Table S1. Levels of the parameter "Adaptivity".

Level	Description
1	There are no adjustments in the application possible. Neither user or program can adapt.
2	The user can adapt the program during setups beforehand and can adjust the program to their needs.
3	The user can adjust while using the program or can ask for help.
4	The program can adapt automatically to user activities, events or changing situations. For this reason, input from sensors and user activities are evaluated.

Table S2. Levels of the parameter "Interactivity".

Level	Description
1	To observe and reproduce/reflect/report an object
2	To observe and reproduce multiple representations
3	To variegate different representations
4	To influence the content of the component
5	To construct the object or the representation
6	To generate processes and construct and manipulate with situational feedbacks

Table S3. Indicators of the parameter "Congruence with Reality".

Indicator	Description
Plausibility	This indicator defines if a depiction is plausible. An object or representation is plausible, if it is part of the perceptible reality and the appearance and depiction is true to life.
Proximity to life	With this indicator the contents of the AR with regards to events in reality are investigated. The proximity of life for the individual user must be considered. Since the target group of AR in science education should be students in (secondary) school or undergraduates, the proximity of life is chosen for a regular student in this review.
Light effects	This indicator describes if and how light effects are present and how they affect the outer appearance.
Shadow effects	Like the indicator of light effects, the presence of shadow effects is assessed.
3D-registration	This indicator outlines if parts of the AR keep distinguished positions in the 3-dimensional space.
Proportions	This indicator investigates the outer appearance of an object regarding the correctness of its proportions.
Photorealism	This indicator describes the photorealistic appearance and the level of details of the presentation.

Table S4. Indicators of the parameter "Content proximity to Reality".

Indicator	Description
Temporal plausibility	This indicator characterizes if processes in the AR application take place in the correct time-frame. Time lapse or slow motion are not plausible.
Local plausibility	Like the temporal plausibility, this indicator defines if the local position of the AR object is plausible. If an object flies, while it should fall or swims while it should sink it is not local plausible.
Causal plausibility	This indicator decides if there is a logical occupation between cause and effect.
Appropriate choice of tracking method	This indicator investigates if the choice of tracking method is appropriate.
Appropriate depiction of tracking method	In addition to the sensibility of tracking method, this indicator determines if the tracking method has a relation to the content. A water molecule as a marker for a 3D model with regards to the topic water can be defined as appropriate.

Table S5. Indicators of the parameter "Game Elements".

Indicator	Description
Rules/Goals	The indicator defines if the AR has a clear objective and if the rules are clearly stated.
Conflict/Challenge	This indicator investigates if the AR confronts the students/users with challenges/conflicts.
Control	With this indicator the application is examined if it contains possibilities for manipulation. This enables the user a feeling of autonomy and the ability to act. A possibility is to give the users opportunities to find different paths or strategies.
Assessment	This indicator states if there is a system to count points, achievements, or feedback.
Action Language	This indicator describes if the user and the program can interact through actions or choices. Basis for this could be joysticks, dices, gestures, or language.
Human Interaction	This indicator describes if there is the possibility of social interaction with other users.
Environment	This indicator outlines if the AR can be used in an arbitrary location or is linked to a determined environment.
Game Fiction	This indicator specifies if the AR has a deeper story/narrative, through which the scenario gets depth/importance.

Table S6. Levels of the parameter "Complexity".

Level	Description
1 (one fact)	Terms of biological, chemical, physical parameters, properties, or variables are described.
2 (two facts)	Two not related facts are shown and described.
3 (context)	Functional relations between facts are described and put into context.
4 (contexts)	Various links are connected to describe complex relations, for instance cycles
5 (superordinate concept)	General (superordinate) concepts of various relations are described and are independent from distinguished situations.

Table S7. Comparison of AR applications for experiments.

Authors	Subject	Experiment	E.N. [a]	AR Application	AR time	Device	Tools (Application and Development)
Akçayır et al. [57]	Physics	Electrolysis of water, Ohm's law, Wheatstone bridge, Kirchhoff's law, phase transformer	1	AR-assisted laboratory manual trough Marker on Worksheet (Videos, Graphics, links) (2D)	optional	Smartphone	Junaio app (Smartphones), Metaio creator (development)
Albuquerque et al. [22]	Physics	Teltron tube (Helmholtz coils), Electron-Beam-Deflection-Tube, Parallel Plate Capacitor	2	Overlay for measured parameters and visualization of forces (vectors fields), particle beams and density fields (3D)	during experiment	HoloLens	DirectX SDK, OpenCV, C#
Altmeyer et al., Kapp et al., Thees et al. [17, 58–61]	Physics	Electrical current and voltage in parallel and series electric circuits	3	Measurement-Display as Overlay to circuit (2D)	during experiment	Tablets, HoloLens	Unity 3D game, Vuforia
Amiraslanov et al. [62]	Physics	Electric theories (Ohm's und Kirchhoff's Law)	4	Visualization of measurements in electrical circuits (schematic) (2D)	during experiment	HoloLens	Unity 3D game engine, HTTP Server written in Python
An et al., An & Holme [1,34]	Chemistry	pH Meter and conductivity meter	5	Overlay: User Interface (UI) (2D) with information to pH-Meter and conductivity meter (safety and background knowledge) called ARiEL	during experiment	Smartphones & Tablets (iOS & Android)	Vuforia SDK, Unity 3D engine, ARiEL
Bakri et al. [63]	Physics	Heat-Experiment	6	AR-based videos to develop concept of heat, to identify	pre- and post-	Smartphone (Android)	-

Authors	Subject	Experiment	E.N. [a]	AR Application	AR time	Device	Tools (Application and Development)
				tools and directions for experiments and daily life examples post-experiment - "developing student" (2D) - ARiEL	experiment		
Caputo et al., Schiano Lo Moriello et al. [64,65]	Physics	Radioactivity	7	Visualized the radioactive source and the reproduction gamma ray detector	During experiment	Smartphones & Tablets (Android)	Unity 3D Android App, non-contact Laser ScanArm by FARO
Chen et al. [66]	Chemistry	a flow chemistry packed bed column	8	Instructions for experimental setup	Pre-experiment	HoloLens	FlowAR-App
Gan et al. [35]	Chemistry	Redox Reaction between hydrogen peroxide and sodium hypochlorite solutions	9	Visualization of solutions and oxygen gas (volume of generated oxygen), optional virtual rendition of liquid levels (2D)	during experiment	Smartphones & Tablets (iOS & Android)	C#, Unity Game engine, Vuforia AR
Giancaspro et al. [67]	Physics	mechanics education	10	Force-Arrows and Force distribution	during experiment	Magic Leap One™	Dist Forces, Unity, C#, Lumin
Hanafi et al. [36]	Science	Safety training for various science experiments	11	Safety assistant training before laboratories (3D)	Pre-experiment	Smartphones & Tablets	-
Jiang et al. [68]	Science	Thermodynamic: thermal radiation (natura convection, forced convection, conduction, latent heat)	12	Visualization of temperature via smartphone and IR camera (2D)	during experiment	Smartphone with Flir ONE IR camera	Infrared explorer

Authors	Subject	Experiment	E.N. [a]	AR Application	AR time	Device	Tools (Application and Development)
Keller et al. [69]	Physics	Natural Radiation ("out of school" learning activity)	13	Visualization of radiation in various locations (natural occurring radiation) (2D)	during experiment	Modified iPad (pixelated silicon sensor & Atom-based Minnow Board)	Timepix, AVRO
Knierim et al. [70]	science	Heat conduction	14	Overlay (false-colour visualization) on metallic rod and graph with real-time values (2D)	during experiment	HoloLens & Optris Piconnect IR camera	Vuforia SDK
Kreienbühl et al. [71]	Physics	Electrical Circuits	15	bicycle chain, water pipe analogy to an electric circuit	During experiment	Tablets (Android)	Vuforia
Kuhn et al. [72]	Physics	Magnetism experiment	16	Magnetic flux lines (conceptual augmentation) (2D/3D)	Pre-experiment during experiment	Smartphone & Tablets	Virtuocity
Lauer et al. [73]	Physics	Electrical Circuits	17	Schematic circuit overlay to help build a working/closed circuit (2D)	during experiment	HoloLens & Tablets (Android)	-
Liu et al. [74]	Physics	Magnet Field Lines	18a	Visualization of magnetic field lines (2D)	during experiment	Smartphones & Tablets (iOS & Android)	Vuforia SDK, Unity 3D engine

Authors	Subject	Experiment	E.N. [a]	AR Application	AR time	Device	Tools (Application and Development)
Liu et al., Shufan et al. [19,75]	Physics	Magnetic Fields (Magnetic Phenomena Observation, Simulation of Magnetic Induction Line, Geomagnetic Field Simulation)	18b	Visualization of magnetic field lines (experimentation tool) (2D), World with magnetic field (3D)	during experiment, post-experiment	Smartphones & Tablets (iOS & Android)	Vuforia SDK, Unity 3D engine
Midak et al. [76]	science	Physical Attributes of water (Surface Tension, capillary Effect, Water Filtration)	19	Chemical structure and state of aggregation of water (molecule, ice, water, vapor) (3D), videos to laboratory experiments (2D)	Pre-experiment	Smartphone & Tablets	LiCo.STEM, Vuforia (markers für AR), 3ds Max (3D-Modelle), Unity 3D (AR-Objects)
Minaskan et al. [77]	Physics	Motion on airtable	20	color-coded lines show the motion of the pucks on the airtable	during experiment	Hololens, projector	
Murillo et al. [78]	Physics	Pendulum (object tracking)	21	Waypoint of pendulum (object tracking) (2D)	during experiment	Kinect	Hewlett Packard, Image Acquisition Toolbox (MatLab)
Ovens et al. [16]	Science (Biology/ Chemistry)	DNA-Precipitation	22	Atomic models: forming links between macro and sub-micro levels (3D)	optional pre or post experiment or during experiment (mostly	Smartphones & Tablets (iOS & Android)	Unity 3D game engine, C#, Unity AR foundation (Android AR Core and iOS ARKit), PyMOL (for DNA structure)

Authors	Subject	Experiment	E.N. [a]	AR Application	AR time	Device	Tools (Application and Development)
					used post experiment)		
Ripsam & Nerdel [79]	Chemistry	Redox reactions consists for the electrolysis of zinc iodide	23	Experimental Setup, Diffusion and Electrolysis at the Particle Level, Chemical Reactions	Pre experiment, during experiment	Hololens	
Sokan et al. [37,38]	Chemistry	Heating iron and sulphur (example experiment)	24	Alerting accidents in experiments (visual 2D and acoustic)	during experiment	A-CUBE	Java, ARToolkit, Phidgets interface kit
Strzys et al., Thees et al. [80–82]	Physics	Heat Conduction in Metals	25	Overlay (false colour representation) on metal rod for Holo.Lab to heat conduction (2D)	during experiment	HoloLens, infrared camera	-
Sun et al. [83]	Physics	mechanics	26	To learn the names, functions, and operation processes of the experimental equipment		HMD (second-generation pocket VR produced by JetRock) with smartphones	HP Reveal Application
Tee et al. [39]	Chemistry	Colorimetric Titrations	27	Colorimetric titration tool: overlay for real experimental setup (2D)	during experiment	Smartphones (Android & iOS)	Unity, Vuforia SDK and API

Authors	Subject	Experiment	E.N. [a]	AR Application	AR time	Device	Tools (Application and Development)
Wozniak et al. [84,85]	Chemistry	Laboratory Operations (mixing, measuring, heating, titration)	28	AR.chemist: action-mapping/logging (automatic), interactive instructions, setup-analyzing (via QR-Codes) (2D)	during experiment	Tablets (Android)	OpenCV & ArUco (Object tracking)

[a] Experiment number.

Table S8. Empirical research analyzation.

Authors	Quant.	Qual.	Research Interest	Research Design	Research Findings	Sample size
Akçayır et al. [57]	x	x	Laboratory-skills, Attitudes	quasi-experimental: pre-test (midterm exam scores), post-test (final exam scores) Questionnaire: (Laboratory Skills), semi-structured interview (Attitude).	Laboratory skills and attitude to physics laboratories in experimental group significant higher after test.	76 (38 AR x 38 Control) 1st year undergraduates
Albuquerque et al. [22]	-	x	Effect on learning process (Concept Connections)	pre- and post-interview	AR-Group showed significant higher rate of correct connections between the concepts. Number of wrong connections similarly decreased in both groups. The number of connections related to the representation of the invisible quantities was higher in the AR group.	14 (8 AR x 6 control) Undergraduate teacher students
Altmeyer et al., [17]	x	-	Cognitive Load, Conceptual Knowledge, Usability	Pre- and post-test	No differences detected in cognitive load-test (between AR and no-AR). AR had impact on learning gain from pre- to post-test in conceptual knowledge items (just concept of parallel circuits). "excellent" usability score, no significant difference between AR and non-AR	50 University students (18-30y)
Amiraslanov et al. [62]	-	-	-	-	-	-
An et al. [1]	x	x	Usability (qual.), Attitude toward the	Focus group study (usability) survey (pre and post), class-scale	Usability was detected high (easy to use). ARiEL could result in less anxiety regarding instrument usage and better attitude to instrumentation (perceived easier and clearer).	12 (Usability) 104 (Attitude) 1st year chemistry students

Authors	Quant.	Qual.	Research Interest	Research Design	Research Findings	Sample size
			Subject of Chemistry (ASCI) (quan.)	Implementation (pre- and post-survey) ASCI		
An & Holme [34]	x	-	App Usage (Type and Amount of Information accessed). Attitudes validated (conformation factor analyzation - CFA)	Google Analytics (App Usage) Pre- and post-administration survey (Attitudes).	App usage: Most visited pages through ARiEL were directly related to the experiment. Attitudes: Extracted factors: Intellectual Accessibility, Enjoyability, Satisfaction, and Anxiety: could not be validated. Results from both studies: laboratory experience, with ARiEL, leads to positive effects on students' level of anxiety toward instrumentation	280 (presurvey responses); 111 (parametric) Second semester chemistry students
Bakri et al. [63]	-	x	Feasibility, Cognitive Ability Gain, Concept Knowledge	Validation test, Field test (pre- and post-test)	The developed worksheet did pass the feasibility test of material, media and learning experts. It was shown that there is an increase in cognitive ability.	6 11th grade high school
Caputo et al. [64]	-	-	-	-	-	-
Chen et al. [66]	-	x	Usefulness, Confidence in handling Chemicals	Pre- and post-test (tool yield survey)	Results from survey (small-scale test) state the learning was supported and confidence in handling chemicals improved.	10 11th & 12th grade high school
Gan et al. [35]	x	x	Konwled gain, usability (rceived clarity,	Pretest-posttest design with questionnaire and two groups (AR and non-AR)	Participants in the experimental condition recalled the procedure and parts at a higher level when compared to the control condition. More content clarity and a much more	34 (17 AR, 17 Controllgroup) University

Authors	Quant.	Qual.	Research Interest	Research Design	Research Findings	Sample size
			training experience)		enjoyable and effective experience compared to the control conditions.	
Giancaspro et al. [67]	x	-	Knowledge	Pretest-posttest design with questionnaire and two groups (AR and non-AR)	The AR group demonstrated significantly greater improvement in post-activity test scores compared to the control group, with the measured effect size of 0.13 indicating that 13% of the total variance in the post-activity test scores can be attributed to the activity.	42 University
Hanafi et al. [36]	-	-	-	-	-	-
Jiang et al. [68]	x	x	Navigation Patterns (Usage of AR), Learning Performance related to Navigation Patterns	Semi-structured Interviews (31 students), Log Data (33 pairs), Lab Reports (learning performance)	Different patterns of navigation representations were observed. The group who switched more frequently between representations could give better rationale. Navigation patterns were associated with learning performance.	70 9th Grade High School
Kapp et al. [58]	x	-	cognitive load, conceptual knowledge, usability	Pretest-posttest design with questionnaire and two groups (AR and non-AR)	Both groups reported low extraneous cognitive load and achieved a significant knowledge acquisition, no group differences were detected	56 Biology University Students
Kapp et al. [59]	x	-	Extraneous Cognitive Load, Knowledge Gain, Affect State, Motivation	Two-group Pretest–midtest-posttest design (AR and non-AR)	Both groups showed no differences in cognitive load or knowledge acquisition and no differences regarding their affective state before or during the experiment. However, both groups achieved significant learning gains which is not guaranteed	56 Biology University Students

Authors	Quant.	Qual.	Research Interest	Research Design	Research Findings	Sample size
Kapp et al. [60]	x	-	Usability, Rating of Interference of Smartglasses during Experimentation (Usage of AR)	Post-Test with System Usability Scale (SUS) by Brooke	Usability Score of 94 out of 100.	20 High School Students
Keller et al. [69]	-	-	-	-	-	-
Knierim et al. [70]	-	-	-	-	-	-
Kreienbühl et al. [71]	-	x	Personal Experience (Usability) and potential Teaching Activities	User study with open ended questionnaire	Group of STEM teachers who highlighted tangibility and believability as positive aspects for learning. Importantly, ARCC does not aim to replace but to support existing classroom activities. Exploration and experimentation stand at the forefront, potentially leading to critical in-class discussions about the advantages and short comings of the different analogies.	8 (Teachers)
Kuhn et al. [72]	-	-	-	-	-	-
Lauer et al. [73]	-	-	-	-	-	-
Liu et al. [74]	-	x	Attitude, Usability	Interviews	Usability: operation was simple and easy to grasp, but uncomfortable long-time-usage. Positive attitude on the AR experiment.	3 14-15y

Authors	Quant.	Qual.	Research Interest	Research Design	Research Findings	Sample size
Liu et al. [19]	x	-	Knowledge Gain, Cognitive Load	Knowledge Quiz (pre- and post-test); Cognitive Load scale, Semi-structured Interviews (post-test, audio recording), 3 Groups: AR, 3D and traditional experiments	Highest knowledge improvement in AR-Group. AR-Group had lowest Cognitive Load.	122 (AR: 41, 3D: 42, traditional: 39) 9th Grade Junior High School
Midak et al. [76]	-	-	-	-	-	-
Minaskan et al. [77]	-	-	-	-	-	-
Schiano Lo Moriello et al. [65]	-	-	-	-	-	-
Murillo et al. [78]	-	-	-	-	-	-
Ovens et al. [16]	-	x	Usage of AR as preparation or reflective tool	Pilot study: Post-test online Survey	Tool usage more after experimenting (Revision/Reflection).	42 First year Students (Biochemistry, Molecular Biology and Pharmacology Major)
Ripsam & Nerdel [79]	x	x	Use of Technical Language of Teachers	pre-post survey. Each test includes five tasks elaborated by thinking aloud. The thinking-aloud protocols to acquire the use of the chemical	Conception of learning environment rated very positively.	30 Secondary School Teachers

Authors	Quant.	Qual.	Research Interest	Research Design	Research Findings	Sample size
				terminology are evaluated in MAXQDA.		
Shufan et al. [75]	x	-	Learning performance, Motivation, Attitudes	2 x 2 factorial quasi-experiment design (AR and non-AR, LA level low and LA level high)	AR can effectively improve students' learning performance and motivation (compared to traditional experimental Materials). regardless of their anxiety, students in AR condition performed better on transfer test than those in non-AR group. AR can also significantly motivate students with high anxiety.	96 Junior High School Students
Sokan et al. [37]	x	-	Usability	Questionnaire, System usability Scale (SUS)	Usability perceived roughly positive. Major concern in usability was improper context recognition.	8 Undergraduate Students
Sokan et al. [38]	x	-	Ambiguity of Presentation (visual; auditive)	Questionnaire	Usability adequate. Context recognition needs to be more robust. Relaxation for the tension between user in case of application malfunction.	40 Undergraduate Students
Strzys et al. [80]	x	-	Conceptual Understanding ,	Quasi-experimental, pre- and post-test, Multiple-Choice Survey two groups (43 control, 16 treatment)	Interplay between experiments and theoretical representation could be enhanced through augmentations with real-time feedback.	59 Second Term students
Strzys et al. [81]	x	-	Cognitive Load	pre-test: Concept-test (HTCE items) and post-test: Concept-test (HTCE items), Cognitive Load items and System usability Scale (SUS), Two Groups (Control, AR)	Significant reduction of extraneous load.	35 1st year students (18-33y)

Authors	Quant.	Qual.	Research Interest	Research Design	Research Findings	Sample size
Sun et al. [83]	x	x	Situational Interest, Engagement, and Learning Performance	quasi-experimental research design, participants assigned to three groups (traditional, wearable AR and wearable hybrid AR/VR)	situational interest and learning performance of the wearable hybrid AR/VR group were significantly higher, compared with that of the traditional learning group. The engagement of the wearable hybrid AR/VR group was significantly higher, compared with that of the other two groups. The wearable hybrid AR/VR material increased situational interest, engagement, and learning performance in the physical laboratory course.	105 High School Students (Freshman)
Tee et al. [39]	-	x	Usefulness	Small scale pre- and post-test Survey	AR application was useful in gaining confidence in handling chemicals and supports learning.	10 Undergraduate students
Thees et al. [82]	x	-	Learning Performance, Conceptual Knowledge, Cognitive Load	quasi-experimental pre- and post-test Two groups (traditional and AR)	Conceptional knowledge: no significant between both groups. Cognitive load: No significant differences were detected. (Initially big difference in pre-test between both groups made it difficult to interpret gain scores)	74 (34 AR, 40 control group) Undergraduate Students
Thees et al. [61]	x	-	Conceptual Knowledge, Cognitive Load, Usability	Pre-post-test study with two Groups (separate Display and head mounted AR)	Separate Display Group had higher learning gains. No significant differences for Cognitive Load.	107 Engineering Students
Wozniak et al. [84,85]	-	x	Design Investigation, Usability	Preliminary study - Usability video analyzation Semi-structured Interviews (recorded; 7 Students and 3 Lecturers),	Tablet is inadequate for this setting (not handy enough for laboratory setting). Participants performed action mapping of simpler procedures after completing them, and of complex ones beforehand. Quick operations were used with GUI-mode, while with	Design: 7 (students) + 3 (Lecturers), Usability: 2 (3rd semester chemistry students 21y)

Authors	Quant. Qual.	Research Interest	Research Design	Research Findings	Sample size
				complicated ones AR-view was used. Interactive Instructions were found to be easy to follow and helped with confidence.	

Table S9. Analyzing Design parameters (x = indicator present; - = indicator missing).

Authors	Experiment number	Immersion Level	Visual Immersion	Auditive Immersion	Haptic Immersion	Olfactory Immersion	Gustatory Immersion	Level Interactivity	Level Congruence with Reality	Plausibility	Proximity to life	Light effects	Shadow effects	3D-Registration	Proportions	Photorealism	Level Content Proximity to [illegible]	Temporal Plausibility	Local Plausibility	Causal Plausibility	Appropriate choice of tracking [illegible]	Appropriate depiction of [illegible]	Level Adaptivity	Level Game-Elements	Rules/Goals	Conflict/Challenge	Control	Assessment	Action Language	Human Interaction	Environment	Game Fiction	Level Complexity
Akçayır et al. [57]	1	1	x	-	-	-	-	1	0	-	-	-	-	-	-	-	3	x	x	-	x	-	1	1	-	-	-	-	-	-	x	-	1
Albuquerque et al. [22]	2	1	x	-	-	-	-	4	2	-	-	-	-	x	x	-	5	x	x	x	x	x	2	0	-	-	-	-	-	-	-	-	3
Altmeyer et al., Kapp et al., Thees et al. [17,58–61]	3	1	x	-	-	-	-	1	3	x	-	-	-	x	x	-	5	x	x	x	x	x	1	0	-	-	-	-	-	-	-	-	2
Amiraslanov et al. [62]	4	1	x	-	-	-	-	4	2	-	-	-	-	x	x	-	4	x	x	-	x	x	1	0	-	-	-	-	-	-	-	-	2
An et al., An & Holme [1,34]	5	1	x	-	-	-	-	1	0	-	-	-	-	-	-	-	2	-	-	x	x	-	1	1	-	-	x	-	-	-	-	-	2
Bakri et al. [63]	6	2	x	x	-	-	-	2	3	x	x	-	-	-	-	x	3	x	-	x	x	-	1	3	x	-	x	-	-	-	x	-	5
Caputo et al., Schiano Lo Moriello	7	1	x	-	-	-	-	1	2	-	-	-	-	x	x	-	4	x	x	-	x	x	x	0	-	-	-	-	-	-	-	-	1

Authors	Experiment number	Immersion Level	Visual Immersion	Auditive Immersion	Haptic Immersion	Olfactory Immersion	Gustatory Immersion	Level Interactivity	Level Congruence with Reality	Plausibility	Proximity to life	Light effects	Shadow effects	3D-Registration	Proportions	Photorealism	Level Content Proximity to [illegible]	Temporal Plausibility	Local Plausibility	Causal Plausibility	Appropriate choice of tracking [illegible]	Appropriate depiction of [illegible]	Level Adaptivity	Level Game-Elements	Rules/Goals	Conflict/Challenge	Control	Assessment	Action Language	Human Interaction	Environment	Game Fiction	Level Complexity
et al. [64,65]																																	
Chen et al. [66]	8	2	1	1	-	-	-	2	1	-	-	-	-	1	-	-	3	1	-	-	1	1	3	1	-	-	1	-	-	-	-	-	1
Gan et al. [35]	9	1	x	-	-	-	-	4	3	x	-	-	-	x	x	-	5	x	x	x	x	x	3	0	-	-	-	-	-	-	-	-	1
Giancaspro et al. [67]	10	1	1	-	-	-	-	2	1	-	-	-	-	1	-	-	4	1	-	1	1	1	1	1	-	-	1	-	-	-	-	-	1
Hanafi et al. [36]	11	1	x	-	-	-	-	1	4	-	x	x	x	x	-	-	1	-	-	-	x	-	1	3	x	-	x	-	-	-	x	-	1
Jiang et al. [68]	12	1	x	-	-	-	-	4	2	-	-	-	-	x	x	-	5	x	x	x	x	x	3	1	-	-	x	-	-	-	-	-	4
Keller et al. [69]	13	1	x	-	-	-	-	1	2	-	-	-	-	x	x	-	5	x	x	x	x	x	1	0	-	-	-	-	-	-	-	-	1
Knierim et al. [70]	14	1	x	-	-	-	-	4	2	-	-	-	-	x	x	-	5	x	x	x	x	x	1	1	-	-	x	-	-	-	-	-	3
Kreienbühl et al. [71]	15	1	x	-	-	-	-	4	3	x	x	x	-	-	-	-	3	-	x	-	x	x	1	1	-	-	x	-	-	-	-	-	4
Kuhn et al. [72]	16	1	x	-	-	-	-	1	2	-	-	-	-	x	x	-	5	x	x	x	x	x	1	0	-	-	-	-	-	-	-	-	2
Lauer et al. [73]	17	1	x	-	-	-	-	1	2	-	-	-	-	x	x	-	5	x	x	x	x	x	1	0	-	-	-	-	-	-	-	-	1
Liu et al. [74]	18 a	1	x	-	-	-	-	4	6	-	x	x	x	x	x	x	5	x	x	x	x	x	1	2	-	-	x	-	-	-	x	-	4
Liu et al., Shufan et al. [19,75]	18 b	1	x	-	-	-	-	4	2	-	-	-	-	x	x	-	5	x	x	x	x	x	1	1	-	-	-	-	-	-	x	-	2

Authors	Experiment number	Immersion Level	Visual Immersion	Auditive Immersion	Haptic Immersion	Olfactory Immersion	Gustatory Immersion	Level Interactivity	Level Congruence with Reality	Plausibility	Proximity to life	Light effects	Shadow effects	3D-Registration	Proportions	Photorealism	Level Content Proximity to [illegible]	Temporal Plausibility	Local Plausibility	Causal Plausibility	Appropriate choice of tracking [illegible]	Appropriate depiction of [illegible]	Level Adaptivity	Level Game-Elements	Rules/Goals	Conflict/Challenge	Control	Assessment	Action Language	Human Interaction	Environment	Game Fiction	Level Complexity
Midak et al. [76]	19	1	x	-	-	-	-	1	6	x	x	x	x	x	x	-	2	-	-	x	x	-	1	0	-	-	-	-	-	-	-	-	3
Minaskan et al. [77]	20	1	x	-	-	-	-	1	1	-	-	-	-	x	0	0	5	x	x	x	x	x	1	2	-	-	x	-	-	x	-	-	1
Murillo et al. [78]	21	1	x	-	-	-	-	3	1	-	-	-	-	x	-	-	5	x	x	x	x	x	1	0	-	-	-	-	-	-	-	-	3
Ovens et al. [16]	22	1	x	-	-	-	-	2	4	-	-	x	x	x	x	-	2	-	-	x	x	-	1	0	-	-	-	-	-	-	-	-	3
Ripsam & Nerdel [79]	23	1	x	-	-	-	-	3	3	-	-	x	x	x	-	-	4	x	x	x	x	-	2	0	-	-	-	-	-	-	-	-	4
Sokan et al. [37,38]	24	2	x	x	-	-	-	1	0	-	-	-	-	-	-	-	4	x	x	x	x	-	4	0	-	-	-	-	-	-	-	-	1
Strzys et al., Thees et al. [80–82]	25	1	x	-	-	-	-	1	4	x	-	x	-	x	x	-	5	x	x	x	x	x	1	0	-	-	-	-	-	-	-	-	3
Sun et al. [83]	26	1	x	-	-	-	-	1	1	-	-	-	-	x	-	-	4	x	x	-	x	x	1	0	-	-	-	-	-	-	-	-	1
Tee et al. [39]	27	1	x	-	-	-	-	4	3	x	-	-	-	x	x	-	5	x	x	x	x	x	2	1	-	-	x	-	-	-	-	-	2
Wozniak et al. [84,85]	28	1	x	-	-	-	-	2	0	-	-	-	-	-	-	-	4	x	x	x	x	-	3	1	-	-	x	-	-	-	-	-	1