Overview: Critical Thinking

Introduction: What is critical thinking?

Critical thinking[1] is the skill of questioning and balancing up the evidence of what we see, hear, are told or read about a subject, a problem or a phenomenon. This means we do not just accept what we are told, or someone else's opinion. Students need to learn how to think, which needs dedicated classroom time, and a learning environment which supports argument, exploration and questions, and which creates a safe space for student dialogue, reflection and mistakes.

Critical thinking skills develop learners' ability to learn more in all subjects. The best way to equip learners with such skills is to teach them explicitly as opposed to simply expecting them to develop while you are teaching another subject.

Critical thinking and 21st-century employability

Critical thinking is a key 21st-century employability skill, allowing students to appraise, evaluate, balance evidence and craft their opinion. Critical thinking synthesises academic knowledge and real-life problems. This is increasingly important for young people, as the CBI[2] suggests soft skills such as critical thinking will give students the advantage over automation, separating workers into those who are ready for the increasingly complex 21st-century work environments and those who are not.[3]

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[1] University of Leeds Critical Thinking: https://library.leeds.ac.uk/info/1401/academic_skills/105/critical_thinking
[2] CBI.2019. Educating for the modern world https://www.cbi.org.uk/media/3841/12546_tess_2019.pdf
[3] Burnage.S.2018 https://www.sec-ed.co.uk/best-practice/ideas-to-teach-critical-thinking

Critical thinking and Project-Based Learning (PBL)

Critical thinking is embedded in PBL[4], through setting a Driving Question, sustained inquiry, problem-solving, reflection and collaborative working. Critical thinking synthesises knowledge for higher-order thinking[5]. To think critically you must research a topic, analyse the information, consider the arguments and weigh up the evidence. Students need to consider the evidence and their peers' ideas, and form their own opinion, which is backed up by evidence or sources.

Critical thinking covers four broad areas:

1   Understanding and accepting different perspectives and viewpoints

Students need to understand and accept different perspectives and viewpoints. In PBL this is developed through an authentic, high-quality product designed for a specific audience, and the processes of redrafting and critique.

2   Evaluating evidence

Students need to make their project design judgements on evidence, and a key aspect of PBL is gathering and synthesising that evidence. An authentic audience, and a challenging open-ended Driving Question allow students exposure to managing conflicting viewpoints, bias, and analysing data to inform their product choices. Evidence is data on which we base our judgements or decisions. Gathering and evaluating evidence is an important feature of critical thinking. PBL helps students recognise where their views or decisions could be based on no evidence or wrong evidence, led by their emotions, and helps them challenge pre-existing views.

3   Non-routine problems

PBL presents non-routine problems to students, where there is no one correct answer because of the open-ended nature of the Driving Question. Student-led problem-solving means that no two end products are the same. Students learn to apply strategies they use in routine problem solving, e.g. set steps in measuring

the angle of a turn, in their project about making a robot move. Here application of routine steps into a non-routine area allows metacognition strategies to be developed.

4   Looking for deep structure

The Driving Question cannot be answered through quick, superficial answers. Project design across several weeks allows knowledge and skills to be layered and interwoven to create deep solutions to real-life problems. This requires critical thinking alongside problem-solving skills.

How is critical thinking developed in PBL?

The Buck Institute suggests that critical thinking can be developed within a project through these project steps[6].

1.   Launching the Project: analyse the Driving Question and begin the inquiry

Students will:

> show an understanding of central aspects of the Driving Question by identifying in detail what needs to be known to answer it

> consider various possible points of view on aspects of the Driving Question

> ask follow-up questions that focus or broaden inquirygain an understanding of the wants and needs of the audience or product users

2.   Building knowledge, understanding, and skills: gather and evaluate information

Students will:

> integrate relevant and sufficient information to address the Driving Question, gathered from multiple and varied sources

> thoroughly assess the quality of information

> consider usefulness, accuracy and credibility

> distinguish fact vs opinion; recognise bias

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[4] PBl Works: Gold Standard PBL: https://my.pblworks.org/system/files/documents/Gold_Standard_PBL_Essential_v2019.pdf

[5] Chartered College: Skillful Questioning: https://impact.chartered.college/article/doherty-skilful-questioning-beating-heart-pedagogy/

[6] https://my.pblworks.org/resource/document/6_12_critical_thinking_rubric_ccss_aligned

3. Developing and revising ideas and products: use evidence and criteria

Students will:

› evaluate arguments for possible answers to the Driving Question; assess whether their reasoning is valid

› check evidence is relevant and sufficient

› justify their choice of criteria used to evaluate ideas, product prototypes or problem solutions

› revise inadequate drafts, designs or solutions; explain why they will better meet evaluation criteria

4. Presenting products and answers to the Driving Question: justify choices, consider alternatives and implications

Students will:

› evaluate the advantages and disadvantages of using different media to present a particular topic or idea

› justify choices made when answering the Driving Question or creating products, by giving valid reasons with supporting evidence

› recognise the limitations of an answer to the Driving Question or a product design (how it might not be complete, certain, or perfect) and consider alternative perspectives

› clearly explain the new understanding gained and how it might transfer to other situations or contexts

This rubric has been adapted to the UK context to show the opportunities for developing critical thinking across each phase of a project.

Sources of best practice

Ofsted	https://dera.ioe.ac.uk/1093/1/Learning%20creative%20approaches%20that%20raise%20standards.pdf
PBL Works / Buck Institute	https://my.pblworks.org/resource/document/project_path_and_routines https://tc2.ca/uploads/PDFs/Critical%20Discussions/does_project_based_learning_teach_critical_thinking.pdf
Magnifying Learning	https://www.magnifylearningin.org/what-is-project-based-learning
Edutopia	https://www.edutopia.org/blog/getting-critical-about-critical-thinking-heather-wolpert-gawron

Ideas to teach critical thinking: https://www.sec-ed.co.uk/best-practice/ideas-to-teach-critical-thinking/

Critical thinking in geography 2015-2018 https://www.geography.org/uk/critical-thinking