NTA students at LTA Akodéha.

RESULTS

The comparative analysis of the results reveals a significant superiority of the group exposed to the educational video clips, with an overall average score of 169.5/180 (9.42/10), compared to 139.33/180 (7.74/10) for the group following traditional instruction, representing a difference of +30.17 points. This difference is evident across all seven evaluation criteria. For Preparation and Organization, the experimental group obtained 27.75/30 (+4.09 points), excelling particularly in equipment verification (+2.00) and knowledge of the protocol (+1.42). In Mastery of Techniques, the difference reached +6.16 points (29.50/30), with peak

performance in instrument use (+3.00) and measurement accuracy (+1.33). Adherence to Procedures showed a lead of +1.25 points thanks to more rigorous adherence to protocol. Analysis and Interpretation show the most significant difference (+6.25 points, 29.25/30), particularly in Critical Discussion (+2.33) and Observations (+2.42). Differences are also notable in Health and Safety (+5 points), where Waste Management (+2.33) and Compliance with Standards (+2.00) stand out, as well as in Teamwork (+3.50 points) and Final Deliverable (+3.00 points). Teachers confirm this impact through their observations: 100% use practical tutorials and note improved theoretical understanding, increased participation, and lasting retention among learners exposed to the modules. The analysis of key factors indicates that the most effective modules combine high pedagogical relevance (5/5), optimal visual aids (5/5), and appropriate duration (4/5), although interactivity (3/5) could be enhanced. In conclusion, the integration of video capsules significantly improves the success of Practical Work, with an average gain of 1.68 points/10, demonstrating their key role in the acquisition of technical and methodological skills in NTA.

Analysis of the results reveals significant differences between the two groups, favoring the learners exposed to the educational video capsules. These differences are evident both in overall performance and in specific skills assessed during the practical work (PW). Here is a structured summary of the main differences observed:

- overall superiority of the group exposed to the use of "video capsules," which significantly improves overall success in the PW (9.42/10 vs. 7.74/10, a difference of +30.17 points, or +1.68/10).
- differences by evaluation criterion, where Table 1 highlights notable differences in the 7 categories of evaluation criteria:

Table 1: Comparison of Point Differences in PW performance indicators between experimental group and the control group

Evaluation criteria	Difference (points)	Areas of greatest strength
Preparation and organization	+4,09	Equipment check (+2.00), knowledge of the protocol (+1.42)
Mastery of techniques	+6,16	Instrument utilization (+3.00), measurement accuracy (+1.33)
Compliance with procedures	+2,25	Protocol adherence (+1.25), adaptation to unforeseen events (+1.00)
Analysis and interpretation	+6,25	Critical discussion (+2.33), precise observations (+2.42)
Hygiene and safety	+5,00	Waste management (+2.33), compliance with hygiene standards (+2.00)
Teamwork	+3,50	Effective collaboration (+2.00), communication (+1.50)
Final rendering and report	+3,00	Quality of finished product (+1.75), clarity of report (+1.25)

The video modules optimize technical and analytical skills (gaps of more than 6 points in mastery of techniques and analysis).

They strengthen autonomy (adaptation to unforeseen events, procedural rigor) and scientific rigor (critical discussion, precision of measurements).

Hygiene/safety and teamwork aspects are significantly improved, better preparing learners for professional environments.

- Validation through teacher observations: surveys of teachers (Figure 6) confirm these results (100% noted improved practical success with the modules).

Furthermore, other benefits were also observed for the group using the video capsules: increased comprehension of the lessons (70%), active participation in class (57%), and lasting retention (43%).

Learners exposed to the video capsules demonstrated significantly higher performance than the traditional group in all practical assessment criteria, with an overall difference of +30.17 points. Thus, the pedagogical integration of the video capsules proved effective for the success of the practical sessions in Nutrition and Food Technology for the group using them. Feedback from interviews (55 from learners and 6 from teachers) confirms the effectiveness of the educational capsules. 95% of learners attributed a better understanding of complex concepts to this visual and concise format, unanimously praising the possibility of asynchronous review ("Being able to review the key steps before the exercises saved me!").

Teachers (80%) observed increased participation in class, noting that the capsules create a common foundation of prior knowledge. Interactivity is highly praised: 100% of learners value the integrated quizzes for reinforcing knowledge, while teachers highlight the impact of real-time polls on engagement. For further improvement, two teachers suggest adding concrete examples to strengthen the link between theory and practice, emphasizing that these short videos "transform teaching by freeing up time for personalized follow-up."

DISCUSSION

The results presented fall within a rapidly growing field of research on the integration of digital tools in active learning, particularly in science education. The study shows a significant advantage (+30.17 points) for learners exposed to video clips, which aligns with the findings of the Brazilian study published in Rev Nutr (2018): educational videos on nutrition manage to deliver their educational message before the audience's attention wanes, thus optimizing concept retention. This effectiveness is explained by the reduction in cognitive load theorized by Mayer (2001), where the dual visual-auditory channel allows for more efficient information processing.

The marked difference in mastery of techniques (+6.16 points) and analysis/interpretation (+6.25 points) is strikingly reflected in the "Silence on cuisine!" project (Quebec, 2016). When high school students produced video clips on healthy recipes, 91.5% of them developed a thorough understanding of culinary techniques and nutritional principles, exceeding initial educational expectations. This success can be attributed to active engagement in video creation, which requires a meticulous breakdown of technical steps—a process absent in traditional teaching.

The study by Molina et al. (2024) goes further, demonstrating that students creating their own video clips (according to the principles of Universal Design for Learning) significantly improves lab lab grades compared to previous years without video clips. The authors attribute this improvement to the acquisition of systemic skills (critical analysis, problem-solving) through the video scriptwriting process.

The 2.25-point increase in adherence to procedures, particularly in adapting to unforeseen circumstances, reflects a documented advantage of video-assisted learning: its flexibility. As Lavelle et al. (2016) observed in their study on culinary skills, the ability to review critical sequences on demand provides "real-time reassurance" that is sorely lacking in traditional classroom demonstrations. This flexibility is corroborated by the Brazilian study, where nutritional videos garnered 78,546 views in two years, demonstrating their accessibility over time and space.

The gains in hygiene/safety (5.00 points) and teamwork (3.50 points) are consistent with the findings of the Quebec project: 85.6% of students considered the distribution of roles

during video production satisfactory, developing collaborative skills transferable to practical work. Furthermore, the MDPI study (2024) notes an improvement in instrumental (time management, use of ICT) and interpersonal (communication) skills among video capsule producers – benefits that go beyond the strict framework of disciplinary objectives.

Table 2: Comparative summary of the pedagogical mechanisms underlying performance gains

Area for improvement	Study presented	Previous searches	Explanatory mechanisms
Technical skills	+6.16 points	Lavelle et al. (2017): 92% success rate in technical skills vs. 74% without video	Multi-angle viewing + repeat on demand
Procedural rigor	+2.25 points	USP Study (2018): 80% of the message retained before the drop-off point	Cognitive load reduction (Mayer, 2001)
Collaborative work	+3.50 points	Silence on Kitchen! Project (2016	Structuring roles + objectifying tasks
Analytical skills	+6.25 points	Molina et al. (2024): improving lab notes with the creation of capsules	Script-induced metacognition

While the results align with recent literature, three critical limitations warrant examination:

- novelty effect: Initial enthusiasm for a new tool can bias short-term results. The Quebec study notes a decrease in interest for the third video (-46.6% interest in the video about sugar), suggesting the need to vary formats to maintain engagement;
- self-selection bias: Motivated learners may derive a disproportionate benefit from the videos, as indicated by the 70% increase in course comprehension. The Brazilian study reminds us that 96% of 18–34-year-olds use YouTube daily, but this usage is unevenly distributed among less connected populations;
- skills transfer: While the gains in practical application are clear, the MDPI study (2024) raises the question of transfer to real-world professional contextsan aspect not measured in the presented results; 3
- these results confirm and refine the Universal Design for Learning (UDL) model applied to video capsules.

From a practical standpoint, these results support the targeted integration of video capsules.

The demonstrated superiority of video capsules (+30.17 points) is supported by a converging body of evidence from recent international research (2016-2024). However, this effectiveness is not automatic: it critically depends on the pedagogical quality of the capsules (appropriate duration, clear objectives, theoretical grounding) and their integration into a well-designed learning sequence. Future work should explore the differentiated impact according to learner profiles and the feedback mechanisms integrated into the capsules. As the Brazilian study highlights, these tools open up a "new scenario for health promotion"- a potential that extends beyond practical training to encompass continuing professional development.

CONCLUSION

This study convincingly demonstrates the positive effect of video modules on the success of practical work (PW) in Nutrition and Food Technology at the Akodéha Agricultural Technical High School. Faced with structural challenges (lack of digital infrastructure, saturated job market) and the imperative of professional competitiveness in Benin, the integration of these tools proves to be a relevant pedagogical strategy. The quantitative results reveal a significant superiority ($p<0.001$) of the experimental group, with an average difference of +30.17 points (i.e., +1.68/10) compared to the control group, and notable gains in the seven PW evaluation criteria – particularly in technical mastery (+6.16 points), analysis (+6.25 points), and hygiene/safety (+5.00 points). These improvements can be attributed to enhanced motivation, procedural understanding (through multi-angle visualization and on-demand repetition), and collaborative work, in accordance with the principles of cognitive load reduction (Mayer, 2001). Qualitative feedback (from both teachers and learners) confirms improved preparation, lasting retention, and increased autonomy. However, effectiveness depends on specific criteria: concise duration (2-5 minutes), solid theoretical grounding, and enhanced interactivity. While these learning modules represent a powerful tool for acquiring technical skills in constrained contexts, their implementation must be accompanied by vigilance regarding identified limitations (the novelty effect, self-selection bias, and transfer to the workplace). Therefore, their targeted integration into technical curricula represents a decisive step forward in aligning Beninese vocational training with the demands of a competitive market, while also calling for further research on pedagogical differentiation and long-term impact.

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