The Original

ANIMATION, AI AND STUDENT MOTIVATION: AN EXPERIMENTAL STUDY IN HIGHER EDUCATION

Dr Sailendra Das[1], Dijendra Das[2]

[1]Assistant Professor in Mass Communication, The Assam Royal Global University, Orcid id: 0009-0004-0321-1820
[2]Dijendra Das, Teaching Assistant in Animation and Visual effects, The Assam Royal Global University, Orcid id- 0009-0004-1280-4302

ABSTRACT:
With the help of artificial intelligence, animation is increasingly being used for visual, interactive and personalized teaching. Nonetheless, the information on its effect on students` motivation is limited. This experiment study aims to find out whether instruction with instruction supported with AI-generated animation will increase student motivation and academic achievement as compared to conventional multimedia instruction. A total of 300 undergraduate respondents will be involved in the study. It will be executed at a pretest-posttest randomized controlled design. The respondents will be randomly assigned to either the AI-animation group, or the control group. Both study the same unit of work for the same time and do the same assessments. The experimental group receives lessons with AI-generated explanatory animations, while the control group gets slides with equivalent text and still images. Student motivation is measured using the Intrinsic Motivation Inventory whereas academic achievement is measured using a curriculum-based test. We controlled for the pre-intervention scores when making comparisons of post-intervention results. Through artificial intelligence-based animation instruction, interests and enjoyment are expected to rise. The connection between achievement and instructional condition is mediated by motivational gains, research indicates. Given that the proposed research will occur within the context of an established organization developing a public-facing instructional animation for their client, the 2024 novel-a-day challenge. Educators, instructional designers and higher education institutions can benefit.

KEYWORDS: Artificial Intelligence, Educational Animation, Student Motivation, Higher Education, Multimedia Learning.

INTRODUCTION

The higher education sector is embracing AI for the generation of content, personalized learning, formative feedback, assessment and learning analytics AI-assisted animation is a fast-emerging application that allows educators to turn text, narration, diagrams, and other abstract concepts into animated lessons. Such systems may shorten production time and allow educational visualization creation by instructors with no high-level animation skills.

Animation can help students comprehend processes that are dynamic, microscopic, spatial, or otherwise hard to observe directly. Animation alone does not enhance learning. Furthermore, poorly designed motion, decoration for decoration's sake, excessive pacing, and visual elements that compete with the main message can overload the cognitive system and distract learners from important information (Ayres & Paas, 2007; Lowe, 2003; Mayer, 2021). The educational values of AI-generated animation are not based on technological novelty alone; they depend on instructional alignment, segmentation, signaling, coherence and learner control.

Motivation is equally important. This is because students must initiate, direct, and sustain effort before instructional materials can bring about meaning learning. According to (Kusurkar et al., 2013; Richardson et al., 2012), motivation is linked to study strategy, effort, persistence and academic performance. Self-determination theory states we can promote learners' intrinsic and self-determined motivation by creating learning environments that provide opportunities for autonomy, competence, and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2020). Research in medical education also shows that providing autonomy, useful feedback, and emotional support can increase intrinsic motivation and enhance learning behavior. pmc.ncbi.nlm.nih.gov

Animated content, created by Artificial Intelligence, could help create motivation in students by presenting content in an interesting format, clarifying challenging concepts, offering meaningful choices, and enhancing students' confidence in their ability to learn. On the other hand, if the material is inaccurate, does not convince, overwhelms the visual experience, is childish or irrelevant, it can have a mere novelty effect and even demotivate. Thus, an experimental design is needed in order to establish whether AI-animation instruction has motivational benefits in controlled conditions.

The present study is focused on the instructionally designed AI-based animation and its impact on undergraduate students' motivation and achievement. It also seeks to determine whether motivation is a mechanism through which AI-animation instruction affects learning outcomes.

2. LITERATURE REVIEW

2.1 AI-generated animation in education

AI-generated animation is an animation educational content that a human has created, using AI. These systems can create everything from visual assets to voiceovers and even full explainer videos. Thanks to AI-assisted tools, it is possible to revise or adapt animation production for different types of subject matter, 4 learner level, and accessibility.

Recent descriptive literature states that animation based on AI has the potential to support visualization, interaction, differentiation, adaptive feedback, and learner-centered education. E-edusci.com These claims are pedagogically plausible, but descriptive evidence alone cannot establish whether AI-animation instruction improves motivation or learning. In experimental studies, researchers need to control the instructional content, learning duration, conditions of assessment and design quality for both treatment groups.

Attendant issues are also raised by AI materials. Their visual or verbal outputs may be erroneous, misleading, biased, or inappropriately emphasised. A human review is necessary before implementation in the classroom. Furthermore, it is necessary to define the experimental treatment pedagogically. Simply stating content was "AI-generated" does not clarify whether the material used signalling, narration, segmentation, personalisation or learner control.

2.2 Multimedia learning and cognitive load

According to Mayer (2021), a cognitive theory of multimedia learning proposes that people learn through partly distinct visual pictorial and auditory verbal channels that each have a limited capacity for processing. This original definition of meaningful learning means that students create, use, and organize their own mental models based on a cogent understanding of the process and their prior knowledge. Animation may be worthwhile when it shows how things change over time, cause and effect, processes, or movement in space.

Despite of that, animation is temporary. Essential information can be missed by learners if the images are shown too briefly to be processed by them, while decorative motion may compete with relevant content (Lowe, 2003). An explanation of the cognitive load theory states that the instructional materials should do away with irrelevant processing and direct mental effort at knowledge construction (Sweller et al.,2019). It is important to use effective educational animations.

- Coherence, by removing ornamental information that does not serve the learning goal.
- Teaching signaling, which enhances learners' understanding of important ideas, linkages and changes.
- Dividing instructions into chunks helps things appear simpler.
- By means of contiguity, one has to place verbal and visual information together.
- Offering learner control, by allowing students to pause, replay, or move between segments.
- Make your multimedia content accessible; add captions, easy-to-read text and a clear voice.

The design quality of animations, not animation itself, determines their instructional usefulness, according to these principles.

2.3 Student motivation in higher education

Motivation is a multi-faceted concept involving the components of intrinsic motivation, identified regulation, perceived competence, effort, value and persistence. Self-determination theory distinguishes autonomous motivation, where learners engage because an activity is interesting or personally important, differentially from controlled motivation which is based mainly on pressure, reward or punishment avoidance (Deci & Ryan, 2000; Ryan & Deci, 2020).

Intrinsic motivation leads to more profound approaches to studying, a greater amount of effort, and an improved performance but motivation is also affected by learners' backgrounds and educational environment. New evidence suggests motivational profiles can differ according to entry path and personal experience, while also calling for longitudinal and multi-institutional research. frontiersin.org.

The achievement goal theory serves as a supplementary explanation. Classroom conditions that emphasize mastery, improvement, meaningful tasks and student agency are more likely to support adaptive motivation than those characterized by comparison and performance ranking (Ames, 1992). The use of AI animation instruction by www1.wellesley.edu may support mastery-oriented engagement by allowing students to review explanations and observe difficult processes at their own pace.

2.4 Animation, motivation, and academic achievement.

Animation could affect motivation in several ways. Explanations visualized can reduce perceived difficulty and increase competence. Next, sections allowing learner control. Contextualized narratives can enhance relevance and emotional engagement. Visualization can help students recognize their progress to strengthen persistence.

You may not get these benefits. Enhancing visual appeal might elevate enjoyment without boosting concept recognition. It was possible for the students to choose colours, characters, movement instead of the principles being taught.

An assessment of motivation and of learning should therefore be sepa-rate. One should also test whether more motivation predicts more achievement or whether more enjoyment is equivalent to more learning.

2.5 Research gap

The current study is justified by three gaps. To begin with, we see that most articles elaborate on AI and animation rather study their causal effect. Studies may combine constructs like engagement, satisfaction, motivation, and achievement yet those are different. Fifth, there are instances when comparing animated and conventional instruction does not hold content and learning time constant.

Current research fills in the gaps through random pretest posttest experiment. The groups receive similar content for the same time period; the major difference is the form in which it is seen.

3. Theoretical Framework

Integration of cognitive theory of multimedia learning, cognitive load theory and self-determination theory.

According to the cognitive theory of multimedia learning, the building of mental models is fostered by appropriately synchronized narration and animation (Mayer, 2021). According to cognitive load theory, irrelevant or fast animation can hinder learning (Sweller et al., 2019). According to self-determination theory, the intervention may affect motivation by supporting perceived autonomy and competence (Ryan & Deci, 2020). The proposed mechanism is:

- AI-animation instruction
- Improved visualization and learner control
- Perceived competence and interest
- Effort and persistence
- Academic achievement
- Cognitive load

AI-animation instruction is expected to support motivation when its visualization, pacing, and control features facilitate understanding. Motivation is then expected to increase students' effort and persistence, contributing to achievement. Cognitive load may moderate this process: well-designed animation should reduce unnecessary processing, whereas poorly designed animation may weaken or reverse the expected effects.

4. Research Objectives

1. To investigate how undergraduate students' general motivation is affected by AI-animation-based instruction.
2. To evaluate how students' interest/enjoyment, perceived competence, effort/importance, and perceived choice are affected by AI-animation education.
3. To assess how well students who get AI-animation-based training perform academically in comparison to those who receive traditional multimedia instruction.

5. Research Questions

Does AI-animation instruction enhance student motivation compared to traditional multimedia instruction?

Which aspects of motivation are most strongly influenced by AI-animation instruction?

6. METHODOLOGY

6.1 Research design

The research will utilize a pretest-posttest controlled design with two groups randomly assigned. The use of random assignment allows us to reduce systematic baseline differences and to forge stronger causal inference.

Group	**Pretest**	**Intervention**	**Post-test**	**Delayed test**
Experimental	Motivation and achievement	AI-generated instructional animations	Motivation, achievement, and cognitive load	Retention test
Control	Motivation and achievement	Text, narration, and static visuals	Motivation, achievement, and cognitive load	Retention test

The intervention will last four weeks, with two 50-minute sessions per week. A delayed achievement test will be administered two weeks after the intervention to assess retention.

6.2 Participants

A university's Introductory Course will have a sample of 300 Under Graduate students as proposed. Students will be recruited from similar sections of the same course and randomly allocated to experimental or control groups.

It is essential to conduct an a priori power analysis pre-recruitment. In terms of planning, 120 participants give about 60 students per group thereby allowing for dropouts and still having enough power to detect the moderate treatment.

Inclusion criteria will be:

- Current enrollment in the selected course.
- Consent to participate in the study.
- Completion of the pretest and at least 75% of the instructional sessions.
- No previous completion of an equivalent course unit.

7. DISCUSSION

AI in Animation and Classroom Motivation: A Comparative Study of School-Level Concept Visualization and University Undergraduate Engagement

7.1 Overview

This study set out to examine whether AI-generated animation, when used in place of or alongside conventional PowerPoint-based instruction, influences the classroom motivation of university undergraduate (UG) students. The discussion below situates the survey findings (N = 300) within the broader trajectory of animation-assisted learning, tracing how a tool long associated with school-level concept visualization is now being repurposed for higher-education content delivery through AI-integrated presentation tools.

7.2 From School-Level Visualization to AI-Assisted UG Instruction

In schools, Animation is a linkage of abstraction and understanding of a student. In science, animated sequences make it possible to observe and sequence invisible processes such as cellular respiration, chemical bonding or planetary motion. Through animation, Social Studies and History timelines, migrations, and events take on a continuity that static text or images cannot convey. Mathematics is learning through step-by-step animated derivations (graph transformations, geometric proofs, function plotting) so that students can see a process rather than infer it from a finished diagram. In each of the subjects they are dealing with animation would be converting a still frame with a one shot view to a moving image

which gives a sense of time and space which is similar to a teacher builds on a concept through a sequence of visuals he or she generates on the board.
Undergraduate-level visual scaffolding is often lacking, however, this is the case. The UG instruction is mainly focused on text-heavy power point slides. And where AI is deployed, it is usually for content generation or beautifying of slides AI-written bullet points, AI suggested layouts, or AI-generated design theme. Never AI-generated explanatory animation. As per the survey, there was a shift in using the AI in the UG classroom: rather than using the AI to generate a relatively more presentable static slide, generating short animated sequences, the likes of which are used to illustrate basic concepts at the school level, adapted to UG-level content complexity.

7.3 Respondent Profile

Three hundred (300) undergraduate students constituted the survey. Table 1 summarizes the sample's composition across gender, year of study, and academic stream. As is clear from the table, the early, middle and final years of the UG programme are represented. Similarly, the sample comprises students across Science, Commerce, Arts/Humanities, and Engineering streams.

Table 1. Demographic profile of survey respondents (N = 300)

Category	Group	N	Percentage
Gender	Male	162	54%
	Female	132	44%
	Other / Prefer not to say	6	2%
Year of Study	First Year	66	22%
	Second Year	84	28%
	Third Year	90	30%
	Final Year	60	20%
Stream	Science	120	40%
	Commerce	75	25%
	Arts / Humanities	60	20%
	Engineering	45	15%

7.4 Perceived Effectiveness of AI-Generated Animation

As per Table 2, we can see the agreement levels of students on 5 statements comparing AI-generated animated content and PPT-based contentaker. A large majority of respondents agreed or strongly agreed that AI animation simplifies complex subjects, maintains attention, and enhances retention compared to static slides. Importantly, 80% of students (Strongly Agree + Agree) expressed a desire for more UG subjects to be integrated with AI-generated animation. This suggests that the preference for visually sequenced content is not restricted to a discipline, but rather indicative of a wider university level appetite.

Table 2. Student agreement with statements on AI-generated animation vs. traditional PPT (N = 300)

Survey Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
AI-generated animation makes complex topics easier to understand than static PPT slides	42%	38%	12%	6%	2%
AI-animated content holds my attention longer than traditional slide-based lectures	45%	33%	14%	6%	2%
I feel more motivated to attend classes that use AI-generated animation	38%	36%	16%	8%	2%
AI animation improves my retention/recall of subject matter	40%	35%	17%	6%	2%
I would like more of my UG subjects to be taught using AI-generated animation	50%	30%	12%	6%	2%

7.5 Impact on Classroom Motivation

Asking directly whether the AI-generated animation made them more motivated to engage with the course content, a total of 72% of the students said that it made them significantly or moderately more motivated to do so (see Figure 1). In an open-ended nature, this type of response generally refers to distraction, timing mismatch, or 'I prefer to read at my own speed. Only 10% report a decrease. The 18% who report no change are likely students who were already highly motivated (or disengaged) regardless of the presentation format. In other words, animation may be an amplifier of engagement rather than a panacea.

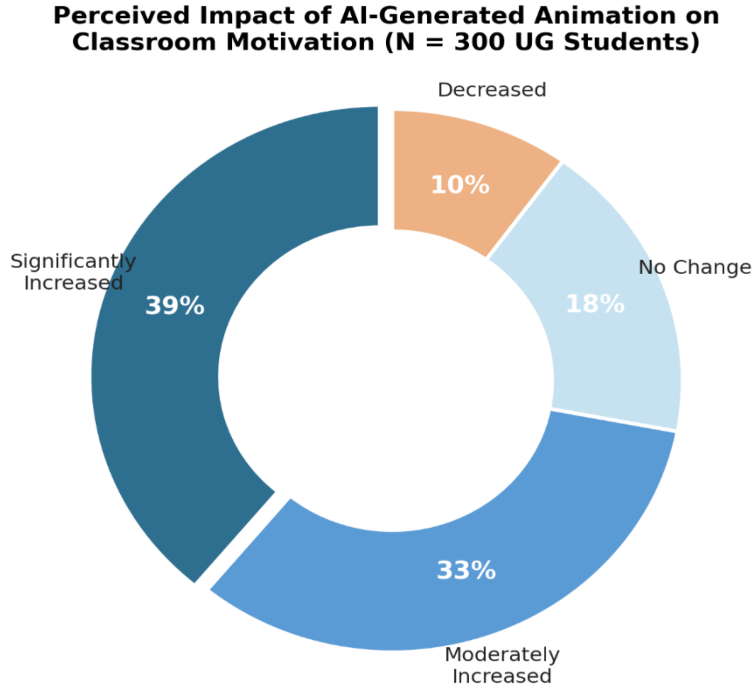

Figure 1. Perceived impact of AI-generated animation on classroom motivation (N = 300)

7.6 Subject-wise Differences in Reported Understanding

Figure 2 splits out the ease of understanding responses by academic area comparing traditional PPT delivery vs AI animation. The gain was consistent in all five areas that were covered – Science & Engineering, Mathematics, Business & Economics, History & Social Studies and Computer Science, ranging from about 24 to 29 percentage points. The consistent impact of animation is similar to that seen on the school level (Section 5.2). Subjects with a process, sequence, or spatial component, such as Mathematics, Sciences and Computer Sciences, benefitted from animation's ability to depict a concept as it unfolds, over a period of time. Other subjects, which are more narrative-based, like History, Social Studies and Business Case discussion benefitted from animation's ability to depict time, cause-effect relationships, and connect entities. Animation's ability to enhance learning in these subjects, which was originally for the beneficiary of the younger student, now appears to transfer to the UG classroom with the appropriate scaling of content.

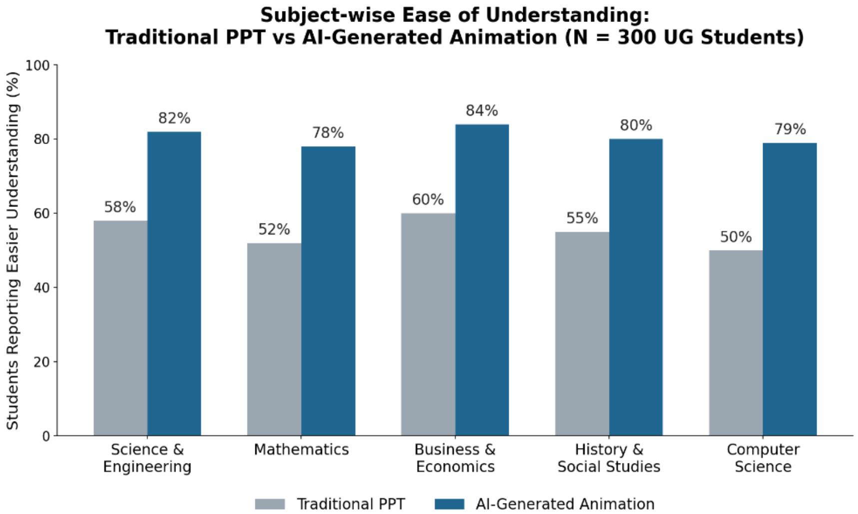

Figure 2. Subject-wise comparison of reported ease of understanding: traditional PPT vs. AI-generated animation (N = 300)

7.7 Illustrative Classroom Reference

As illustrated in Figure 3, this whole classroom cool set-up involves undergraduate students at desks looking at animated content generated by AI at the front of the class instead of a slide. This shows the delivery context referred to in the survey instrument and discussion above.

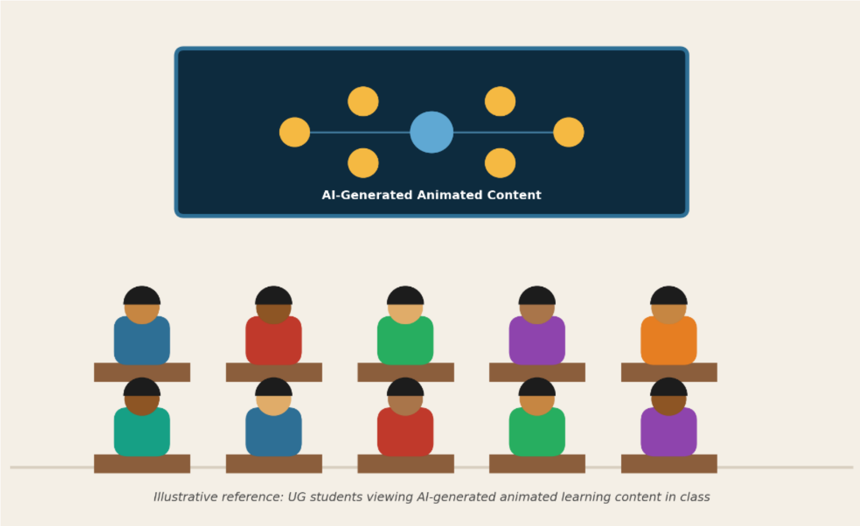

Figure 3. Schematic illustration of UG students viewing AI-generated animated content in a classroom setting

7.8 Interpretation and Implications

Collectively, the findings lead to the inference that the motivational value of animation in the teaching of School-level Science, Social Studies, History and Mathematics is not limited to younger learners. When students use AI tools that are not primarily aimed at aesthetic PPT enhancement (like design suggestions, automated layout, and AI-written bullet content), but rather at producing short explanatory animations, UG students report better perceived understanding and more motivation. This changes our perspective on the role of AI in UG presentations. Rather than being just a productivity tool that makes slides look better, the AI-generated animation can be a teaching tool that makes the underlying concept more learnable. This closes part of the gap between school-level visual instruction and the largely text-based format of UG lecturing.

For educators in UGs, this means the choice is not merely between 'using AI ' and 'not using AI' in their presentations. The choice is not "should I use AI to polish a static slide" but "should I use AI to animate the concept itself." Based on the survey data, students consider the second assessment to be much more beneficial for their understanding and motivation than the first, especially in content- and process-heavy courses.

7.9 LIMITATIONS

The findings in this study are based on perceptions solely reported by 300 respondents from one institution and a cross-sectional survey design precludes claims of causation about learning and motivation. Our study did not validate perceived ease of understanding with objective assessment scores. Furthermore, although the sample was fairly broad across streams, one cannot generalize this for all undergraduate disciplines. Future research should combine perception survey data of this kind with pre/post assessment scores in a longitudinal design to determine if the attitudinal gains associated with AI-generated animation produce lasting effects on academic performance across a full semester.

7.10 FUTURE RESEARCH

- Future research should:
- Conduct longitudinal and multi-institutional replications.
- Compare AI-generated animation with professionally produced human animation.
- Separate the effects of animation from students' awareness that AI was used.
- Examine behavioral indicators such as replay frequency, time on task, attendance, and persistence.
- Study accessibility outcomes for students with different learning needs.
- Evaluate discipline-spec
- If effects across science, engineering, humanities, and language education.
- Investigate whether personalization improves outcomes sufficiently to justify its privacy and production costs.
- Compare generative AI animation with interactive simulations and virtual or augmented reality.

8. CONCLUSION

AI-assisted animation can make higher-education content more visual, controllable, and thus, appealing – but we cannot take this at face value. The planned randomized experiment assesses whether carefully designed AI-animation instruction can boost motivation and academic performance, while keeping content and instructional time constant. By integrating these perspectives, the study presents a conceptual framework for examining learning outcomes and mechanisms that is underpinned by theory.

It is expected that animations that are purposeful and aiding instruction be used and while these animations will not lead to any misinterpretation on cognitive load, these will enhance interest competence and effort. For AI-generated animation to become a reference point for higher education, rigorous measurement, transparent reporting, human quality control and ethical implementation are essential.

REFERENCES

1. Ames, C. (1992). Classrooms: Goals, structures, and student motivation. Journal of Educational Psychology, 84(3), 261–271. https://doi.org/10.1037/0022-0663.84.3.261
2. Ayres, P., & Paas, F. (2007). Can the cognitive load approach make instructional animations more effective? Applied Cognitive Psychology, 21(6), 811–820. https://doi.org/10.1002/acp.1351
3. Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
4. Kusurkar, R. A., ten Cate, T. J., Vos, C. M. P., Westers, P., & Croiset, G. (2013). How motivation affects academic performance: A structural equation modelling analysis. Advances in Health Sciences Education, 18(1), 57–69. https://doi.org/10.1007/s10459-012-9354-3
5. Lowe, R. K. (2003). Animation and learning: Selective processing of information in dynamic graphics. Learning and Instruction, 13(2), 157–176. https://doi.org/10.1016/S0959-4752(02)00018-X
6. McAuley, E., Duncan, T., & Tammen, V. V. (1989). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. Research Quarterly for Exercise and Sport, 60(1), 48–58. https://doi.org/10.1080/02701367.1989.10607413
7. Mayer, R. E. (Ed.). (2021). The Cambridge handbook of multimedia learning (3rd ed.). Cambridge University Press. https://doi.org/10.1017/9781108894333
8. Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. Psychological Bulletin, 138(2), 353–387. https://doi.org/10.1037/a0026838
9. Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68
10. Ryan, R. M., & Deci, E. L. (2017). Self-determination theory: Basic psychological needs in motivation, development, and wellness. Guilford Press.
11. Sweller, J., Ayres, P., & Kalyuga, S. (2011). Cognitive load theory. Springer. https://doi.org/10.1007/978-1-4419-8126-4