

Articles		5	4	3	2	1
Structured communication 1: Structure/Clarity/Language	Students are able to communicate their research and that of others in a structured and catchy manner, both written and verbally.	Structured layout: all instructions concerning the layout have been met: all headers are marked, all figures have clear and extensive captions, figures have a clear position, <b>concise</b> & clear formulation, correct use of scientific jargon, <b>academic use of language</b> . <b>Clear</b> distinction between measured data and theory, all references have been made where necessary.	Structured layout: <b>all</b> instructions concerning the layout have been met: <b>all</b> headers are marked, <b>all</b> figures have clear <b>and extensive</b> captions, figures have a clear position, <b>clear formulation</b> , <b>correct use of scientific jargon</b> . <b>Distinction</b> between measured data and theory, <b>all</b> references have been made where necessary.	Structured layout: <b>almost all</b> instructions concerning the layout have been met: <b>most</b> headers are marked, <b>most</b> figures have <b>clear</b> captions, <b>figures have a clear position</b> , <b>mostly clear formulation</b> , <b>some references have been made where necessary</b> .	Structured layout: <b>several</b> instructions concerning the layout have been met: <b>some</b> headers are marked, <b>some</b> figures have captions.	<b>No or very little</b> structured layout.
Structured communication 2: Data presentation		Clear presentation of <b>all data revealing patterns and features in the data</b> : neat tables and graphs including error bars, names for axes, consistent use of units, <b>clear</b> definition of <b>all</b> symbols in formulas, end results are correctly rounded and accuracy is presented correctly.	Clear presentation of <b>most</b> of the data: neat tables and graphs including error bars, names for axes, consistent use of units, <b>definition of most symbols</b> in formulas, end results are correctly rounded and <b>accuracy</b> is presented correctly.	Clear presentation of <b>important</b> data: <b>neat</b> tables and graphs <b>including error bars</b> , names for axes, <b>consistent</b> use of units, end results are <b>correctly rounded</b> .	<b>Tables and graphs</b> are used to present data including <b>names for axes</b> , <b>most</b> units are present.	Data is presented <b>unclearly</b> .
Structured communication 3: Argumentation		Arguments are written <b>concisely</b> and are <b>complete</b> . The article is written in a logical (not a chronological) order. The abstract summarizes the <b>complete</b> article <b>including conclusion</b> . All references are given in <b>APA7-style</b> . The research contribution to science <b>and</b> the world is discussed.	<b>Most</b> arguments are clear. The article is written in a logical (not a chronological) order. <b>The abstract summarizes the article</b> . All references are given. <b>The research contribution to science or the world is discussed</b> .	<b>Some clear</b> arguments are given. <b>An abstract is given</b> . <b>The article is written in a logical (not a chronological) order</b> . <b>Some</b> references are given.	Arguments are vague/unclear or too short/unnecessarily long.	Arguments are <b>vague/unclear and too short/unnecessarily long</b> .
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Introduction 1: Goal, Research question	Based on a specific problem students are able to write a measuring plan from which reasonably may be expected that it will deliver usable results.	The research' contribution to science and the world is discussed. Contains a well-defined <b>and creative</b> goal and a quantifiable research question in a nicely readable text.	The research' contribution to science and the world is discussed. Contains a <b>well-defined</b> goal and a quantifiable research question in a <b>nicely readable text</b> .	<b>The research' contribution to science or the world is discussed</b> . Contains a goal and a <b>quantifiable</b> research question.	Contains <b>a goal and a research question</b> .	Contains <b>no goal or no</b> research question.
Introduction 2: Theory		An <b>extensive</b> overview of relevant theory and research in the field is given <b>and correctly related to the students' measuring method</b> . No irrelevant theory is mentioned.	<b>An overview of relevant theory and research in the field is given</b> . No irrelevant theory is mentioned.	<b>An overview of relevant theory is given</b> . <b>No irrelevant theory is mentioned</b> .	Contains <b>some</b> scientific theory.	Contains <b>no or very limited</b> theory.
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Trustworthy results 1: Setup	Students are able to independently execute their measuring plan, adapting it where necessary to collect trustworthy results from an experiment while clearly documenting their steps.	Contains clearly understandable visual and description of a <b>creative or clever</b> final experimental setup including a complete description of used materials, <b>all critical parts and critical aspects are discussed</b> .	Contains <b>clearly understandable</b> visual and description of the final experimental setup including a complete description of used materials.	Contains visual <b>and</b> description of the <b>final</b> experimental setup <b>including a complete description of used materials</b> .	Contains <b>visual or description</b> of experimental setup.	Contains <b>no or a very limited</b> visual or description of experimental setup.
Trustworthy results 2: Measuring method		Contains a <b>creative or clever and complete retraceable</b> measuring method, containing <b>all</b> essential steps and settings, discusses the spread of measurements, what has been varied in <b>which range</b> and how that variation has been controlled, and <b>what has been kept constant</b> , including how raw data errors have been determined.	Contains a <b>retraceable</b> measuring method, containing <b>most</b> essential steps and <b>settings</b> , discusses the spread of <b>measurements</b> , <b>what has been varied and how that variation has been controlled</b> , including <b>how raw data errors have been determined</b> .	Contains <b>the measuring method</b> , containing <b>several essential steps</b> , and <b>what has been measured</b> .	Contains a measuring method.	Contains <b>no or a very limited</b> measuring method.
Trustworthy results 5: Measurement errors		Contains all important measurement errors and remarks on the size of <b>all</b> of them.	Contains <b>all important</b> measurement errors and remarks on the size of <b>several</b> of them.	Contains <b>most</b> measurement errors.	Contains <b>very limited</b> measurement errors.	Contains <b>no</b> measurement errors.

**Trustworthy results 6: Results  
& Productivity**

Contains proven **outstanding productivity** (where possible extra observations are made), contains **only** quantified remarks. **Some resulting data can be a useful starting point for publication.**

Contains proven **above average** productivity (some extra observations) and some quantified remarks.

Contains **proven** adequate productivity (no extra observations) and **some quantified** remarks.

Contains adequate productivity (no extra observations) and **only** descriptive remarks.

Contains inadequate productivity (**no** extra observations or descriptive remarks).

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<b>Critical Analysis 1: Interpretation of data</b>	<b>Students are able to independently execute their analysis plan, adapting it where necessary to critically analyse an experiment while clearly documenting their steps.</b>	<b>Logically correct</b> interpretation of the data using theory: <b>every</b> result is critically discussed, in the case of unexpected results the <b>cause</b> is discussed.	<b>All</b> data is correctly interpreted: some results are critically discussed, <b>unexpected results are reinvestigated.</b>	<b>Most</b> data is correctly interpreted: some results are <b>critically discussed.</b>	<b>Some</b> correct interpretation of the data: results are <b>not</b> critically discussed.	<b>Incorrect</b> interpretation of the data: results are <b>not</b> critically discussed.
<b>Critical Analysis 2: Application of theory</b>		Building on existing scientific theories: a <b>broad</b> knowledge of current scientific theory is applied <b>correctly and quantitatively</b> to the data within the correct restraints. No irrelevant theories are mentioned.	<b>Thorough</b> knowledge of <b>current</b> scientific theory is used in analyzing <b>all</b> data. No irrelevant theories are mentioned.	<b>Sufficient knowledge of</b> scientific theory is used in analyzing <b>most</b> of the data. <b>No irrelevant theories are mentioned.</b>	<b>Some</b> scientific theory is used in analyzing <b>some</b> of the data.	<b>No or very limited</b> scientific theory is used in analyzing the data.
<b>Critical Analysis 3: Error analysis and fits</b>		The size of <b>all</b> important statistical and systematic errors and fits are <b>critically and quantitatively</b> discussed concerning their <b>influence on the conclusions.</b>	The size of most important statistical <b>and</b> systematic errors <b>and</b> fits are discussed.	The size of <b>most</b> important statistical <b>or</b> systematic errors <b>or</b> fits are discussed.	The size of <b>some</b> statistical <b>or</b> systematic errors <b>or</b> fits are discussed.	The size of statistical <b>and</b> systematic errors <b>and</b> fits are <b>not</b> critically discussed.
<b>Critical Analysis 4: Raw data to conclusions</b>		Conclusion <b>summarizes all main findings</b> , answers <b>each (sub)</b> research question and <b>hypotheses are tested quantitatively and correctly</b> , the <b>creative or clever</b> line from raw data to conclusion is <b>coherent, logical</b> and clear, <b>all</b> important end results are critically discussed, <b>limitations are mentioned.</b>	<b>Most</b> (sub) research questions are answered and the line from raw data to conclusion is <b>clear, most</b> important end results are critically discussed.	Research question is answered <b>and</b> the line from raw data to conclusion can be traced, <b>some</b> important end results are <b>critically</b> discussed.	<b>Research question is answered or an end result is discussed.</b> The line from raw data to conclusion can be traced <b>somewhat.</b>	Research question is <b>not</b> answered <b>or</b> the line from raw data to conclusion is <b>not clear, or</b> end results are <b>not</b> discussed.
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