

Abschlussbericht des Projekts

Sonne, Erde, Wasser, Wind -

Physikalische Phänomene erneuerbarer Energien erleben und verstehen

Eine Mitmachausstellung für nachhaltiges Handeln

im Humanitarium, Breslau, Polen



DBU Projekt AZ 32971/01

Projektträger:

Pädagogische Ideenwerkstatt BAGAGE e.v.

Kooperationspartner:

Humanitarium, Breslau Polen

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Anhang:
Final evaluation summary

1. Anlass des Projekts

Erneuerbare Energien wie Sonne, Wind, Wasser, Biomasse und Erdwärme sind beinahe unendlich vorhanden und liefern kohlendioxidfreie Energie. Biomasse zählt zu den CO₂ – neutralen Quellen. Bei ihrem Einsatz wird nur so viel CO₂ frei, wie die Pflanzen der Atmosphäre zuvor entzogen haben. Wenn es gelingt, den jährlichen Ausstoß von Treibgasen in der Weltskala bis zum Jahr 2050 zu halbieren, kann der globale Temperaturanstieg auf ca. 2 Grad Celsius begrenzt werden. Um dieses Ziel zu erreichen und den steigenden Energiebedarf der Bevölkerung weiterhin decken zu können, ist ein Umdenken in der Energieversorgung notwendig.

Die vom Institut für Ökoentwicklung aus Warschau durchgeführten Untersuchungen zum Thema ökologisches Bewusstsein der polnischen Bevölkerung zeigten, dass diese im Vergleich zu anderen Bürgern der EU immer noch unterdurchschnittlich entwickelt ist. Im Bericht „Energiewirtschaft für die Umwelt, die Untersuchung des ökologischen Bewusstseins der Polen“ (Warschau 2010) wird unter anderem ausgeführt, dass die freundliche Einstellung der Polen gegenüber der Umwelt in Taten nicht wirklich unterstützt wird. Vermutlich liegt es an dem mangelnden Vertrauen in die Regierung, in die Selbstverwaltungsorgane, in die Unternehmen und dem fehlendem Glauben an die Effektivität ihrer Aktivitäten.

Ein anderes großes Problem ist die geringe Neigung der polnischen Wirtschaft selbst für die Einführung von Umweltinnovationen. Das kann ebenso ein entscheidendes Hindernis bei Wirtschaftsreformen unter Berücksichtigung der nachhaltigen Entwicklung sein.

Interessant sind Angaben im Bericht „Wer hat Zeit für Ökologie?“ und im Bericht über "Umweltbildungsuntersuchung (Lodz 2011)", der auf mangelnde Laboruntersuchungen teilnehmender SchülerInnen hinweist, andererseits die Attraktivität und Effektivität von Laboraktivitäten für die SchülerInnen unterstreicht.

In den Kindergärten wird diese Lernmethode lediglich von 3,5 % der Lehrer genutzt, obwohl sie nach Auffassung derselben von 10 % der Kinder für attraktiv gehalten wird.

In den Grundschulen (1-3 Klasse) haben nur 2% der SchülerInnen mit Laboruntersuchungen Berührung, bei 14 % Effektivität nach Meinung der SchülerInnen, bei den Klassen 4-6 nehmen nur 4 % der SchülerInnen an Laboruntersuchungen teil, bei 16 % Effektivität, in den Gymnasien nehmen 4 % an Laboruntersuchungen teil, die Effektivität liegt hier bei 18 % der SchülerInnen und schließlich bei weiterführenden Schulen wird bei nur 3 % der Schüler diese Lernmethode genutzt.

Die befragten LehrerInnen gaben an, dass nur in 29 % der untersuchten Schulen Möglichkeiten für Laboruntersuchungen vorhanden sind. In den Schulen, wo keine Labore existieren, haben 73 % der Lehrer erklärt, dass sie Laboruntersuchungen durchführen würden, wenn sie die technischen Möglichkeiten dazu gehabt hätten.

Während der Projektvorbereitung wurde im Humanitarium (Breslauer Forschungszentrum EIT+ GmbH) eine Umfrage zum Thema proökologischer Aktivitäten durchgeführt. Eingegangen sind 383 Antworten von Lehrern aus ganz Polen. Die Befragten waren mit entschiedener Mehrheit (87%) an einer Ausstellung interessiert, die das Interesse der potentiellen Projektempfänger unterstreicht. Weiterhin wurde festgestellt, dass 99% der SchülerInnen die Teilnahme an Laboruntersuchungen und Werkstattaktivitäten für attraktiv halten.

2. Zielsetzung des Projekts

Zielsetzung des Projektes war die Entwicklung und Umsetzung einer interaktiven Dauerausstellung im Humanitarium, die sich mit regenerativen Energien sowie der Anwendung physikalischer Grundgesetze in verschiedenen Lebensbereichen befasst.

Mit Hilfe von multimedialen Präsentationen und interaktiven Exponaten wurden moderne Praxisanwendungen und Lösungsansätze in der Energiegewinnung aus Wasser, Wind, Sonne und Erde aufgezeigt, sowie die Nutzung der Physik dargestellt. Alle Exponate wurden interaktiv umgesetzt und ermöglichen den Besuchern selbstbestimmtes eigenes Forschen und Experimentieren.

Darüber hinaus werden bei gezielten Führungen, Workshops und begleitenden Ausstellungsaktivitäten vielfältige Gruppenangebote gemacht.

Das Projekt konzentrierte sich im Gegensatz zu ähnlichen Vorhaben nicht in der Hauptsache an der Herausgabe von Informations- und Bildungsmaterialien. Seine Aufgabe war und ist es nicht nur zu informieren, sondern vor allem durch aktives und dynamisches Engagement von Teilnehmergruppen (lernen durch spielen) für die erneuerbare Energien zu sensibilisieren, emotionalisieren, Interesse wecken, Wahrnehmung und Akzeptanz zu schaffen, sowie Handlungsoptionen zu öffnen.

Die Mitmachausstellung verfolgt das Ziel, das Bewusstsein der Gesellschaft in allen Altersgruppen für die erneuerbaren Energien zu steigern und nachhaltiges Handeln als Lebensoption zu stärken.

Als Zielgruppe ist deshalb die gesamte Gesellschaft gemeint, unter besonderer Beachtung von Kindern und Jugendlichen im Alter von 4-6, 7-12, 13-15 und 16-19 Jahren. Bei diesen Zielgruppen soll mit Hilfe der begleitenden Erwachsenen vertiefendes Wissen und Lernen auch außerhalb der Ausstellung in den Kindertageseinrichtungen und Schulen weitergeführt werden können.

Die in der Ausstellung beinhalteten Arbeitsfelder sind eine attraktive Bildungsform, sowohl für die SchülerInnen als auch für die LehrerInnen, um Interesse zu wecken, eigene Fragestellungen zu finden und den Wert nachhaltigen Handelns erkennen zu können.

Im Rahmen des Projektes wurde ebenso ein differenziertes Kommunikations- und Bildungsangebot umgesetzt, das für einzelne Empfängergruppen und deren individuellem Wissen zum gesellschaftlichen und ökologischen Engagement passend ist. Hier soll vertiefendes und auch wissenschaftliches Lernen ermöglicht werden.

Zusätzlich werden Aktivitäten angeboten, sogenannte „family days“ die an die allgemeine Bevölkerung gerichtet sind, mit dem Ziel, deren Interesse für die Umweltprobleme und den damit verbundenen Problemlösungen zu wecken. Dank seiner Vielfalt werden nachhaltige Fragestellungen auf vielfältigste Weise angeregt und Lösungsansätze aufgezeigt.

Der stetige Anstieg des ökologischen Bewusstseins, sowie Haltungsänderungen in der polnischen Bevölkerung sind nur mit Hilfe von modernen und effektiven Bildungsprojekten möglich.

Die im Humanitarium geschaffenen Lernbedingungen eröffnen nun vielen Interessierten die Möglichkeit, durch eigenständige Praxis Zugang zu den genannten Themen zu finden,

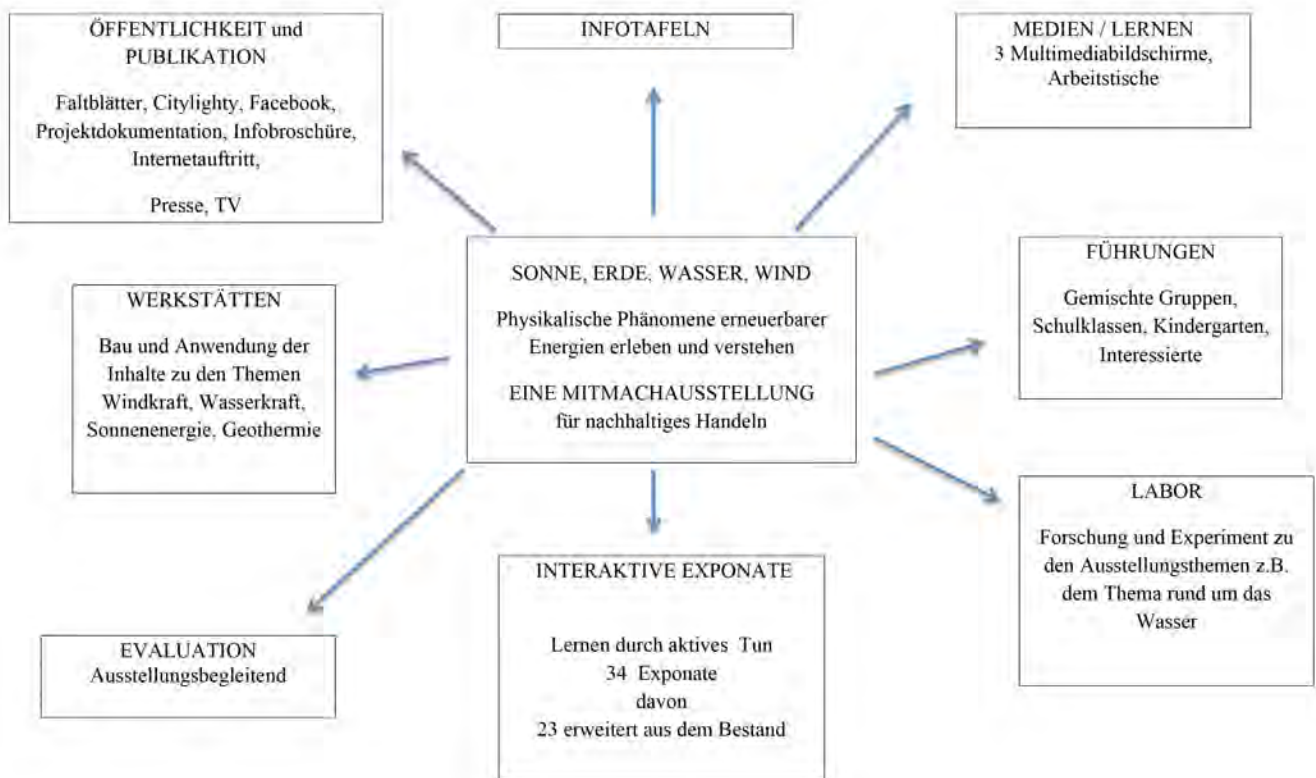
Darüber hinaus ist die Durchführung dieser Form der Umweltbildung mit Programminhalten in der Verordnung des polnischen Bildungsministeriums vom 27.08.12 hinsichtlich der Lernprogramme in den Kindergärten und in den einzelnen Schultypen, mit folgenden Prioritäten konform:

- der ökologischen Bildungsstrategie des Nationalen Fonds für den Umweltschutz und Wasserwirtschaft für die Jahre 2013-2016 (Erhöhung des ökologischen Bewusstseins und Gestaltung der ökologischen Handlungen der Gesellschaft),
- der Nationalen Ökologischen Bildungsstrategie (ermöglicht jedem Menschen Wissens- und Fähigkeitengewinnung unabdinglich für die Verbesserung der Umweltlage, besseren Zugang an attraktive didaktische Hilfsmittel, Durchführung der ökologischen Bildung vor Ort),
- dem Bericht des Europäischen Parlamentes, der Kommission für Umweltschutz, Gesundheit und Lebensmittel sowie Kommission für Industrie, Forschungen und Energie vom 27.01.14, mit vielzähligen Lokalprogrammen, darunter dem Programm für ökologische Bildung für Niederschlesien (Entwicklung des ökologischen Bewusstseins der Bewohner von Niederschlesien, rationale Nutzung und Entwicklung der Basis für ökologische Bildung) sowie anderen.

Zur Umsetzung waren folgende Schritte vorgesehen:

- Ausarbeitung eines Raumplanungskonzepts,
- Ausarbeitung eines detaillierten methodisch-didaktischen Konzepts,
- Planung und Herstellung interaktiver Objekte
- Planung und Entwicklung multimedialer Inhalte
- Themenwerkstätten ergänzend zu den Exponaten für alle Altersgruppen
- Ausarbeitung der Angebote in den Laboren
- Erarbeitung eines Werbungs- und Marketingkonzeptes,
- Ausbildung von MitarbeiterInnen für Führungen
- Begleitende Evaluation

3. Gesamtübersicht



Päd. Ideenwerkstatt BAGAGE e.V. in Kooperation mit dem Humanitarium, Wrocław, Polen

weitere Zielsetzungen:

- Erhöhung des ökologischen Bewusstseins der Gesellschaft
- Ökologische Bildung der Kinder und Jugendlichen
- Übereinstimmung mit den Zielen der geltenden Regierungsprogramme
- Stärkung der Zentren für ökologische Bildung in Polen.

4. Darstellung der Arbeitsschritte und der angewandten Methoden

Das Projekt startete wie vorgesehen am 09. Dezember 2015. Aufgrund frühzeitiger Terminabsprachen mit Herrn Witte von der DBU zur Eröffnung der Ausstellung am 8. September 2016 wurde der ursprünglich vorgesehene Produktionszeitraum verkürzt. Dies beinhaltete, dass in den ersten neun Monaten ein erhöhter Arbeitsaufwand, vor allem in den Leitungsaufgaben zu verzeichnen war.

4.1. Beirat

Aufgrund der Bewilligungsauflagen wurde ein polnischer und deutscher Beirat bestellt. Der polnische Beirat wurde von Frau Dr. Rak und der deutsche Beirat von Herrn Stadelmann geleitet.

Beirat Deutschland:

Prof. i.R. Dr. Eberhard Brügel - Professor für Kunstdidaktik Freiburg, Graphiker und Zeichner, Mitbegründer der Jugendkunstschule Offenburg

Martin Wiedemann - Kulturveranstalter, Gesch.ftsführer der Fabrik für Handwerk, Ökologie und Kultur e.V. in Freiburg

Thomas Stadelmann - Projektleiter, Vorstand und Leiter der Pädagogischen Ideenwerkstatt BAGAGE e.V., Spielraumplaner und Autor

Beirat Polen:

Rafał Szukiewicz, graduate of the Faculty of Physics and Astronomy at the University of Wrocław - PhD with specialization Experimental Physics. Head of the Laboratory of Research Structure of Solids in Wrocław Research Center EIT+

Patrycja Pikoń-Kwiatkowska – graduate of the Faculty of Biology - Zoology with pedagogical specialization at the University of Wrocław – M.S. Postgraduate studies in Environmental Management. Subject matter expert in Humanitarium

Artur Lemiesz – graduate of the Faculty of Physics at the Wrocław University of Technology - PhD with specialization of thermodynamics

Kamila Myrdek-Rak – PhD, postgraduate of the EU law and economy. Experienced in science and culture institutions management. Head of Humanitarium

Hauptaufgaben des polnischen Beirats war die Beratung des Projekts hinsichtlich technischer und wissenschaftlicher Fragestellungen, der deutsche Beirat beschäftigte sich mit der methodisch-didaktischen Ausrichtung des Projekts. Die Einrichtung des wissenschaftlichen Projektbeirates wurde mit der Deutschen Bundesstiftung Umwelt (DBU) abgestimmt.

Folgende Fragestellungen wurden u.a. bearbeitet:

- Kontrolle der Ausstellungsinhalte bezüglich des methodisch-didaktischen Konzepts
- Wie kann ein vertiefendes Lernen stattfinden?
- Generelle Verfahrensvorschläge für die Ausstellungsumsetzung

Um vertiefendes Lernen stattfinden zu lassen, ist eine Überprüfung der Ausstellung hinsichtlich folgender Fragen notwendig:

- Welche Rolle hat der Erwachsene/Lehrer?
- Braucht es methodisch-didaktisches Material für eine Weiterführung?
- Wie muss der Betreuungsschlüssel (Ausbildung der Betreuer, Gruppengröße) für die verschiedenen Besuchergruppen sein - inhaltlich/pädagogisch/didaktisch
- Ein eigenes Tempo für den Ausstellungsbesuch sollte für alle Besucher gewährleistet sein - handlungsorientierte Herangehensweise

Der Beirat schlägt unter anderem vor:

- Um die Evaluation für die Teilnehmer attraktiver zu gestalten, könnten Preise oder kleine Geschenke förderlich sein.
- Die Projekte oder Versuche sollten zu Hause weitergeführt werden können. Zum Beispiel in Form von Bausätzen zum Mitnehmen z.B. Autos mit Solarantrieb
- Es könnten auch weiterführende Aufgaben zum Thema mit nach Hause gegeben werden, um das Gelernte zu vertiefen und fortzuführen.
- Den Lehrern/Schulen sollte weiterführendes Material zur Vertiefung mitgegeben werden, um als Multiplikator in Ihrer Einrichtung die Inhalte weiterzutragen

Allgemeine Hinweise und Tipps für die Gestaltung der Ausstellung hinsichtlich didaktisch-inhaltlicher Überlegungen:

Die Eigenerkundung sollte ein wichtiger Bestandteil der Lernerfahrung sein. Die Visuelle Darstellung der Ausstellung sollte intensiv überprüft werden. Das Visuelle wird immer wichtiger - trotzdem sollte neben dem Bildschirm auch immer die Möglichkeit des Arbeitens mit Stift und Papier bereitgestellt werden. Die Textbeiträge sollten in angemessener Form gestaltet werden:

- verständliche Formulierung
- Überprüfung der Textlängen
- sind die Beiträge altersgemäß?

Ideen

- Eine spielerisch/technische Verknüpfung der Bildschirmaktivitäten, z.B. mit einem Frage-Antwort-Spiel mit Selbstkontrolle
- Bild-Urkunde zum Ausdrucken oder mit der hinterlegten mail-Adresse zum Verschicken
- Broschüren zu den verschiedenen Themengebieten wären für eine Vertiefung und Weiterführung der Inhalte von großem Vorteil
- QR-Code für die Ausstellung wäre als Option für Menschen mit Smartphones eine Ergänzung oder eine Vertiefung der Inhalte

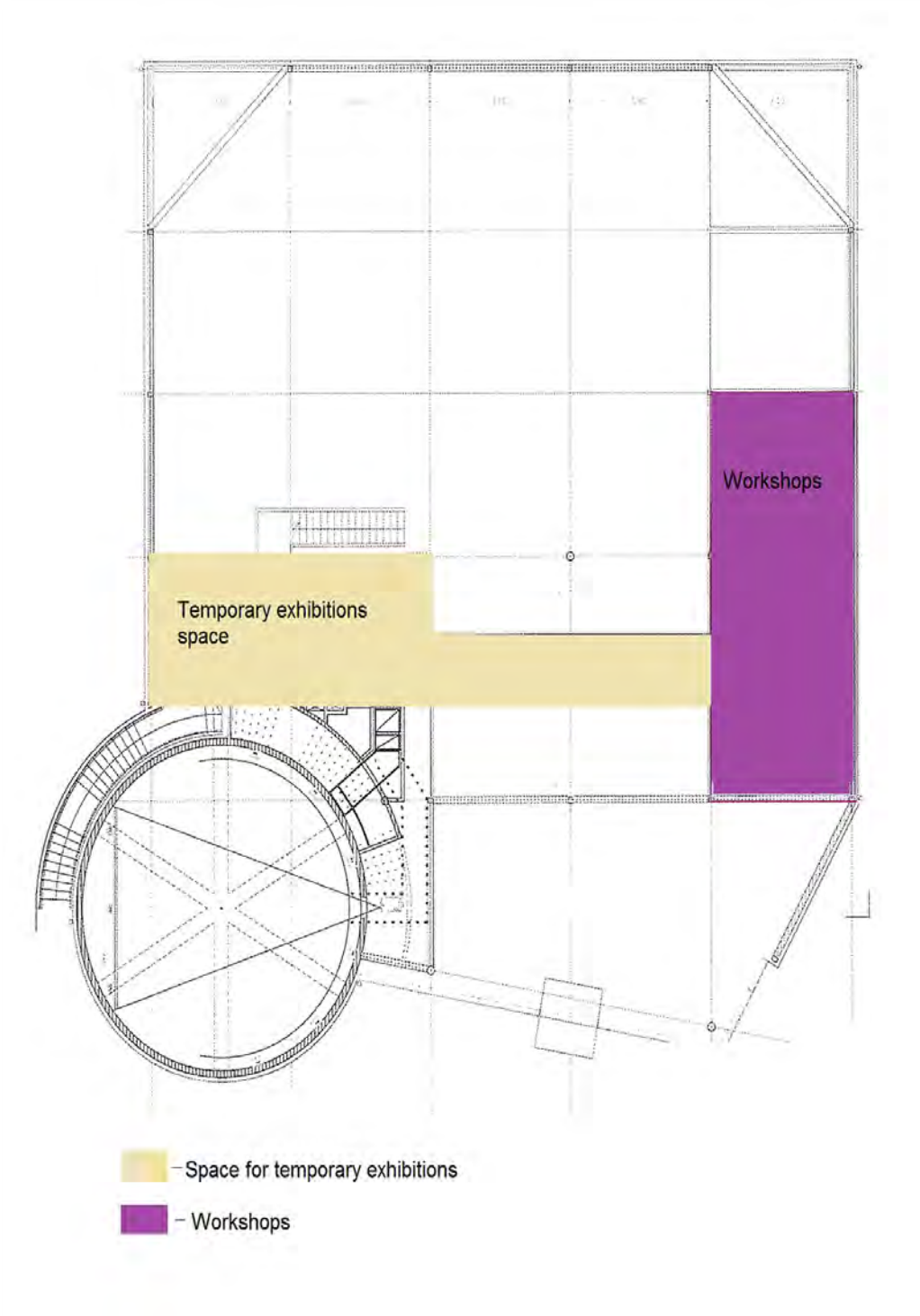
Aufgrund des engen Budgets konnten allerdings nicht alle Vorschläge im Projekt auch umgesetzt werden.

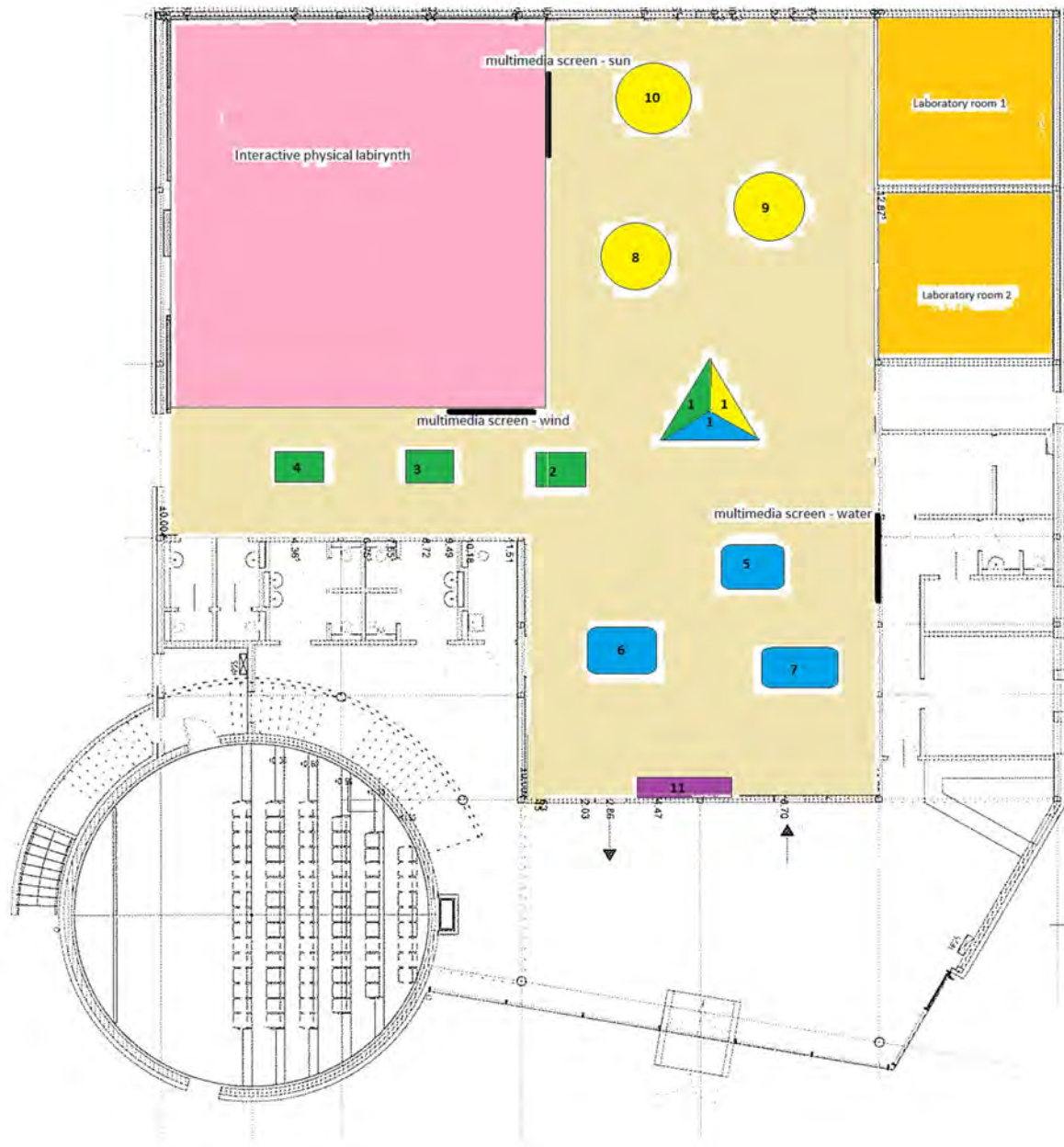
4.2. Räumlichkeiten



Blick auf das Ausstellungsgebäude

Die Ausstellungsräume gliedern sich auf zwei Ebenen und wurden nach dem folgenden Ausstellungsplan auf den ca. 700 qm Ausstellungsfläche eingerichtet.





Thematic islands:

- I - wind, water, sun energy exhibit (start of educational path)
- II - 2,3,4 - wind energy path
- III - 5,6,7 - water energy path
- IV - 8,9,10 - sun energy path
- V - 11 - other energy exhibit

- laboratory rooms
- interactive physical labyrinth
- exhibition space

multimedia screen

4.3. Interaktive Exponate:

Die interaktiven Exponate wurden entwickelt und geplant und so umgesetzt, dass sie den erhöhten Anforderungen einer ständigen Nutzung auch gut standhalten.

Insgesamt 34 interaktive Exponate zeigen physikalische Phänomene erneuerbarer Energien. Sie sind in sogenannten Themeninseln zusammengefasst, sodass die Inhalte für den BesucherIn gut vollziehbar sind. Der Einsatz interaktiver Elemente und die Motivation zum Mitmachen bieten den Besuchern neue Zugänge und eine intensive Auseinandersetzung mit den dargestellten Inhalten.

Die Ausstellungsstücke präsentieren auf interaktive Art und Weise die Grundregeln der erneuerbaren Energien aus Wasser, Sonne und Wind. Die mit den Exponaten vermittelten Inhalte stimmen mit den Lernprogrammen in den Schulen überein.

Zum Beispiel

- Ökologisches Breslau
- Hauskraftwerk
- Arten von Windanlagen
- Wasserenergie
- Wellenenergie
- Wasserstoffzelle
- Fahrradrennen
- Pumpspeicherkraftwerk
- Energie durch Druckluft
- Mit Wind schießen
- Sonnenenergie

Zwischen den Exponaten verlaufen Bildungswege. Im Ausstellungsraum wurde zudem eine Ruhezone eingerichtet, in der die Gäste ihr gewonnenes Wissen analysieren können.



4.4. Interaktive Exponate (Auswahl)



***Energia Wody
Szczytowo-Pompowa***



Elektrownia



***Energia
Elektrowni
Sprężonego Powietrza***



Ogniwo Wodorowe



Rodzaje



Ciepło ze Słońca Wiatrowych



Energia z Fal



Ekologiczny Wrocław



Wyścigi Rowerowe



Woda i Słońce

4.5. Werkstätten

Folgende Inhalte werden in den Werkstätten vermittelt:

WIND:

Formen des Windes
Phänome der Windkraft
Bau von Windmühlen

WASSER:

Wasserzirkulationssystem
Elemente des Wasserkraftwerks
Bau eines Wasserkraftwerks

SONNE:

Elemente des Wärmekraftwerk
Sonnenenergie ganz praktisch
Mini-Sonnenofen



4.6. Labore

Die den Ausstellungsräumen ursprünglich zugeordneten Labore konnten im Laufe des Projekts aufgrund von Feuerschutzgründen in Labore innerhalb des Breslauer Forschungszentrums EIT umgewandelt werden. Im benachbarten Gebäude der Nanotechnologieforschung forschen also Kinder und Jugendliche Wand an Wand mit „echten“ Wissenschaftlern. Die Räume wurden vorab von unserer Seite besichtigt und erwiesen sich für das Projekt vorteilhaft. Allerdings war die direkte räumliche Anbindung nicht mehr gegeben, was Auswirkungen auf den Ablauf der Angebote an Gruppen mit sich brachte.

An folgenden Inhalten wurde und wird geforscht:

Luft und seine Komponenten

Analyse von Wasser

Wasser reinigen

Wasserhärte

Licht als Energiequelle

Optik

Exo- und endoenergetische Reaktionen





4.7. Multimedia

Drei Multimedia Bildschirme wurden installiert. Die Multimedia Bildschirme dienen zur Absicherung und Vertiefung der angebotenen Inhalte. Hier können auf spielerischer Art und Weise oder mit wissenschaftlichen Fragestellungen vertiefende Informationen abgerufen werden. Jeder der Bildschirme hat einen anderen Schwerpunkt.

Die inhaltliche Ausarbeitung für die Touchscreens konnte zu Beginn der Ausstellung nur in polnischer Sprache umgesetzt werden. Hier wäre es sinnvoll gewesen zu Projektbeginn noch Übersetzungskosten ein zu planen.



4.8. Führungen

Die enorme Nachfrage besonders auch von pädagogischen Einrichtungen hat dazu geführt, das ursprüngliche Konzept immer wieder an zu passen. Wie werden die Gruppen begrüßt und geleitet, wie viel Input ist zu Beginn nötig, wann werden die Gruppen zu vertiefenden Aktivitäten wieder zusammen gerufen? Dies waren nur einige der Fragestellungen, die den jeweiligen Altersgruppen angepasst werden mussten. Zudem war es notwendig mehr Personal zu schulen, um überhaupt den vielen Anfragen gerecht zu werden.

Hier war es von großem Vorteil, dass das Humanitarium über langjährige Ausstellungserfahrung verfügt und deshalb auch rechtzeitig handeln konnte, um die methodisch-didaktischen Fragestellungen weiter zu entwickeln. Zudem darf festgestellt werden, dass die begleitende Evaluation hier von großem Nutzen war.

5. Die Eröffnung

Die Ausstellung wurde wie vorgesehen am 8. September 2016 mit einem Festakt eröffnet.

Anwesend war neben politischen Würdenträgern, Vertretern der Universitätsleitung und der Deutschen Botschaft auch Herr Dr. Witte von der DBU. Frau Dr. Kamila Rak, Leiterin des Humanitariums, begrüßte die Gäste und führte durch das Programm, das neben den Festreden auch eine Führung durch die Ausstellung und das Angebot zur Teilnahme in den Werkstätten und Laboren einbezog. Hier wurde von den geschulten Fachkräften und auch von Kindern und Jugendlichen, die zukünftige Arbeitsweise ganz praktisch vorgestellt.





**THE GARDENS OF EXPERIENCE
HUMANITARIUM**

INVITATION

HUMANITARIUM,
GARDENS OF EXPERIENCE
Wrocław Research Centre EIT+
and German Federal Environmental
Foundation

are pleased to invite you
to the opening of new exhibition
RENEWABLE ENERGY RESOURCES
in Humanitarium

on Thursday, September 8, 2016,
at 10:00 am
147a Stalowicka Street,
54-066 Wrocław, Poland

renewable
energy sources

NEW EXHIBITION
in Humanitarium

sponsored by
DBU Q
Deutsche
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HUMANITARIUM
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TVP 3 **Gazeta** **RADIO WROCLAW** **ram**
WROCLAW

6. Evaluation

Ebenfalls als Bewilligungsaufgabe wurde ein detailliertes Evaluationsdesign der DBU vorgelegt. Aufgrund der geringeren Erfahrungen seitens unseres polnischen Partners wurde das Evaluationsdesign in Absprache mit uns weiter konkretisiert. Die Vorgehensweise beinhaltete einen ersten Evaluationszeitraum nach der unmittelbaren Eröffnung der Ausstellung. Da in diesem Zeitraum mit besonders vielen Besuchergruppen aus Schulen und Kindergärten gerechnet wurde, war der erste Evaluationszeitraum (20.09.-30.11.2016) speziell daraufhin abgestimmt. Danach gab es eine Auswertung der ersten Phase und eine Überprüfung und Ergänzung der Ausstellungsdidaktik.

Der zweite Evaluationszeitraum war zwischen dem 01.04.-30.04.2017.

Nach folgendem Fragebogen wurde evaluiert:

Fragebogen

Sehr geehrte Besucherin, sehr geehrter Besucher,

für uns und den weiteren Verlauf der Ausstellung ist es von hoher Bedeutung ein Feedback Ihres Besuches der Ausstellung über erneuerbare Energien hier im Humanitarium zu erhalten.

Der erste Teil des Fragebogens befasst sich mit Angaben über den Museumsbesuch, im zweiten Teil werden personenbezogene Angaben erfragt.

Wir möchten hiermit auch auf unser Gewinnspiel hinweisen, bei dem jede Teilnehmerin und jeder Teilnehmer automatisch teilnimmt, wenn er seine E-Mail Adresse hinterlässt.

1. Wie schätzen Sie Ihre Vorkenntnisse über erneuerbare Energien ein?

keine Kenntnisse Fachkenntnisse

2. Wie haben Sie von der Ausstellung im Humanitarium erfahren? (Bitte kreuzen Sie an)

Schule Arbeit Bekannte Homepage Soziale Medien _____

3. Wie verständlich wurden die interaktiven Exponate für Sie präsentiert? (Bitte kreuzen Sie an)

sehr verständlich unverständlich

4. Wie benutzerfreundlich sind die interaktiven Exponate für Sie? (Bitte kreuzen Sie an)

sehr verständlich unverständlich

5. Wie verständlich waren die Lernmaterialien der Ausstellung für Sie?

sehr verständlich unverständlich

6. Wie ansprechend waren folgende Angebote für Sie? (Bitte kreuzen Sie an)

	<i>sehr ansprechend</i>	<i>eher ansprechend</i>	<i>eher nicht ansprechend</i>	<i>nicht ansprechend</i>
Workshop A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Workshop B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Labor A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Labor B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Was hat Ihnen an der Ausstellung besonders gut gefallen?

8. Hat die Ausstellung Ihr Wissen über erneuerbare Energien verbessert?

- Ja Nein

Bitte erläutern Sie uns die Gründe:

9. Würden Sie Ihren Freunden / Bekannten das Humanitarium weiterempfehlen? (Bitte kreuzen Sie an)

- Ja Nein

Was würden Sie verbessern?

Fragen zur Person: (Bitte kreuzen Sie an)

10. Angaben zum Geschlecht: weiblich männlich

11. Welcher Altersgruppe gehören Sie an?

- 6-12 J. 13-16 J 17-22 J. 22-35 J. über 35 J.

12. Bitte machen Sie Angaben über Ihre berufliche Tätigkeit

- Schüler/in Student/in Lehrer/in Angestellte/r selbstständig
 andere: _____

13. Bitte machen Sie Angaben über Ihren Wohnort

- Breslau oder unmittelbare Umgebung
 mehr als 50 km entfernt
 mehr als 150 km entfernt
 Ich komme nicht aus Polen, sondern aus: _____

14. Haben Sie sonstige Anmerkungen?

Vielen Dank für die Unterstützung!

Ja ich möchte am Gewinnspiel teilnehmen, bei dem jeden Monat attraktive Preise verlost werden. Ich bin mir bewusst, dass es keine Gewinngarantie gibt und der Rechtsweg ausgeschlossen ist. Das Humanitarium wird die angegebene E-Mail Adresse lediglich für das Gewinnspiel nutzen und nicht an Dritte weitergeben.

Meine E-Mail Adresse lautet: _____

Nachfolgend erfolgt die Gesamtauswertung: der Besuchererfassung und die Rückmeldung aus den Evaluationsphasen:

Überprüfung der Ausstellung und Änderungsvorschläge

Die Zielgruppe der Ausstellung sind in der Regel interessierte Laien und Schülergruppen, die in Begleitung ihrer Lehrer kommen.

Aus diesem Grund muss der Inhalt der Ausstellung überprüft werden:

- Ist das vermittelte Wissen zu theoretisch?
- Wird den unterschiedlichen Altersgruppen das Wissen auf verständliche Art und Weise vermittelt?
- Wie viele Besucher können teilnehmen?

Zusammenfassung der Gesamtauswertung

Das Projekt erweist sich als großer Erfolg. Mehr Besucher als erwartet sahen sich die Ausstellung im Humanitarium an.

Besucherzahlen nach Altersgruppe (**September 2016 – 9. Juni 2017**):

SchülerInnen bis 12 Jahre: 27.700

Jugendliche zwischen 13 und 16 Jahren: 8.200

Studenten zwischen 17 und 22 Jahren: 4.560

Besucher zwischen 23 und 34 Jahren: 5.000

Besucher über 35 Jahre: 6.100

Besucher insgesamt: 51.560

a) Alle Elemente der Ausstellung wurden sehr positiv bewertet.

Zusammenfassung: Workshops, Labore, interaktive Exponate und Multimediaangebote waren die Ausstellungselemente, die bei den Besuchern am besten ankamen.

Ausstellungselemente, die bei den Besuchern am beliebtesten waren (Angaben in Prozent):

- Workshops: 96,9 %,
- Labor: 95,9 %,
- Interaktive Exponate: 94,5 %,
- Multimediaangebote: 87,8 %.

b) Laut Evaluation könnten folgende Punkte geändert bzw. verbessert werden:

Kritikpunkte:		Anzahl der Antworten
	Die interaktiven Exponate haben nicht richtig funktioniert.	24
	Es war so laut, dass man die Betreuer kaum verstehen konnte.	20
	Schlechte Kalkulation der Zeit zwischen Workshops und Laboren.	3
	Die Stifte reichen nicht aus.	3
	Es wurde zu wenig Werbung gemacht.	1
Änderungsvorschläge		
	Größere Ausstellung mit mehr Exponaten	32
	Die Betreuer sollten besser verstanden werden.	20
	Bei der Ausstellung sollte es mehr Betreuer geben.	17
	Das „verrückte Haus“ (optisches Labyrinth) sollte noch verwinkelter sein.	9
	Die Beleuchtung und Farben bei der Ausstellung könnten verbessert werden.	3
	Es sollte mehr Experimente geben.	3
	Das „verrückte Haus“ sollte eine Decke haben.	2
	Es sollte mehr Sitzgelegenheiten geben.	1
	Es sollten kompliziertere Phänomene erklärt werden.	1
	Es sollte mehr Informationen über die Zukunft erneuerbarer Energien und Orte, wo diese als Hauptenergiequelle genutzt werden, geben.	1

Auf Grundlage der Evaluationsergebnisse haben wir im Humanitarium einige Änderungen vorgenommen. Zunächst einmal haben wir mehr Personal eingestellt, das Schülergruppen und einzelne Gäste während ihres Besuchs in unserem Wissenschaftszentrum betreut. Das Personal wurde außerdem mit Stimmverstärkern ausgestattet, sodass unsere Gäste sie während der Erkundung der Ausstellung besser hören können. Sehr wichtig ist auch, dass wir nun regelmäßig Wartungen an unseren interaktiven Exponaten durchführen. Die kaputten Teile der Exponate haben wir ausgetauscht, weshalb es nun seltener zu Beschwerden kommt. Wir haben weitere Stühle aufgestellt, damit sich unsere Gäste ausruhen oder in Ruhe Notizen machen können. Schließlich haben wir im Humanitarium (im runden Saal) noch ein interaktives Element ergänzt, wodurch den Gruppen weitere Aktivitäten zur Verfügung stehen. All diese Veränderungen verbessern das Angebot für die Besucher.

Bei der Ausarbeitung des Evaluationsdesigns hat sich die Drittsprachregelung nicht bewährt. Die englische Kommunikation hat vor allem die spezifischen deutschen und polnischen Begriffe und deren Verständlichkeit deutlich erschwert. Hier hätte es sich bewährt größere Mittel für eine Übersetzerin / einen Übersetzer im Projekt zu verankern.

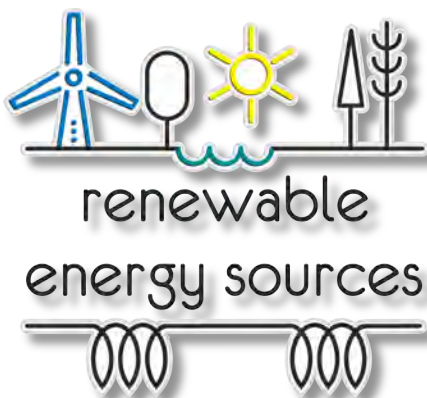
7. Öffentlichkeitsarbeit



HUMANITARIUM Website:

- A) grafische Informationen in Form von Banner in der Hauptseite aufgenommen 1/3 Website-Layout (Emission: Juli 2016 - Gegenwart); Die grafische Gestaltung wird jedes Quartal aktualisiert, wenn die Anzahl der Besucher wächst,
- B) Artikel- und Fotoaufnahmen bei der Eröffnungszeremonie der RES-Ausstellung (Publikation: Juli 2016 - Dezember 2016)
- C) Hinzufügen von "RES Exhibition" zur Spalte mit dem Titel "Unser Angebot" und die Erstellung von zusätzlichen Lesezeichen mit dem Titel "Über DBU" und "About Bagage" (Publikation: September 2016 -present).

Logo Ausstellung:



HUMANITARIUM Facebook Aktivitäten:

- A) eine Veranstaltung einzuleiten, die eine Einladung zur Eröffnungszeremonie war (Emission: Juli 2016 - September 2016),
- B) Kauf einer genau gezielten Anzeige der oben genannten Veranstaltung (Emission: Juli 2016 - September 2016),
- C) aktuelle Kommunikation über unsere Ausstellung, d.h. Beiträge, Fotos, Aktivierung von Quiz und Wettkämpfen (Publikation: September 2016 - Gegenwart).

HUMANITARIUM Visuelle Werbung:

- A) Informationen über RES-Ausstellung angezeigt Innen-Breslau Municipal Buses; (Emission: 29. August - 28. September 2016),
- B) Werbung RES Ausstellung mit dem Einsatz von Citylights im Stadtzentrum von Breslau (Ausstellung: 15.-28. August 2016),
- C) RES-Ausstellungsblätter, die bei verschiedenen lokalen Veranstaltungen ausgegeben werden
- D) RES-Plakate an verschiedenen Orten in der Stadt Wroclaw (Schulen, lokale Bildungs- und Kulturzentren, Informationsposten, Geschäfte usw.)

Massenmedienkooperation:

- A) für die Eröffnungszeremonie von RES Exhibition, Erlangung einer Medienpatronage der Mainstream-Medienkanäle in Niederschlesien (TVP3 Wroclaw, Radio Wroclaw und Radio RAM, Wroclaw.pl Website);
- B) die Pressemitteilung zur Eröffnungszeremonie der RES-Ausstellung und ihre mehrkanaligen Publikationen auszusenden.

Herstellung von gedruckten Informationsmaterialien auf RES Ausstellung:

- A) Broschüre (Größe A5, 16 Seiten) zur allgemeinen Idee der erneuerbaren Energiequellen und Beschreibung der pädagogischen RES-Wege bei HUMANITARIUM,
- B) besonders entworfene Flugblätter, die Leute einladen, die Ausstellung in HUMANITARIUM zu besuchen,
- C) Hinzufügen von Informationen über die RES-Ausstellung zu den bereits vorhandenen allgemeinen Merkblättern für HUMANITARIUM,
- D) RES Ausstellung Poster.

Produktionen von zusätzlichen Werbemitteln:

- A) RES Give-Aways (Stress Relief Spielzeug in Form von Glühbirnen und Öko Canva Taschen),
- B) Werbezelt (Größe 3,5 x 3,5 m) inkl. 4 Canva-Wände (2 Wände mit RES-Ausstellung und 2 Wänden mit DBU-Stiftung) Das Zelt wird für externe Veranstaltungen in Breslau und außerhalb der Stadt verwendet.

Activities promoting RES exhibition:

- RES Exhibition opening – 8th September 2016
- 17.09.2016r - Family Picnic in Humanitarium with a theatre performance about energy for kids, RES workshops for our guests, energy bike generator



- 9.10.12.2016 – ecological event in Humanitarium for school groups and individual guests – RES exhibition, RES laboratories and workshops + extra recycling workshops and activities + thematic exhibition (recycling)

- Humanitarium on local TV about our science centre and project with DBU (exhibition, laboratories and workshops): <http://www.echo24.tv/odcinek/rozmowa-echo24-myrdek-pikon-jakubcewicz-433>



- Article about Humanitarium (RES exhibition + photos):

<http://wrodzice.blogspot.com/2016/11/humanitarium-wrocaw-ogrody-doswiadczen.html?spref=fb>

- 11 and 25.03.2017 – ecological event in Humanitarium; anti-smog action in cooperation with other ecological institutions from Wrocław (RES exhibition, RES laboratories and workshops for children from Wrocław)

- 17.03.2017 – Humanitarium took part in international competition “Destination Imagination” in Wrocław (Centennial Hall) where around 2000 children from many different countries were present. We organized laboratories and promoted RES exhibition among all the guests.

- 15-17.03.2017 – Humanitarium took part in SPiN (The Society and Science Agreement) conference. This agreement is by non-profit institutions from Poland oriented towards social development based on education, science, technology, and innovation. During the conference Humanitarium took active part in different panels talking about Humanitarium and its main activities: RES exhibition, laboratories and workshops.

- 22.04.2017 – Earth Day and Odra Day in Wrocław – Humanitarium organized RES workshops in the city (Bulwar Dunikowskiego) for local society. We also spoke about RES exhibition and gave out leaflets.

- 1,2,3.05.2017 – Humanitarium promoted RES exhibition in the city (during public holidays in Poland) – we gave out leaflets and illuminated Humanitarium logo on the Odra river.

We try to promote our actions not only locally, but also in the whole region and beyond it. We send newsletters and information about the RES exhibition, laboratories and workshops to many cultural, educational and tourist institutions around Poland.

Internetartikel:

- http://humanitarium.eitplus.pl/?page_id=1143

- http://humanitarium.eitplus.pl/?page_id=1210

- http://humanitarium.eitplus.pl/?page_id=1498

- <http://humanitarium.eitplus.pl/wystawa-oze/>

- <http://humanitarium.eitplus.pl/wystawa-oze/o-fundacji-dbu/>

- <https://www.youtube.com/watch?v=sTughnqG3BQ>

- <http://wroclaw.tvp.pl/26813234/04092016> (2:17-3:51) - TVP (exhibition opening)

- <http://www.umwd.dolnyslask.pl/edukacja/aktualnosci/artykul/otwarcie-wystawy-pt-odnawialne-zrodla-energii-w-humanitarium-we-wroclawiu/> - RES exhibition opening – photo report by Marshal Office of Lower Silesia)

- <http://www.radiowroclaw.pl/articles/view/58121/Ogrody-Doswiadczen-we-Wroclawskim-Humanitarium> - Radio Wrocław (exhibition opening)

- http://img2.newspointpress.pl/yz0y16d20501_1.jpg - promotion of RES exhibition during Educational Picnic in Humanitarium 17.09.2016
- <https://www.facebook.com/events/148016692290399/> (RES exhibition opening – Fb event – reach of 41.000 people)
- <http://www.radiowroclaw.pl/articles/view/58168/Interaktywna-wystawa-we-wroclawskim-Humanitarium> - short information about RES exhibition + short interview with Mrs. Kamila Rak,
- <http://img2.newspointpress.pl/g8ba16e80306.mp3> - promotion of RES exhibition in Humanitarium
-
- http://wroclaw.dlastudenta.pl/wiadomosci/artukul/Odnawialne_zrodla_energii_we_Wroclawskim_Humanitarium_Zobacz_zdjecia,121513.html – RES exhibition opening – photo report
- <http://www.wroclaw.pl/go/wydarzenia/muzyka/29948-interaktywna-wystawa-odnawialne-zrodla-energii-w-humanitarium> - information about RES exhibition in Humanitarium
- <https://www.youtube.com/watch?v=sTughnqG3BQ> – short film: RES exhibition in Humanitarium
- <http://krasnale.pl/odnawialne-zrodla-energii-interaktywna-wystawa-w-humanitarium/> - information about RES exhibition in Humanitarium (Wroclaw city official website)
- <http://cojestgrane24.wyborcza.pl/cjg24/Wroclaw/1,43,297763,Odnawialne-Zrodla-Energii-w-Humanitarium.html> – promotion of RES exhibition in Humanitarium
- <http://www.polen.diplo.de/Vertretung/polen/pl/03-gk-breslau/03-aktuelles/2016-09-08-humanitarium.html> - information about opening of RES exhibition in Humanitarium (Deutsche Vertretungen Polen)
- <http://itvpolska.pl/humanitarium-odnawialne-zrodla-energii-nowa-wystawa/> - short film: RES exhibition in Humanitarium
- <http://kinotube.info/channel/watch/sTughnqG3BQ> - short film: RES exhibition in Humanitarium
- <http://www.eitplus.pl/odnawialne-zrodla-energii-w-humanitarium/> - information about RES exhibition in Humanitarium (Wroclaw Research Center EIT+ webpage)
- <http://www.lo17.wroc.pl/galeria-1319,gal.html> – photo report from RES exhibition visit (secondary school no 17 in Wroclaw webpage)
- <http://www.zlote-przedszkole.pl/pl/rok-20162017/item/197/page/2/> - photo report from RES exhibition visit in Humanitarium (Kindergarden Zlote Przedszkolaki in Wroclaw webpage)
-
- http://spbojanowo.pl/wiadomosci/1/wiadomosc/208893/wycieczka_do_humanitarium_do_wroclawia - photo report from RES exhibition visit in Humanitarium (Primary school from Bojanowo webpage)
- https://www.youtube.com/watch?v=OekLMG_Vgt8 (9:10-9:34) – the announcement of RES exhibition opening
- <http://celestyn.pl/grudniowa-wizyta-uczniow-sp-gimnazjum-spdp-humanitarium/> - photo report from RES exhibition visit (Celestyn Association)
- <http://www.echo24.tv/artukul/dzien-wiatru-we-wroclawskim-humanitarium-3678> - short information about a 'Wind day' in Humanitarium

- <http://www.sp.donaborow.pl/index.php/aktualnosci/1001-wycieczka-do-humanitarium> - photo report from RES exhibition visit (Primary School in Donaborow)
- <https://przedszkole106.edu.wroclaw.pl/?p=1708> – photo report from RES exhibition visit (Kindergarden no 106 in Wroclaw)
- <http://dolnoslaski.pzn.org.pl/2017/04/wycieczka-do-humanitarium/> - photo report from the RES exhibition visit (Polish Blind Association – Senior Club)

8. Fazit

Das Humanitarium ist ein gut aufgestellter Projektpartner mit langjähriger praktischer Ausstellungstätigkeit.

Die in der Ausstellung bearbeitete Thematik ist allerdings noch nicht im gesellschaftlichen

Bewußtseins Polens. Somit war die Entwicklung dieser Ausstellung auch ein Wagnis. Die im Vorfeld entwickelten Umfragen und Prognosen zeigten sich allerdings insoweit als zutreffend, da wie vermutet ein tatsächlich größeres Interesse an erneuerbaren Energien und nachhaltigem Handeln schlummert und tatsächlich auch geweckt werden kann.

Kühnste Erwartungen sind von einer Besucherzahl von ca. 40.000-45.000 im ersten Jahr ausgegangen.

Tatsächlich waren vom 9. Sept. 2016 bis zum 9. Juni 2017 also innerhalb von neun Monaten 51.560 Besucher und Besucherinnen in der Ausstellung. Dies darf man getrost als großen Erfolg bezeichnen. Bemerkenswert ist auch, dass alle Altersgruppen angesprochen wurden und die Ausstellung für alle Gruppen auch interessante und neue Erkenntnisse liefern konnte.

Der große Besucherandrang hat natürlich auch dazu geführt, dass ein erhöhter personeller Aufwand zur Betreuung der Ausstellung und der Gruppen notwendig war. Dies konnte aber bewältigt werden,

Da die Ausstellung ja auch weiterhin geöffnet ist und fortgeführt wird, ist als Folge des Projekts ein weiterer wichtiger Baustein gewonnen, um möglichst auch in den kommenden Jahren viele kleine und große Menschen zu erreichen und zu begeistern.

Durch die regelmäßig durchgeführten und von uns begleiteten Evaluationen konnten die Inhalte der Ausstellung reflektiert werden und Anpassungen im methodisch-didaktischen erfolgen. Natürlich sind die methodisch-didaktischen Vorgehensweisen in Polen und in Deutschland nicht alle identisch. Um vertiefendes Lernen zu ermöglichen, könnte die oft klassisch eingesetzte Frontalunterrichtsmethode noch häufiger aufgelöst werden. Hierzu wäre es wünschenswert noch mehr Zeit für die Betreuer und Betreuerinnen zu haben, um mit Ihnen diese Konzepte weiter vertiefen zu können.

Das Projekt gliederte sich in zwei Teilbereiche:

Zum einen die verkürzte Produktionszeit von neun Monaten, um den Eröffnungstermin halten zu können.

Das führte zu einer kostenneutralen Mittelumwandlung bei beiden Partnern, da vor allem für die Projektleitungen deutlich mehr Aufwand betrieben werden musste, um die inhaltlichen Fragestellungen gut zu lösen. Zum anderen die Phase der praktischen Umsetzung mit nun mehr neun Monaten Ausstellungsbetrieb, in dem das ausgearbeitete Konzept in zwei Evaluationsphasen nochmals auf das nachhaltige Handeln der Akteure überprüft werden konnte. Dies hat sich als sehr vorteilhaft erwiesen, da es einerseits Handeln bestärkt hat und neue Motivation durch die guten Rückmeldungen gewonnen wurde. Zum anderen konnte die Ausstellung fein nachjustiert werden.

Eine ausführliche Auswertung ist diesem Bericht im Anhang beigefügt.

Die technische Begleitung des Ausstellungsbetriebs klappt hervorragend. Die MitarbeiterInnen halten die Ausstellung in einem sehr guten Zustand, kleinere technische Problemen können unmittelbar gelöst werden und behindern so die tägliche Arbeit nicht.

Die BesucherInnen treffen so eine gleichbleibend hohe Qualität der Exponate und der Angebote an.

Eine Ausstellung über die Elemente sollte nicht nur in den Innenräumen stattfinden, sondern auch auf die Außenflächen erweitert werden können. In kleinen Workshops wurde dies auch schon realisiert.

Weitere zur Thematik passende Exponate für das Freigelände wurden im Laufe des Projekts angedacht und wären eine sehr wünschenswerte Erweiterung.

Leider hat die Trägerschaft des Humanitariums im Frühjahr 2017 gewechselt und die bisherigen Freiflächen um das Ausstellungsgebäude sind jetzt nicht mehr verfügbar.

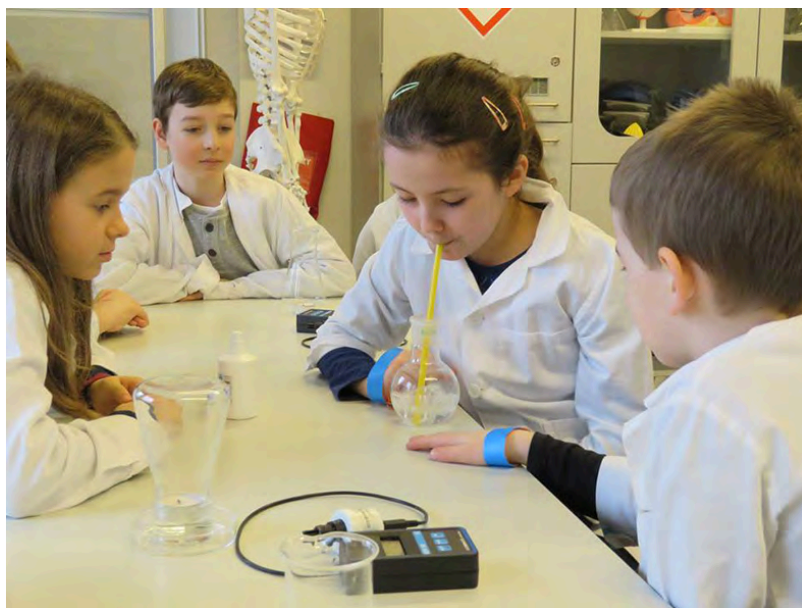
Wir bedanken uns für die sehr gute und kooperative Zusammenarbeit beim Humanitarium Wroclaw und der Deutschen Bundesstiftung Umwelt.

Bildnachweis: alle Bildrechte Humanitarium, Wroclaw

9. Impressionen











Anhang zum Abschlussbericht des Projekts

Sonne, Erde, Wasser, Wind -

Physikalische Phänomene erneuerbarer Energien erleben und verstehen

Eine Mitmachausstellung für nachhaltiges Handeln

im Humanitarium, Breslau, Polen



DBU Projekt AZ 32971/01

Projektträger:

Pädagogische Ideenwerkstatt BAGAGE e.v.

Kooperationspartner:

Humanitarium, Breslau Polen

Renewable Energy Sources

Final Evaluation Report

This report summarizes the results of the final stage of the external evaluation of the „Renewable Energy Sources“ project in Humanitarium sponsored by the German Federal Environmental Foundation (DBU).

Wroclaw, 2017

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1. Introduction

This final evaluation report is the result of the survey carried out in Humanitarium.Gardens of Experience. The "Renewable energy sources" exhibition is object of the study. The report discusses the results obtained in the external evaluation carried out between 20.09.2016 and 28.02.2017.

The information was collected through questionnaires that were conducted among guests immediately after visiting the exhibition in Humanitarium. The following report was made on the basis of these data. The evaluation report presents the results of the survey, as well as conclusions and recommendations for the future of the project.

2. Basic information

2.1. Humanitarium

Humanitarium.Gardens of Experience is an educational unit that was established in December 2011. Its main goal is to create an inspiring place to explore the world around us through the lens of the latest achievements of science. By presenting interactive and multimedia temporary exhibitions as well as conducting unique laboratories and workshops prepared and carried out in the physical, chemical and biological laboratories Humanitarium teaches through experience, showing that science does not have to be difficult. Its educational mission is not only placing itself in the current curriculum, but beyond it. Humanitarium's goal is to raise smart, innovative and sustainable society. Innovative way education that is used in our centre promotes multidisciplinary and social integration. It connects generations and different environments, involving all age groups: children, youth, parents, as well as seniors.

2.2. Project objectives

The aim of the project is to raise public awareness, particularly through children and young people in the field of renewable energy sources by creating a space in Humanitarium with interactive exhibits, multimedia applications dealing with the renewable energy sources theme. Another objective of the project is to provide a hands-on workshops and laboratories for the project participants of different age groups. The hands-on experiments should increase participants' knowledge on wind, solar and water energy.

2.3. Specific project objectives

The main project objective is to raise public awareness in the field of renewable energy sources and physical phenomena occurring during their manufacture by presenting "Renewable energy sources" exhibition in Humanitarium, including 11 interactive exhibits and 3 multimedia applications that are suitable for the following age groups: 6-12, 13-16, 17-22, 23-35 and 35+.

Another specific objective of a project is to organize educational, hands-on laboratories and workshops for school groups and individual visitors. Those activities should teach participants what is solar, wind and water power. They should also teach them different applications of these energies. Each thematic workshop and laboratory should be suitable for a different age group.

2.4. External evaluation objectives

- Evaluation of all elements of the exhibition (interactive exhibits, multimedia applications, educational workshops and laboratories) in terms of effectiveness and efficiency.
- Defining strengths and weaknesses of the elements of the project in Humanitarium.
- Thorough assessment of the effectiveness of the project.
- Assessment of the involvement of the target groups.
- Analysis and systematization of data from the internal evaluation.
- Conclusions and recommendations.

2.5. Additional information

The external evaluation was accompanied by internal evaluation, which involved filling the questionnaire forms by project participants of different age (6-12, 13-16, 17-22, 23-35 and over 35 years (including teachers - experts in the fields of chemistry, biology, physics), immediately after visiting Humanitarium. The questionnaire forms were prepared by Humanitarium in consultation with BAGAGE.

2.6. Schedule of evaluation

Task	Time limit	Representative
First stage of internal evaluation	20.09.2016–30.11.2016	Humanitarium staff
Data analysis and preparation of the first stage of evaluation	1–23.12.2016	External evaluator
Second stage of internal evaluation	01.01.2017–28.02.2017	Humanitarium staff
Data analysis and preparation of the first stage of evaluation	1–27.03.2017	External evaluator
Preparation of final evaluation	1–30.04.2017	External evaluator

2.7. Evaluation method

- Questionnaire

This method of data collection was used in „Renewable Energy Sources“ project survey as it allowed us to get detailed information from a large group of people at the same time. As such a form of survey ensures anonymity to its respondents, it also allowed us to collect meaningful response by the project participants, who could express their opinion feeling confident that they will not be identified by anybody for giving a particular point of view. Survey results could also be easily summarised and further analysed.

2.8. Questionnaire form

Dear visitor,

Thank you for visiting the Humanitarium. To further improve the exhibition it is important to collect feedback. In the first part of the following questionnaire we will ask you about your visit. The second part is about you. We really appreciate that you took time to answer these short questions. If you leave your email address at the end of this questionnaire you automatically enter into a draw of attractive prizes.

1. Please rate your knowledge about renewable energy before visiting the exhibition. (please tick)

no knowledge expert knowledge

2. Where did you learn about the exhibition in Humanitarium? (please tick)

school work friends webpage social media _____

3. How do you feel about the descriptions of interactive exhibits? Were they easy to understand? (please tick)

easy to understand hard to understand

4. Please rate the user-friendliness of the interactive exhibits. (please tick)

easy to understand hard to understand

5. How intelligible was the learning material of the exhibition to you? (please tick)

easy to understand hard to understand

6. How attractive were the following offers to you? (please tick)

	<i>Very appealing</i>	<i>Somewhat appealing</i>	<i>Little appealing</i>	<i>Not at all appealing</i>
Workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laboratory	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interactive exhibits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multimedia applications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. What is your favorite part of the exhibition?

8. Did you learn anything new about renewable energy at the exhibition? (please tick)

yes no

Please comment the reasons:

9. Would you recommend the Humanitarium to your friends / acquaintances? (please tick)

yes no

What would you like to improve?

Personal questions: (please tick)

10. Gender: female male

11. Age bracket:

6-12 y. 13-16 y. 17-22 y. 23-35 y. over 35 y.

12. Occupation:

pupil student teacher worker self-employed worker
 other: _____

13. Place of residence:

Wroclaw or direct neighborhood more than 150 km from Wroclaw
 more than 50 km from Wroclaw I´m not from Poland, I´m from: _____

14. We'd like to hear further comments:

Thank you for your time!

To enter into the price draw please leave your email address:

3. Presentation of the evaluation results based on conducted questionnaires.

3.1. Introduction

The questionnaires were filled in by visitors immediately after visiting the exhibition. In the first stage of evaluation, a total of 524 questionnaires were collected. After an external verification of the correctness of the questionnaires, 24 of them were rejected and 500 questionnaires were further analyzed.

The questionnaire consisted of open and closed questions. Discussing the results, abbreviations that refer to a number of questions - 1, 2, 3, etc. - for closed questions, and 7T, 8T, 10T etc. were used for open questions or their part.

The most common mistake made by the respondents in closed questions where one could choose only one answer, was selecting multiple answers. This was mostly observed in responses to question number 1,2 and 3. In question no 6, which consisted of four parts the respondents very often did not mark any answer.

In this report the following abbreviation will be used:

6 W for 'workshop',

6 L for 'laboratory',

6 E for 'interactive exhibits',

6 A for 'multimedia applications'.

The number of wrong answers to the question no 6 was as follows:

Table 1. Errors in the responses to question No. 6

Question symbol	Number of incorrect answers	No answer	Total
6 W	16	26	42
6 L	11	49	60
6 E	11	34	45
6 A	12	46	58

On the other hand, in open questions, often no response was given.

Table 1. Errors in responses to open questions

Question symbol	Number of incorrect answers	No answer	Total
7T	2	133	135
8T	0	316	316
10T	6	248	254
15T	3	389	392

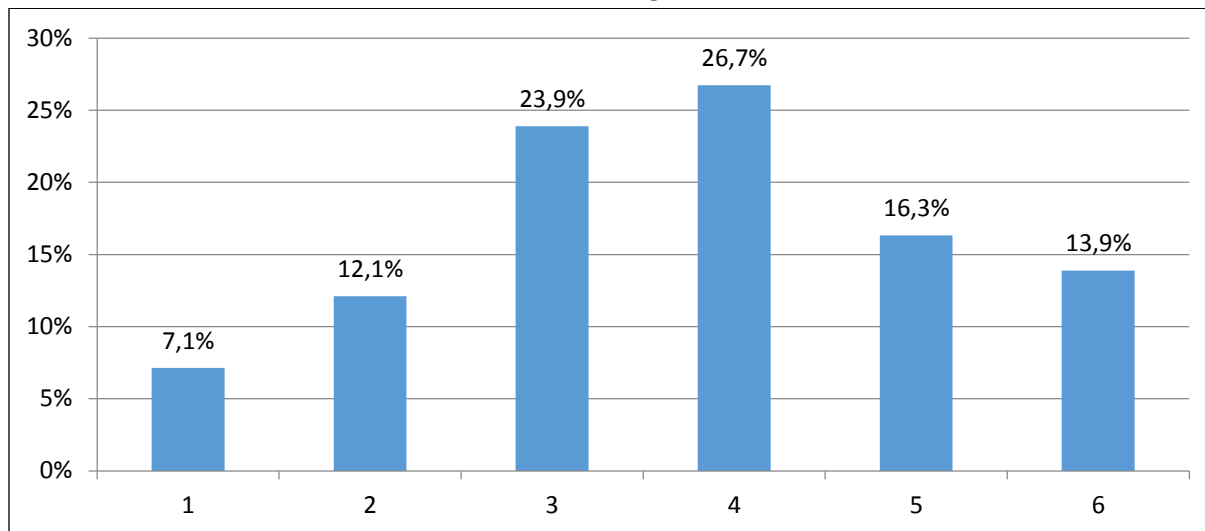
3.2. Discussion on the findings

In this section answers to specific questions in the questionnaire form will be discussed.

In each of the following figures that describe project participants' responses to the questions all questionnaires filled in correctly were taken into account. First, the table shows the number of answers to the specific question obtained in all the analyzed surveys. Then, the results of the percentage distribution of all responses are presented as a figure. In some cases, more specific characteristics of answers to the question were presented, taking into consideration: age, gender or occupation (questions 11, 12 and 13).

3.2.1. Please rate your knowledge about renewable energy sources before visiting the exhibition

Figure 2. Self-assessment of knowledge on a scale of 1 to 6 (1 - lack of knowledge, 6 - expert knowledge)



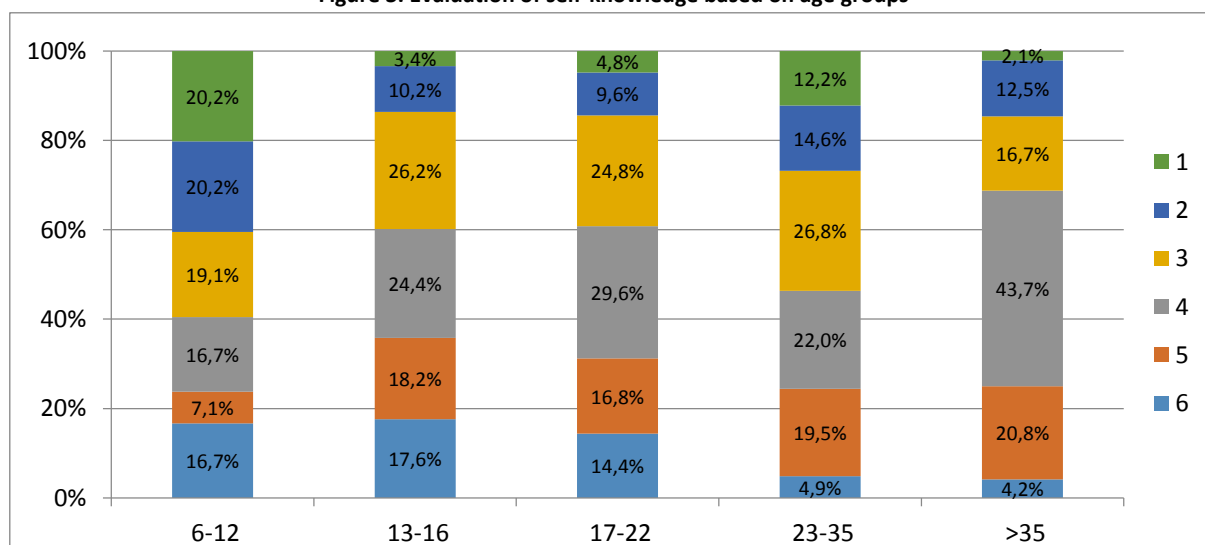
In this question, a total of 490 correct answers were analyzed.

In absolute terms, the results were as follows:

Rate	1	2	3	4	5	6
No of answers	35	59	117	131	80	68

Over half of the respondents (50,6%) identified their knowledge about renewable energies as average (answer 3 and 4). No and little knowledge (answer 1 and 2) was reported by 19,2%. In contrast, the high and very high level of expertise (answer 5 and 6) was reported by 30,2%.

Figure 3. Evaluation of self-knowledge based on age groups



Considering the level of assessment of self- knowledge, 40,4.% of the responders of 6-12 years, defined it as low (answer 1 and 2), whereas groups aged 13-16, 17-22, 23-35 and over 35 years defined their knowledge as low respectively: 13.6% and 14.4%, 26,8% and 14,8%.

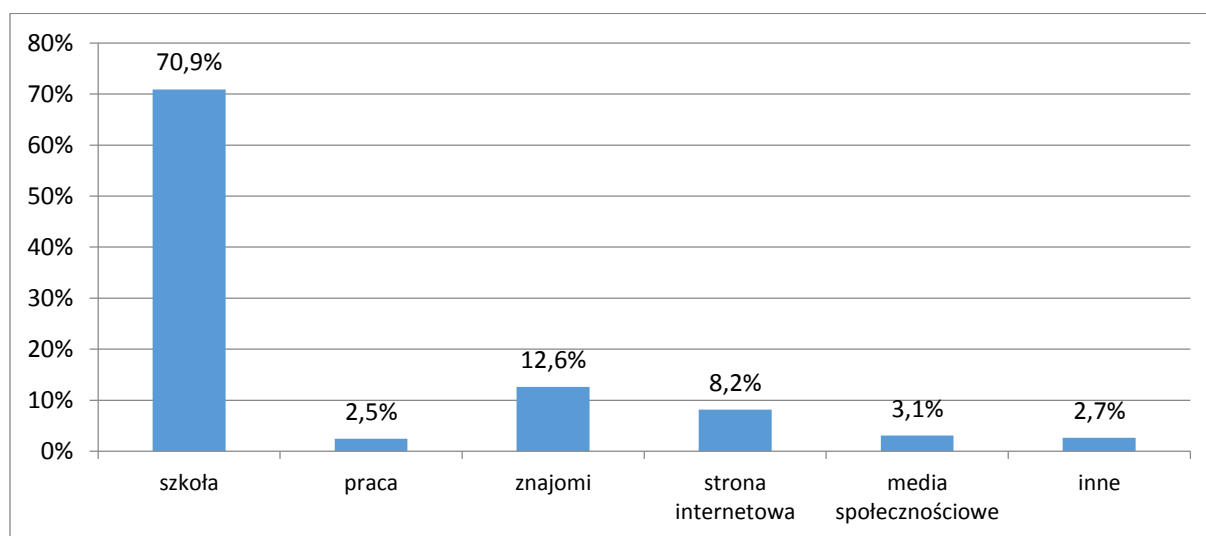
High level of assessment of self-knowledge (score 5 and 6) was defined by those age groups as follows: 6-12 – 23,8%, 13-16 – 35,8%, 17-22 – 31,2%, 23-35 – 24,4%, and over 35 – 25,0%.

Employed respondents, similarly to learners, rated their knowledge as score 3 and 4 on a six-point scale – that is 57.8% and 48.3% respectively in those age groups. The significant difference can be seen in the number of people who rated their knowledge as expert-level before visiting the exhibition: learners - 16.4% and employed responders - 4.7%.

Generally, women rated their knowledge on renewable energy sources before visiting the exhibition slightly more critically than men. 23.5% of them rated their knowledge as low (score 1 and 2), whereas only 15.3% of men rated their knowledge as low. On the other hand, 29.2% of men and 31.5% of women rated their knowledge on renewable energy sources as high level (score 5 and 6).

3.2.2. Where did you learn about exhibition presented in Humanitarium?

Figure 1. Sources of information about Humanitarium



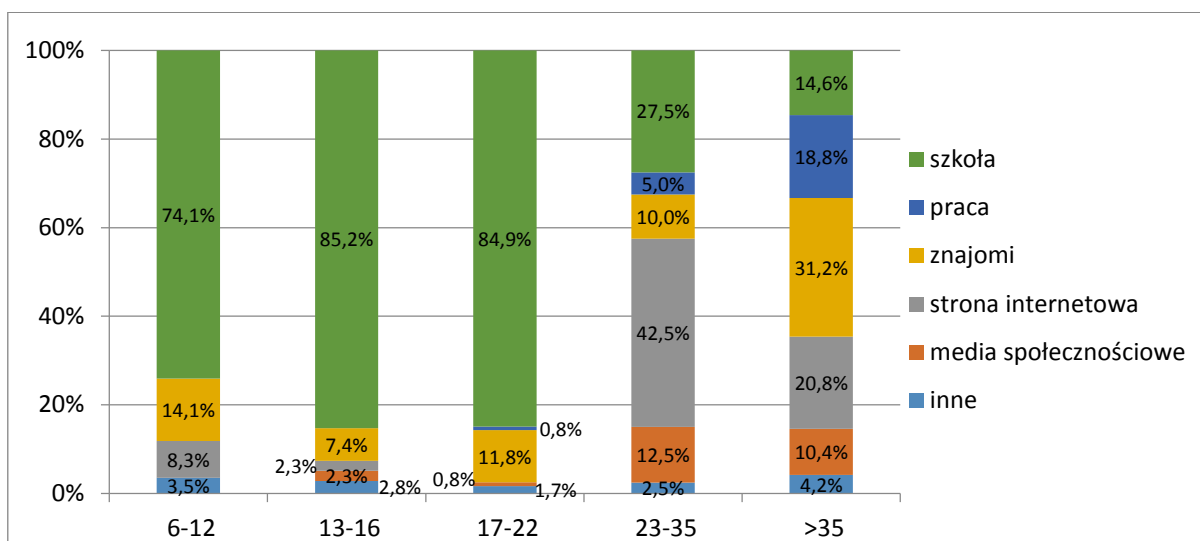
In this question a total of 484 correct answers were analyzed.

In absolute values the results were as follows:

Source	School	Work	Friends	Webpage	Social media	Other
Number of responses	343	12	61	40	15	13

Due to specific age structure of visitors (majority of students) 84,0% of responders defined school as their source of information about Humanitarium.

Figure 2. Sources of information about Humanitarium in different age groups

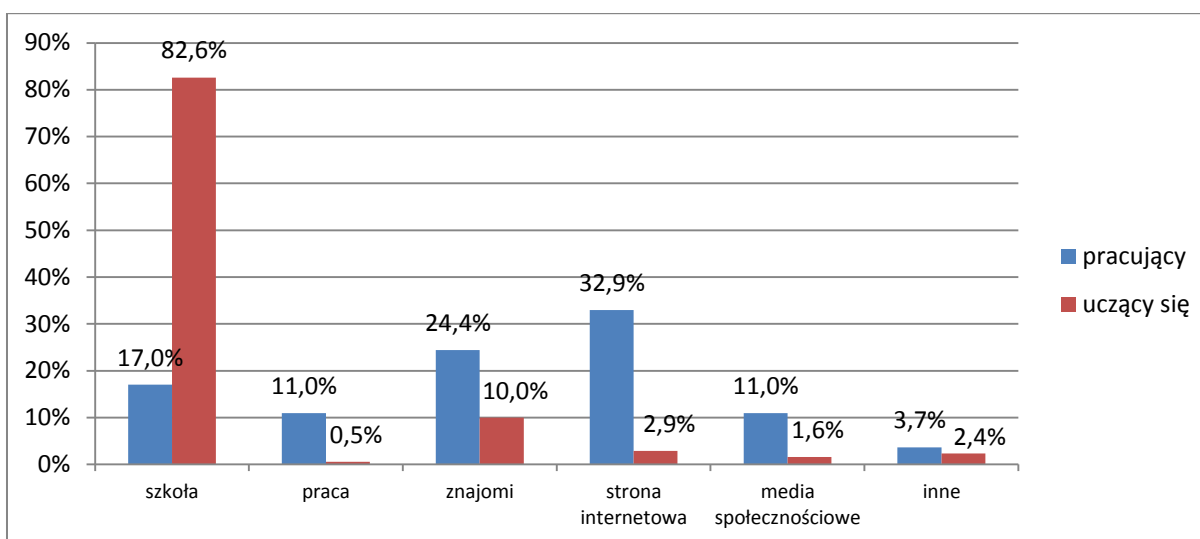


Among youth (age group 6-22), the main sources of information about Humanitarium were school and friends - 77.1%. These two sources in the individual age groups accounted for 88.2% - in the group of 6-12, and 92.6% - in the group 13-16 and 96.7% - in the group of 17-22 years.

In the age group of 23-35 years, the main sources of information about Humanitarium were websites and schools (70.0%), and in the group over 35 years, the main sources of information about Humanitarium were friends (31.2%) and then website (20.8%).

Website and social media were mentioned by age groups: 23-35 - 55.0%, and over 35 - 33.3%. Among youth, this percentage was low and amounted to 8.3% for respondents aged 6-12, 4.6% for age group 13-16 and 0.8% for age group of 17-22.

Figure 3. Sources of information about Humanitarium among employed respondents and learners

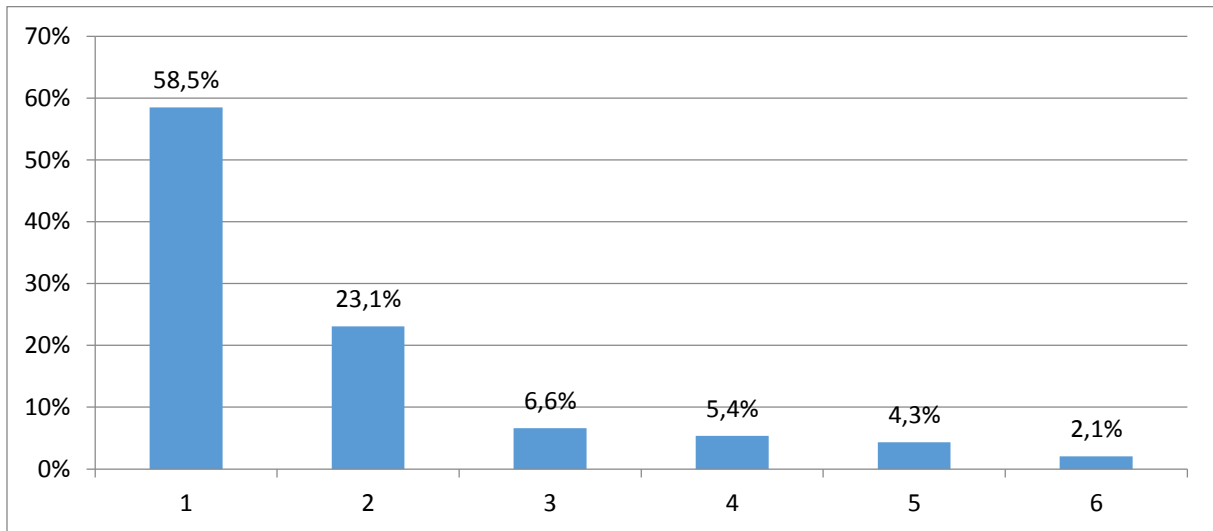


43,9% of employed respondents pointed Internet as the source of information about Humanitarium, whereas only 4,5% of learners mentioned this source of information. Employed respondents pointed friends - 24,4%, and school – 17% as an important sources of information about Humanitarium.

Learners mentioned school - 82,6% and friends – 10% as main sources of information about Humanitarium.

3.2.3. How do you feel about the descriptions of interactive exhibits? Were they easy to understand?

Figure 4. Evaluation of the descriptions of the exhibits in scale from 1 to 6 (1 – understandable, 6 – not understandable)



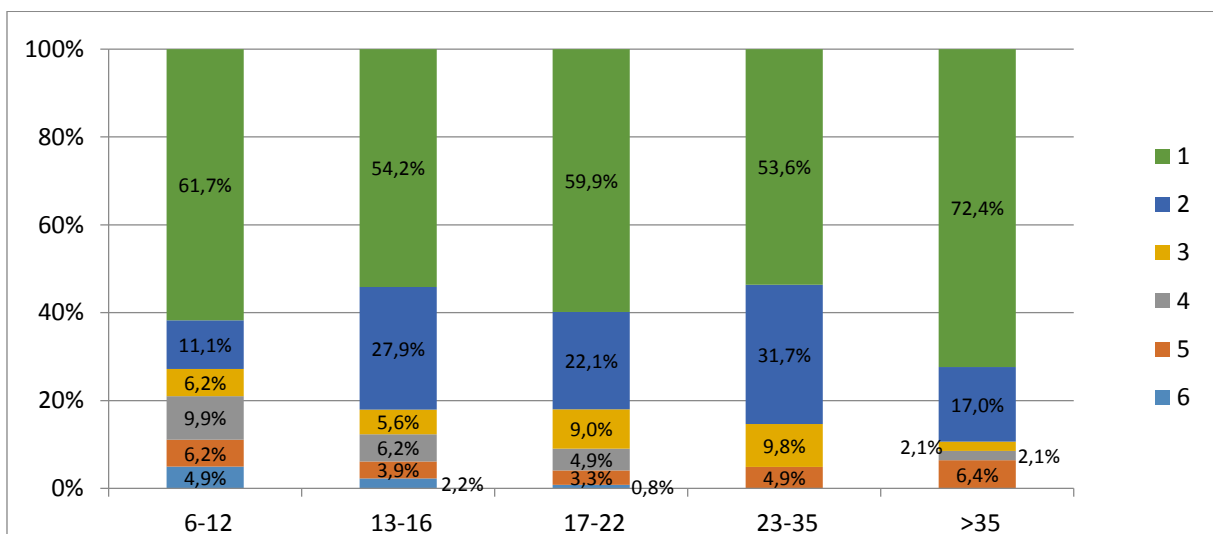
In this question a total of 485 correctly answered questions were analyzed.

In absolute values the results were as follows:

Score	1	2	3	4	5	6
Number of responses	284	112	32	26	21	10

Majority of respondents positively rated the quality of descriptions (score 1 to 3 – 90,6%). While 8,7% had opposite opinion (score 4 to 6). The highest grade of understanding of the descriptions (score 1) was given by 58,5% of respondents.

Figure 5. Evaluation of descriptions of exhibits in age groups



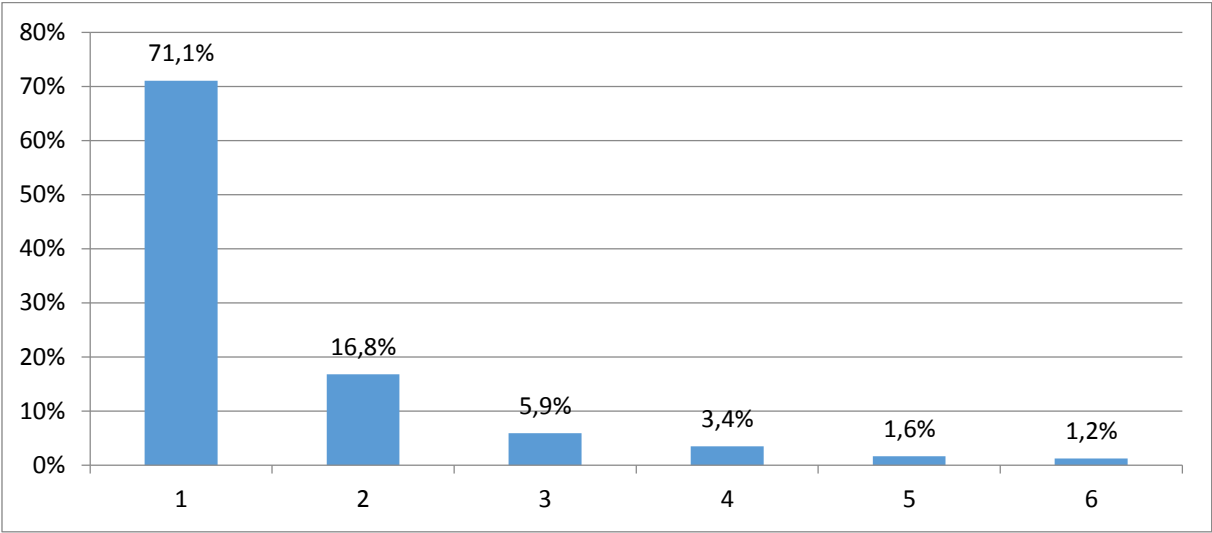
Most of the respondents in each age group highly rated the descriptions of the exhibits. Score 1 and 2 make up 72.8% in the age group of 6-12, 82.1% in the age group of 13-16, 82.0% in the age group of 17-22, 85.3% in the age group of 23-35 and 89.4% in the age group over 35.

As seen in the figure above, the comprehension of descriptions (scores 1 and 2) increased with the age of the respondents. A similar tendency occurs with a total ratings of scores 1 to 3 in the age group of 6-22. The descriptions of the exhibits are not understandable (scores 4 to 6) for 21,0% of respondents aged 6-12, 12,3% for respondents aged 13-16, 9,0% for respondents aged 17-22, 8,5% for respondents aged over 35 and 4,9% of respondents aged 23-35.

The ratings of descriptions of the exhibits by women and men were similar. 82.4% of women and 80.6% of men rated them as understandable (scores 1 and 2).

3.2.4. Please rate the user-friendliness of the interactive exhibits.

**Figure 6. Degree of difficulty handling interactive exhibits on a scale 1 to 6
(1 – understandable 6 – incomprehensible)**



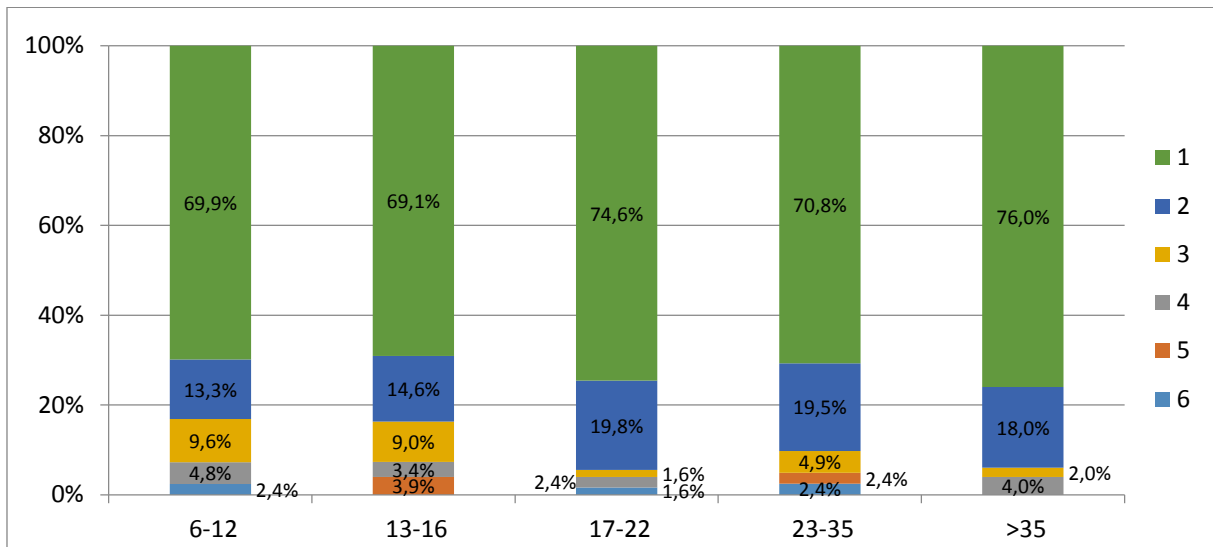
In this question, a total of 494 correctly answered questions were analyzed.

In absolute values the results were as follows:

Score	1	2	3	4	5	6
Number of responses	351	83	29	17	8	6

Most of the respondents assessed the handling of the exhibits as easy (score 1 to 3)– 93,8%. 71,1% of respondents rated the exhibits as easy to use (score 1), and only 1,2% rated them as incomprehensible (score 6).

Figure 7. Degree of difficulty handling interactive exhibits in age groups



Among teenagers (age group 6-22) the ease of use of exhibits increases with the age of the visitors. The highest ease of use of the exhibits (score 1) was reported by different age groups as follows: 83,2% (age group of 6-12), 83,7% (age group of 13-16), 94,4% (age group of 17-22), 90,3% (age group of 23-35) and 94,0% (age group over 35).

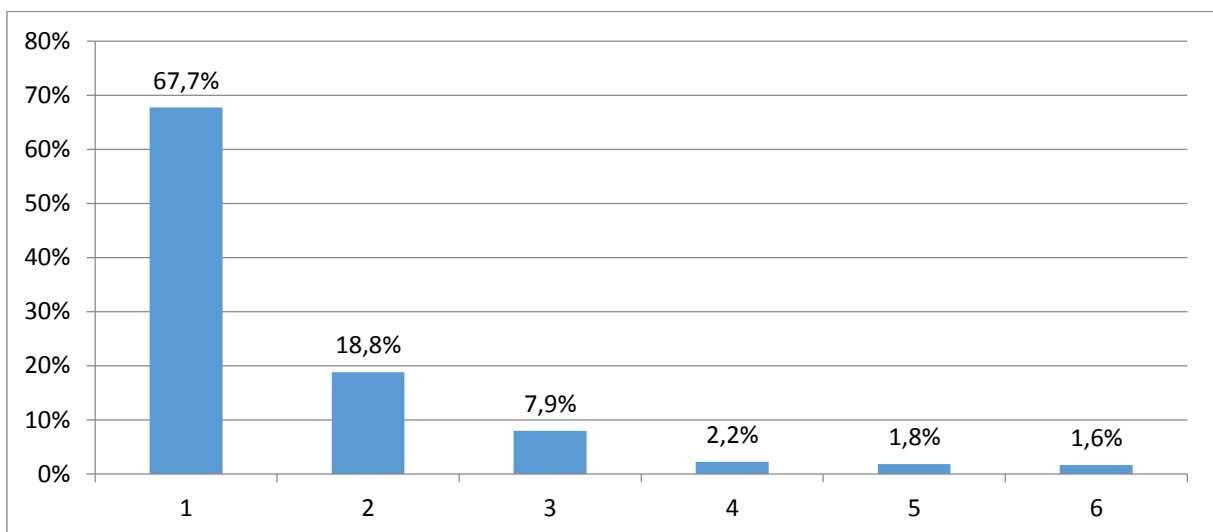
Hard to understand (score 4 to 6) ratings were reported by 7,2% of respondents aged 6-12, 7,3% of respondents aged 13-16, 4,0% of respondents aged 17-22, 4,8% of respondents aged 23-35 and 4,0% of respondents aged over 35.

When it comes to gender, 91,2% of men and 85,4% of women rated interactive exhibits as easy to use (score 1 and 2).

3.2.5. How intelligible was the learning material of the exhibition to you?

Figure 8. Assessment of understanding of the educational materials on a scale 1 to 6

(1 – understandable, 6 – incomprehensible)



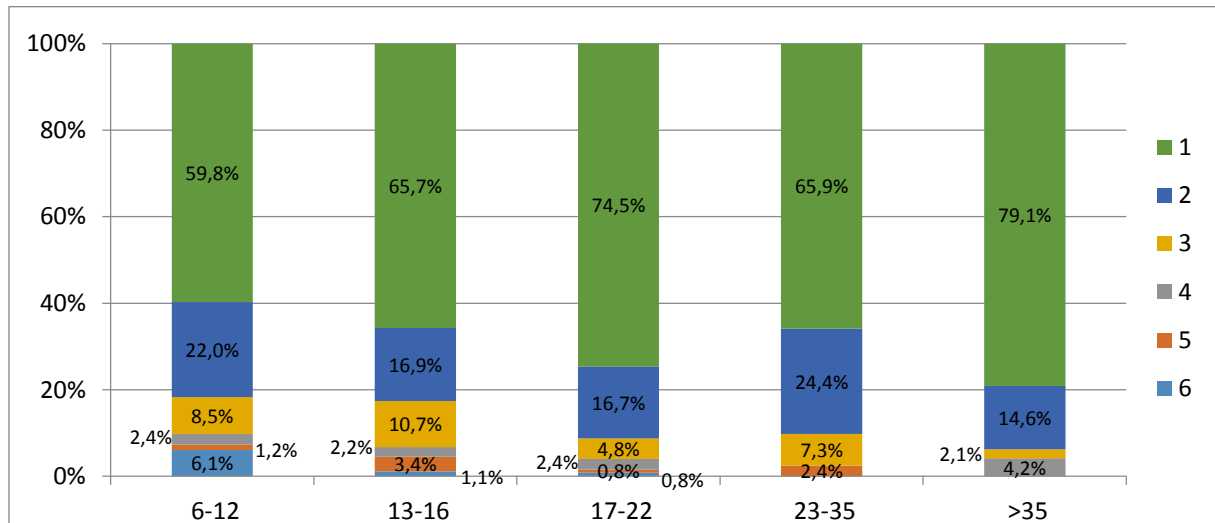
In this question a total of 491 correctly answered questions were analyzed.

In absolute values the results were as follows :

Score	1	2	3	4	5	6
Number of responses	332	92	39	11	9	8

94,4% of respondents highly assessed the intelligibility of educational materials (score 1 to 3), and 67,7% of respondents rated them as fully understandable (score 1). Only 1,6% of respondents identified the educational materials as incomprehensible (score 6).

Figure 9. Assessment of understanding of educational materials in age groups



The understanding of educational materials increases with the age of the respondents. This is especially evident at the highest level of understanding (score 1) - 59.8% for age group of 6-12, 65.7% for age group of 13-16 and 74.5% for age group of 17-22. For scores 1 and 2 the results are as follows: 81.8% for age group of 6-12, 82.6% for age group of 13-16 and 91.2% for age group of 17-22.

The upward trend is also evident in the sum of the scores 1 to 3 and it is as follows: 90.3% for age group of 6 -12, 93.3% for age group of 13-16 and 96.0% for age group of 17-22.

Women and men assessed the understanding of educational materials at a similar level. Scores from 1 to 3 were given by 94.7% of men and 93.6% of women.

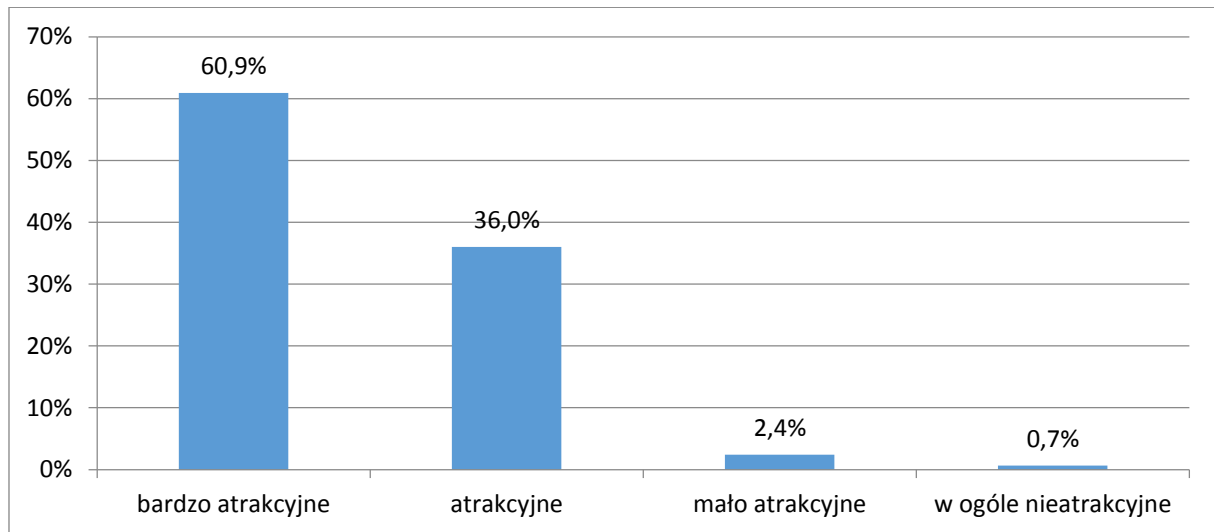
3.2.6. How would you rate the attractiveness of the elements of the exhibition presented in Humaniatrrium?

The sixth question in the questionnaire consisted of four parts assessing the attractiveness of the various elements of the exhibition. For a better understanding of answers to this question, each part of a question will be discussed separately, and then summary will be presented.

For all elements of the exhibition in question numer six four options were given, that is: very appealing, somewhat appealing, little appealing and not appealing at all. During the discussion of the answers to this question, the following terms are also used: positive assessment (sum of ratings „very appealing” and „somewhat appealing”) and negative assessment (sum of ratings „little appealing” and „not appealing at all”).

3.2.6.1. How would you rate the attractiveness of workshops?

Figure 10. Assessment of the attractiveness of workshops



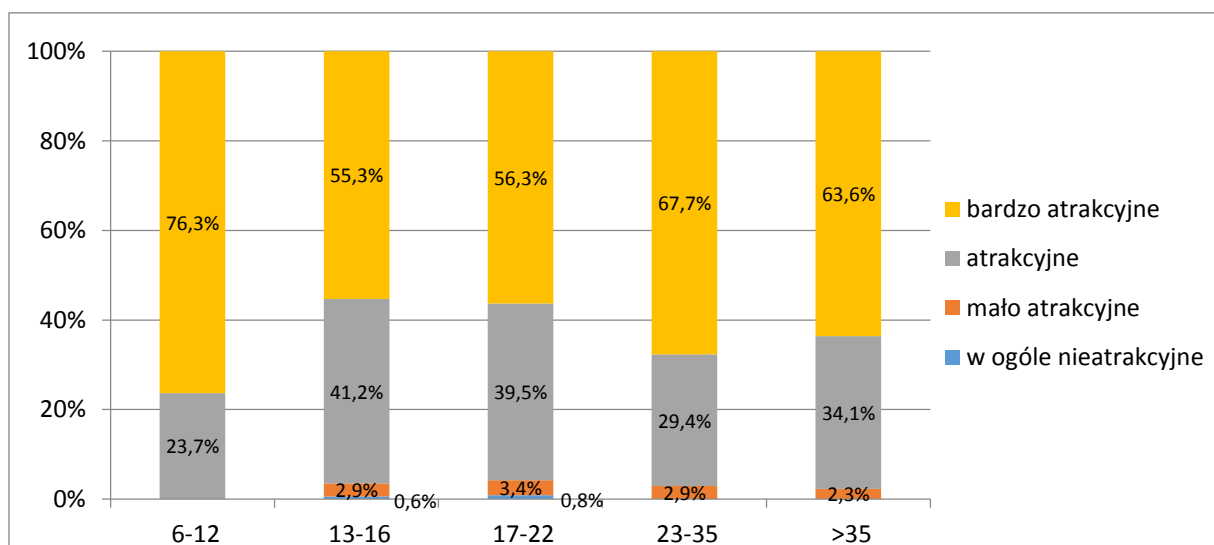
In this question, a total of 458 correctly answered questions were analyzed.

In absolute values the results were as follows:

Score	Very appealing	Somewhat appealing	Little appealing	Not appealing at all
Number of responses	279	165	11	3

The workshops were rated at 60,9% as very appealing, and positive assessment („very appealing” and „somewhat appealing”) was given by 96,9% of respondents. Only 2,4% of respondents rated workshops as „little appealing”, and 0,7% of them as „not appealing at all”.

Figure 11. Assessment of the attractiveness of workshops in age groups



The attractiveness of workshops was rated the highest („very appealing”) by the youngest visitors – 100%. Other age groups gave workshops positive assessment: 96,5% in age group 13-16, 95,8% in age group 17-22, 97,1% in age group 23-35 and 97,7% in age group over 35.

Among respondents aged 6-22 one can see a decline in ratings of workshops with raising age of respondents.

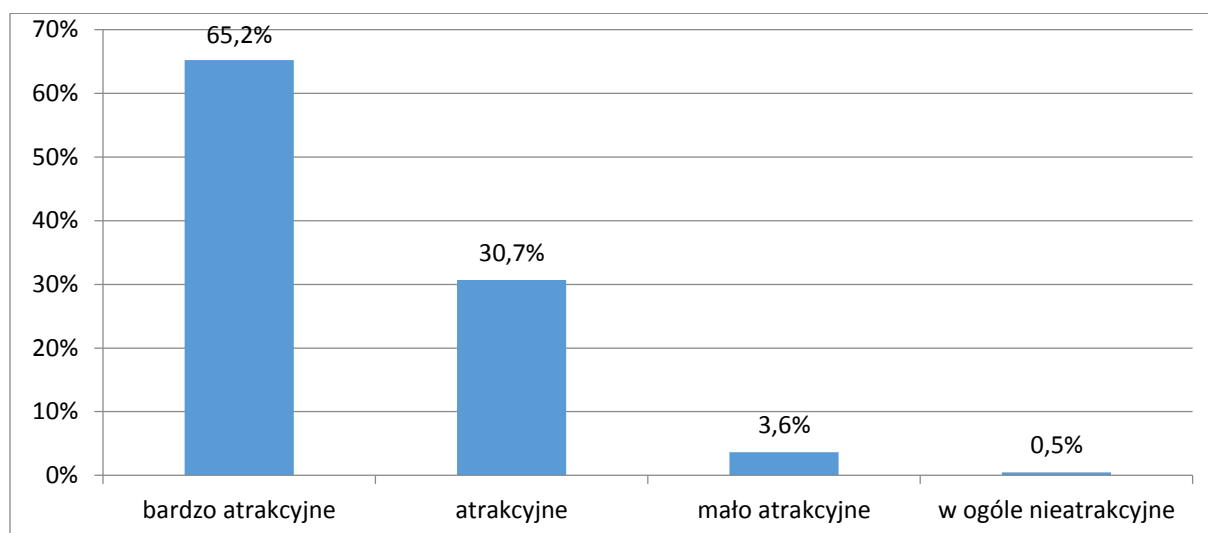
“Not appealing at all” ratings could be seen in age group of 17-22 – 0,8%, and in age group 13-16 – 0,6%.

Respondents of different sexes rated the attractiveness of interactive exhibits similarly. 95.1% of men and 98.8% of women gave workshops a positive assessment. The negative assessment of workshops was given by 0.5% of men, and 0.4% of women.

Teachers and students likewise appreciated the attractiveness of the workshops. The positive assessment was given by 100.0% of the teachers and 96.9% of the students.

3.2.6.2. How would you rate the attractiveness of laboratory?

Figure 12. Assessment of the attractiveness of the laboratory



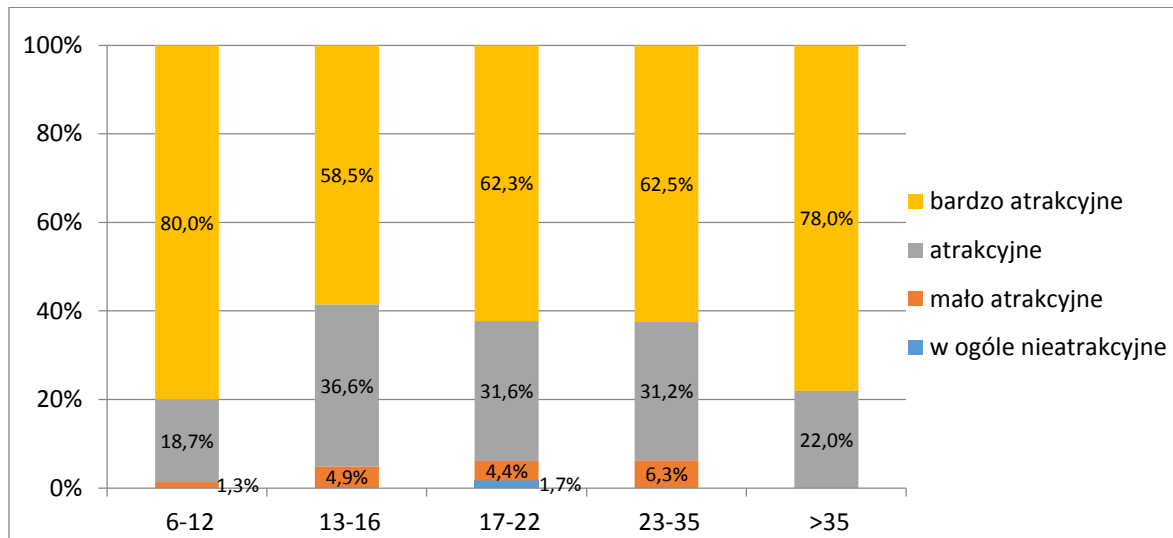
In this question, a total of 440 correctly answered questions were analyzed.

In absolute values the results were as follows:

Score	Very appealing	Somewhat appealing	Little appealing	Not appealing at all
Number of responses	287	135	16	2

Laboratory was rated at 65,2% as very appealing. A positive assessment was given by 95,9% of respondents. Only 3,6% of respondents rated them as „little appealing”, and 0,5% as „not appealing at all”.

Figure 13. The assessment of attractiveness of laboratory in age groups



There are no significant differences in the assessment of the attractiveness of a laboratory in individual age groups. Positive assessment was given by 98.7% of respondents in the 6-12 age group, 95.1% in the 13-16 age group, 93.6% in the 17-22 age group, 93.7% in the 23-35 age group and 100.0% in the group over 35 years.

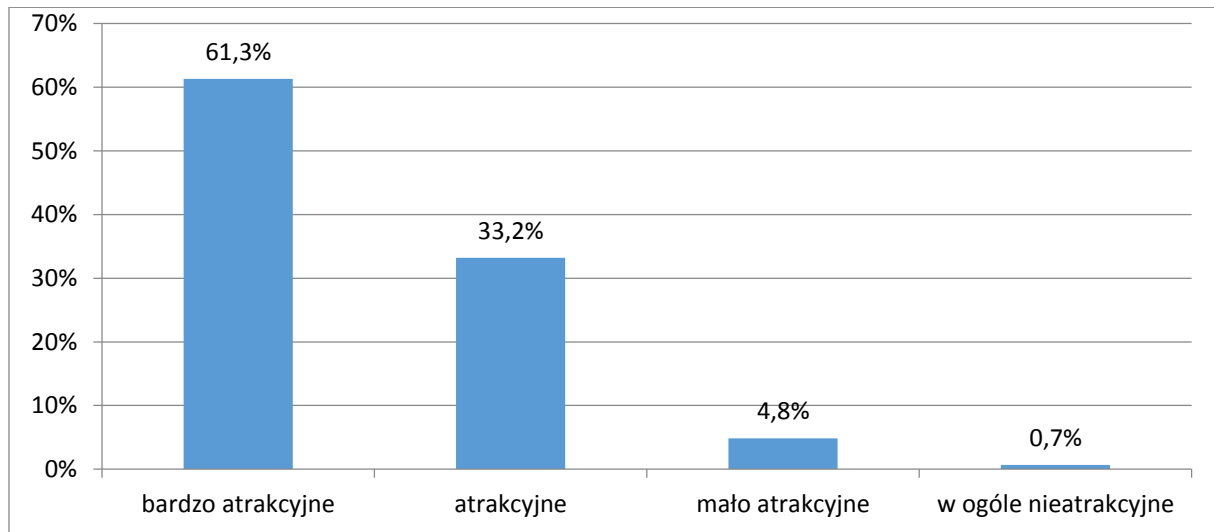
Among the respondents aged 6-22 years, there is a slight decrease in the rating of attractiveness of laboratories with the age of respondents. The "not appealing at all" rating was only given by 1.7% of respondents in the 17-22 age group.

Differences in the assessment of the attractiveness of the laboratory can be seen taking gender into account. Men were more critical than women. 92.3% of men and 98.7% of women gave a positive assessment of laboratories. The negative assessment was given only among men - 1.0%.

Teachers and students likewise appreciated the attractiveness of the laboratory. Positive assessment was given by 95.5% of teachers and 95.7% of students.

3.2.6.3. How would you rate the attractiveness of the interactive exhibits?

Figure 14. Assessment of the attractiveness of interactive exhibits



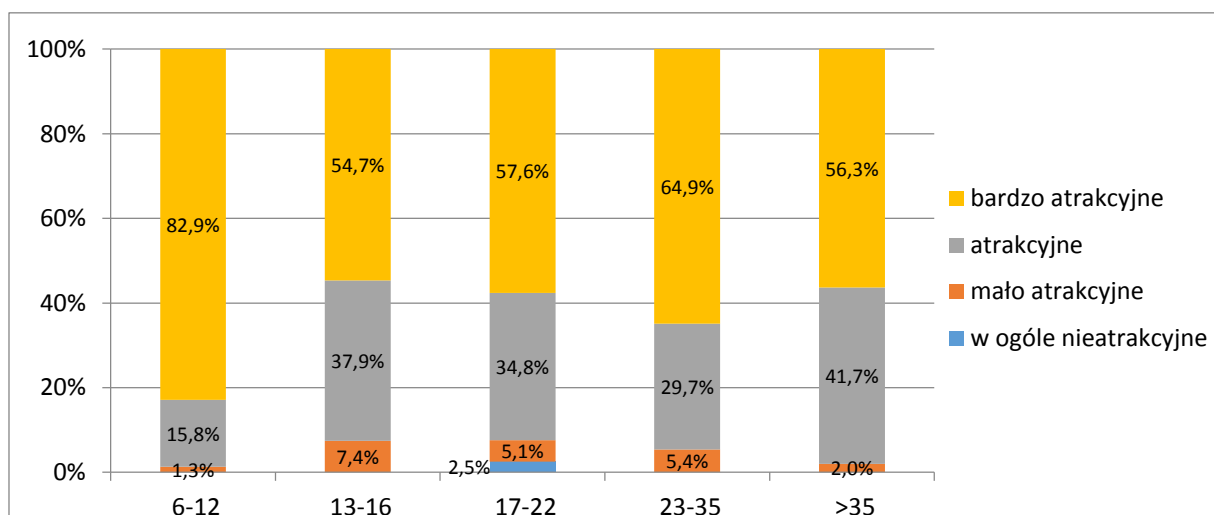
In this question, a total of 455 correctly answered questions were analyzed.

In absolute values the results were as follows:

Score	Very appealing	Somewhat appealing	Little appealing	Not appealing at all
Number of responses	279	151	22	3

Interactive exhibits were rated by 61,3% of respondents as „very appealing”, and the positive assessment was given by a total of 94,5% respondents. Only 4,8% of respondents rated them as „little appealing”, and 0,7% as „not appealing at all”.

Figure 15. Assessment of attractiveness of interactive exhibits in age groups



There are no significant differences in the ratings of attractiveness of interactive exhibits in individual age groups. The highest percentage of positive assessments can be seen among the youngest visitors (6-12 age group) - 98.7%. Other age groups rated interactive exhibits at a similar level: 92.5% of

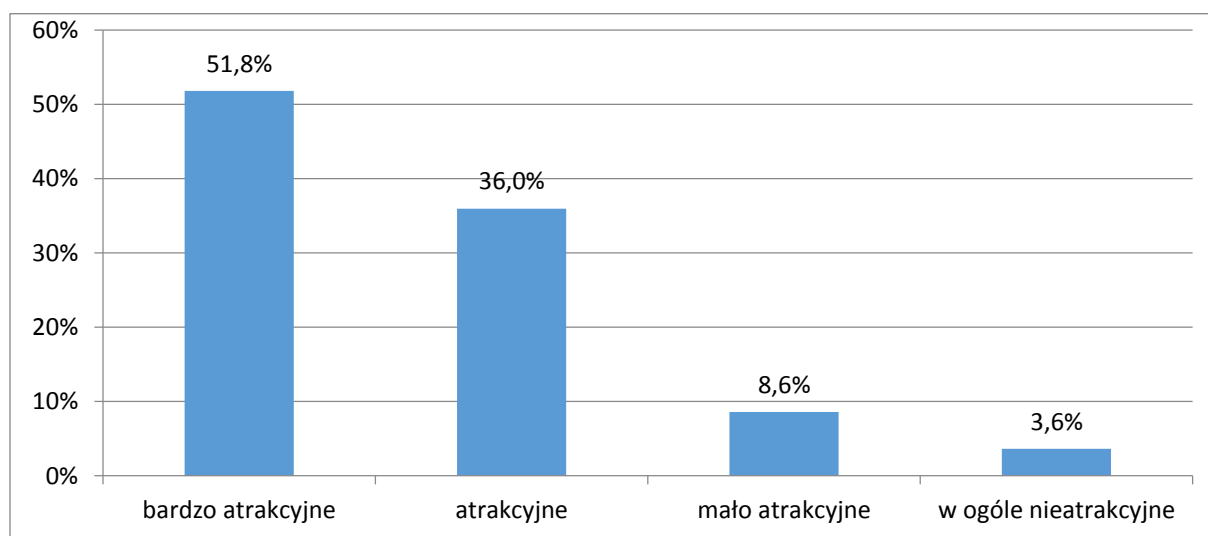
positive assessment in the 13-16 age group, 92.4% in the 17-22 age group, 94.6% in the 23-35 age group and 97.9% in the age group of over 35. Only 2.5% of the respondents in the 17-22 age group rated interactive exhibits as "not appealing at all".

Respondents of different sexes rated the attractiveness of interactive exhibits similarly, that is: 94.1% of men and 94.6% of women gave interactive exhibits positive assessment. The "not appealing at all" rating appeared only among men - 1.5% of male respondents.

Teachers and students have likewise rated the attractiveness of interactive exhibits. Positive assessment was given by 95.5% of teachers and 94.2% of students.

3.2.6.4. How would you rate the attractiveness of multimedia applications?

Figure 16. Assessment of the attractiveness of multimedia applications



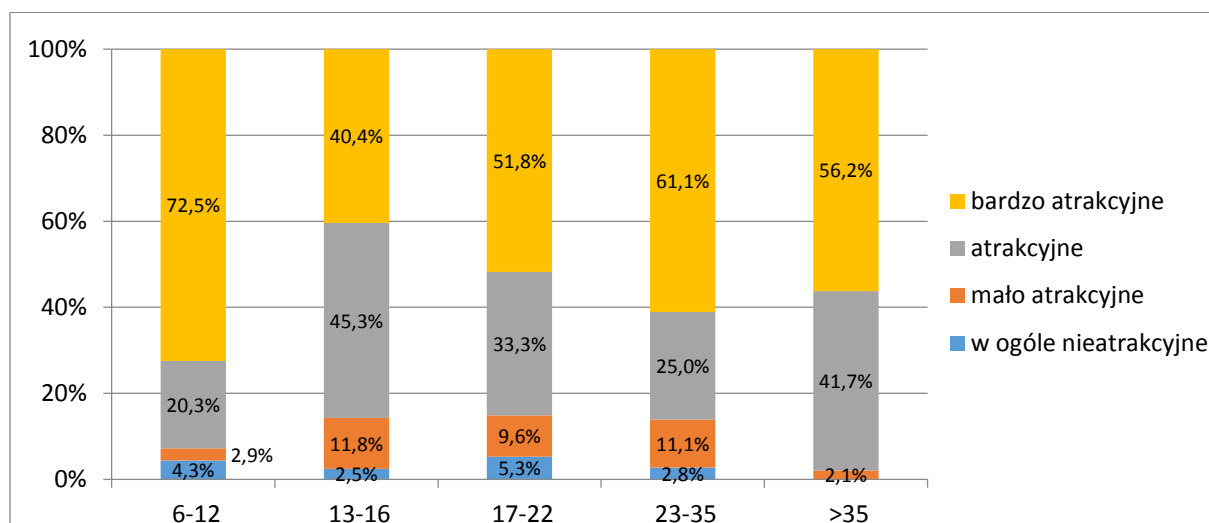
In this question, a total of 442 correctly answered questions were analyzed.

In absolute terms the results were as follows:

Score	Very appealing	Somewhat appealing	Little appealing	Not appealing at all
Number of answers	229	159	38	16

Multimedia applications were rated as „very appealing” by 51,8% of respondents, and positive assessment of the applications was given by 87,8% of respondents. Only 8,6% of respondents rated them as „little appealing”, and 3,6% of respondents as „not appealing at all”.

Figure 17. Assessment of the attractiveness of multimedia applications in age groups



There are no significant differences in the rating of attractiveness of multimedia applications among individual age groups. The highest percentage, that is 97.9%, of positive assessment was given by the age group of over 35 years. Among the respondents aged 6-22, the results were as follows: 92.8% of respondents aged 6-12 gave a positive assessment, 85.7% of respondents aged 13-16 gave a positive assessment, and 85.1% of respondents aged 17-22 assessed multimedia applications positively.

In the age group of 23-35, positive assessment was given by 86.1% of respondents.

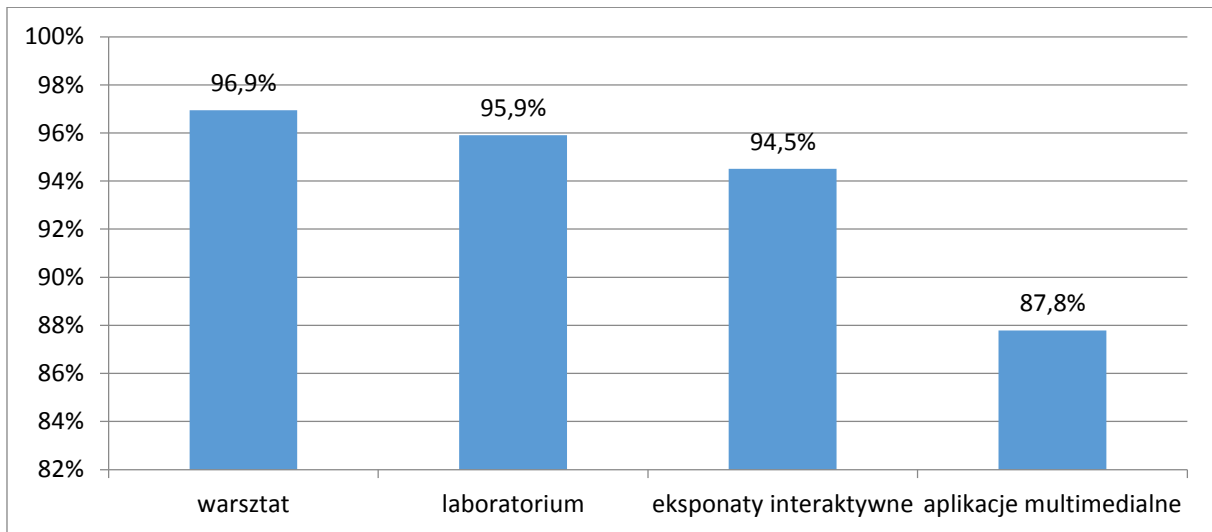
The "not appealing at all" answers appeared in several age groups: 5.3% in age group of 17-22, 4.3% in age group of 6-12, 2.8% in age group of 23-35 and 2.5% in age group of 13-16.

Men were a bit more critical in assessing the attractiveness of multimedia applications than women. Positive assessment was given by 85.2% of men and 90.6% of women. The "not appealing at all" answers appeared among 5.1% of men, and among 1.7% of women.

Teachers and students in assessing the attractiveness of multimedia applications slightly differed. Positive assessment was given by 95.5% of teachers and 94.2% of students.

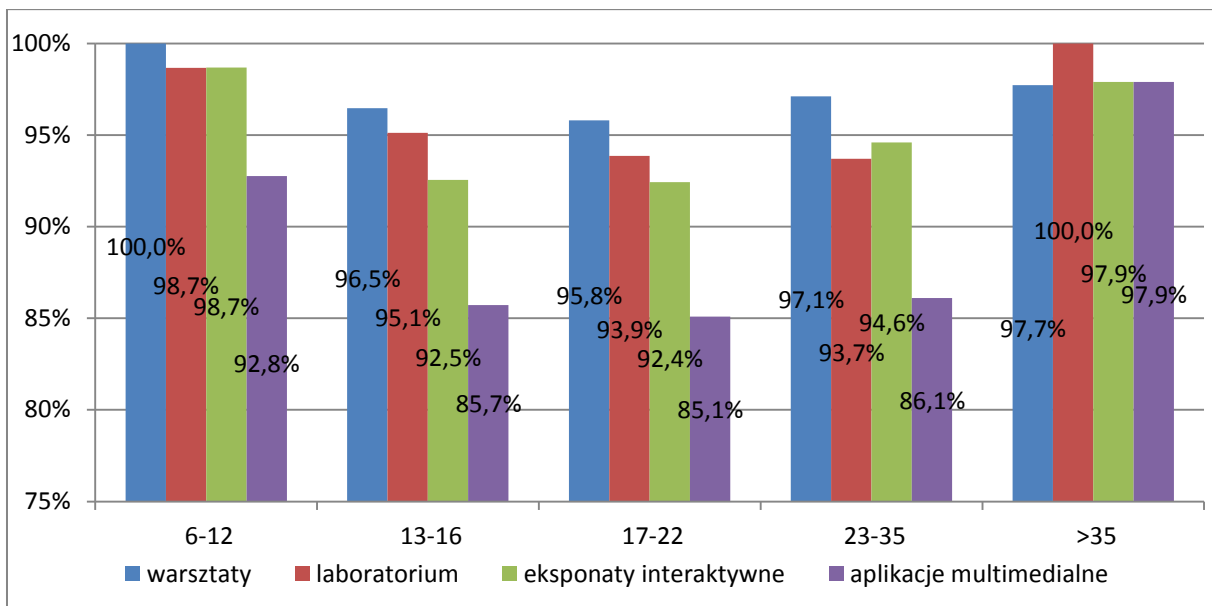
3.2.6.5. Comparison of attractiveness ratings of elements of the exhibition

Figures 18. „Very appealing” and „somewhat appealing” assessments of elements of the exhibition



Analyzing the results of the survey in terms of attractiveness of all four elements of the exhibition, the following trend is observed: the most positive assessments were given to workshops – 96,9%. A little less of positive assessment was given to laboratories– 95,9% and interactive exhibits – 94,5%. Multimedia applications were positively assessed by 87,8% of respondents.

Figure 19. „Very appealing” and „somewhat appealing” assessments of elements of the exhibition in different age groups

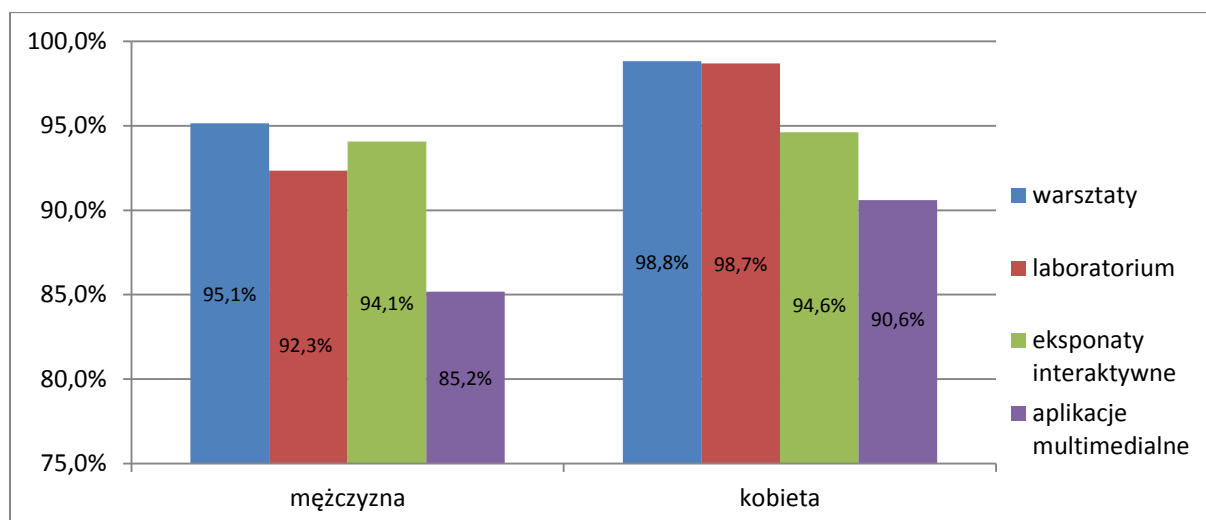


Among young people, workshops were rated at the highest level: 100% of respondents aged 6-12 gave them positive assessment, 96,5% of respondents aged 13-17 gave them positive assessment and 95,8% of respondents aged 17-22 assessed workshops positively.

Other elements of the exhibition were also assessed positively and they were the most attractive in the following order: laboratory, interactive exhibits and multimedia applications.

In older age groups the assessments differed. In the age group of 23-35, workshops were rated the highest (97.1%), followed by interactive exhibits (94.6%), laboratory (93.7%) and multimedia applications (81.6%). In the over 35 age group the highest rated were: laboratory (100.0%) and other elements of the exhibition that were rated at a similar level between 97.7% and 97.9%.

Figure 20. Assessment of the elements of the exhibition as „very appealing” and „somewhat appealing” by gender

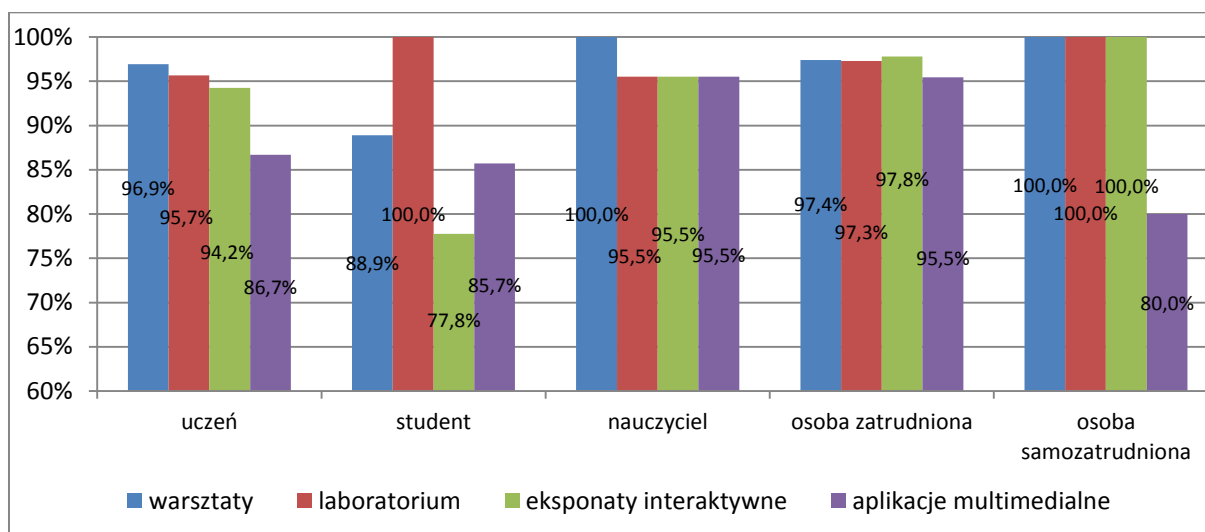


All the elements of the exhibition presented at Humanitarium were generally assessed positively by women. The most appealing element of the exhibition were workshops, which were positively assessed by both, women (98.8%) and men (95.1%). Laboratories got 98.7% among women and interactive exhibits 94.1% among men. Multimedia applications got 90.6% among women and 85.2% among men. Multimedia applications got the lowest ratings and they were positively assessed by 90,6% of women and 85,2% of men.

The comparison of negative assessment of all the elements of the exhibition among men and women is as follows:

	Men	Women
Workshops	0.5%	0.4%
Laboratories	1.0%	0.0%
Interactive exhibits	1.5%	0.0%
Multimedia applications	5.1%	1.7%

Figure 21. Assessment of the elements of the exhibition as „very appealing” and „appealing” by occupation

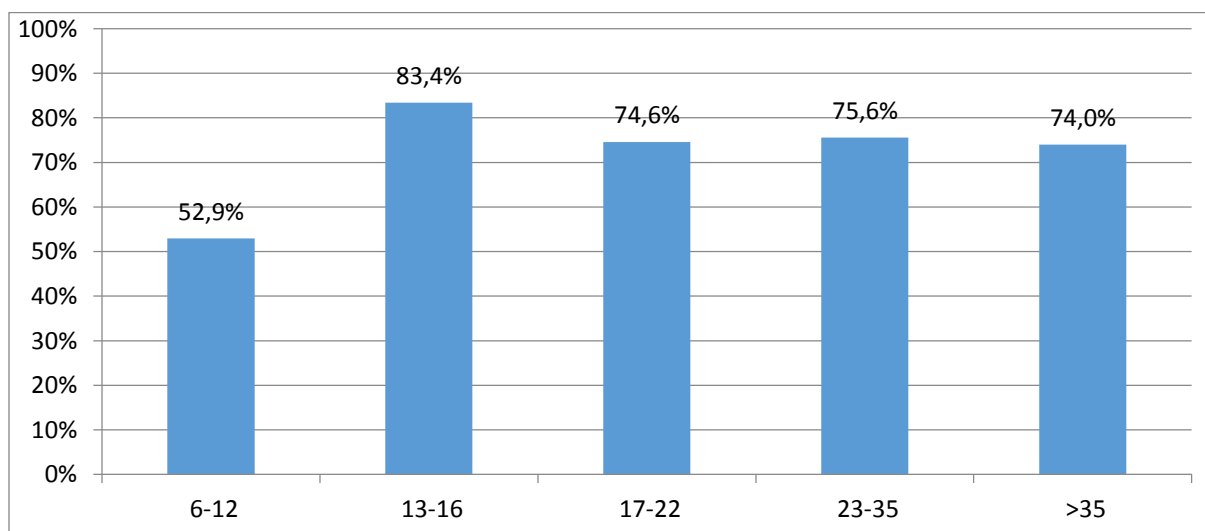


Among students the positive assessment of all the elements of the exhibition was as follows: workshops - 96.9%, laboratory - 95.7%, interactive exhibits - 94.2%, and multimedia applications - 86.7%. Employed responders assessed the elements of the exhibition on a similar level to students: beginning with interactive exhibits, which were rated on the highest level - 97.8% to multimedia applications, which were rated the lowest - 95.5%. All teachers assessed workshops positively and the remaining elements of the exhibition were rated at the same level of 95.5%.

3.2.7. Which part of the exhibition was in your opinion the most attractive?

Of all the collected questionnaires 73.0% of respondents answered this question. A total of 365 correctly answered questions were analyzed. The majority of respondents mentioned one element of the exhibition that was the most attractive. 36 respondents mentioned two elements, while 9 mentioned 3 most attractive elements of the exhibition.

Figure 22. Participation of respondents in question number 7 in age groups



The least answers were provided by responders from the 6-12 age group - 52.9%. The most answers to question number 7 were provided by responders aged 13-16 - 83.4% followed by responders aged 23-35 - 75.6%, and 17-22 - 74,6%, and responders over 35 - 74,0%.

Women responded more often to this question (80.2% of women) than men (67.3% of men).

The most frequently mentioned elements of the exhibition are presented in the tables below.

Table 2. The most frequently mentioned elements

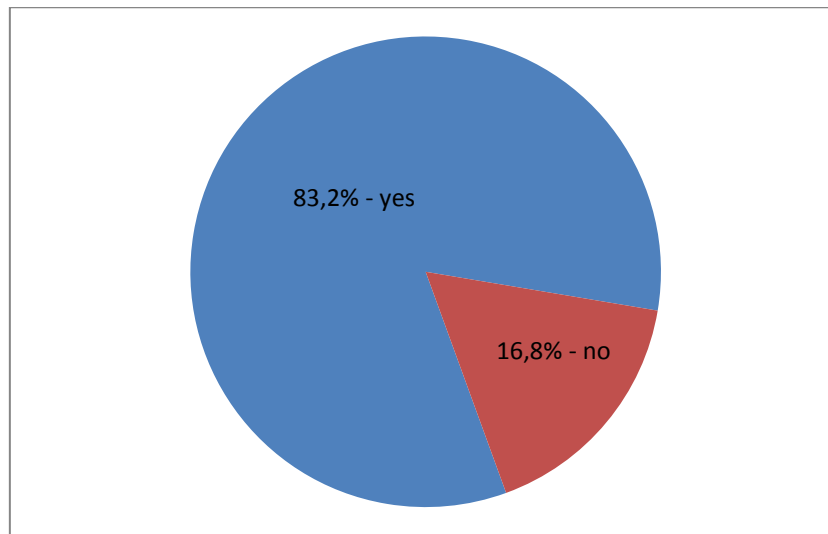
Element of the exhibition*	Numer of occurrences
Optical labyrinth	94
Mad room	84
Laboratory	72
Rainbow	43
Interactive exhibits	39
Workshops	29
Mirrors	10
Bike racing	10
Multimedia applications	8
Solar batteries	7
I don't know	6
Logic riddles	5
Hydrogen cell	2
Nothing	1

* The names of the elements of the exhibition were taken from the terms used in the questionnaire

Optical labyrinth and Mad room, which is a part of the optical labyrinth were the most frequently mentioned elements of the exhibition. People who indicated those two elements of the exhibition as the most attractive belonged to all age groups. Laboratories and workshops were also popular among respondents.

3.2.8. Did you learn anything new about renewable energy at the exhibition?

Figure 23. Layout of responses to question „Did you learn anything new about renewable energy at the exhibition?“

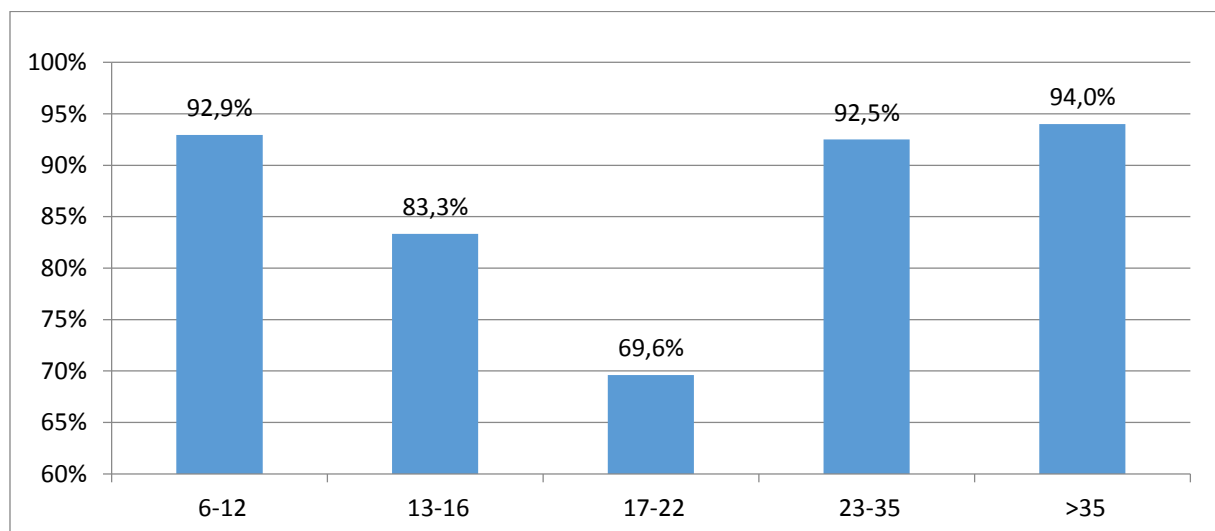


The question consisted of two parts: answer to a question by giving a simple „yes” or „no” answer and a written justification. In this question, a total of 482 correctly answered “yes” and “no” questions and 183 justifications were analyzed.

In absolute values the results were as follows:

Answer	Yes	No
Number of answers	401	81
Number of justifications	133	50

Figure 24. Percentage of respondents reporting that the exhibition taught them something new about Energy sources in age groups



In the 6-22 age group a gradual decrease in positive answers to the question is observed, and it shows respectively: 92.9% for the age group of 6-12, 83.3% for the age group of 13-16 and 69.6% for the age group of 17-22. The rest of the respondents answered "yes" at a similar level. In the age group of 23-35 - 92.5% and in the age group of over 35 years - 94.0%.

83.7% of women and 83.0% of men claimed that the presented exhibition taught them something new about renewable energy sources.

Among different occupational groups, the following tendency is evident: pupils (81.1%) and students (77.8%) reported less frequently than teachers (91.7%), employees (93.6%) and self-employed (100%), that they learned something new about renewable energy sources at the exhibition.

In the descriptive part of this question, 133 people provided justification for the "yes" answer, and 50 for the "no" answer. The most common justification of "yes" answer was: "I learned something new" without any further explanation. In the rest of the answers, the respondents mentioned most often an element of the exhibition that broaden their knowledge on renewable energy sources.

The following tables present the answers.

Table 3. Grouped answers of respondents who claimed that they learned something new after seeing the exhibition

Groups of answers*	Number of responses
I learned something new	67
Ecological power plants	19
Workshops and laboratories	17
Learning through experience is the best	11
Green energy sources	11
electricity	5
About wind	1
The use of light	1
Solar power	1

* The name of elements of the exhibition were taken from the terms contained in the questionnaires.

When justifying „no” answer respondents frequently claimed that they already knew the issues presented at the exhibition or they specified the source of their knowledge.

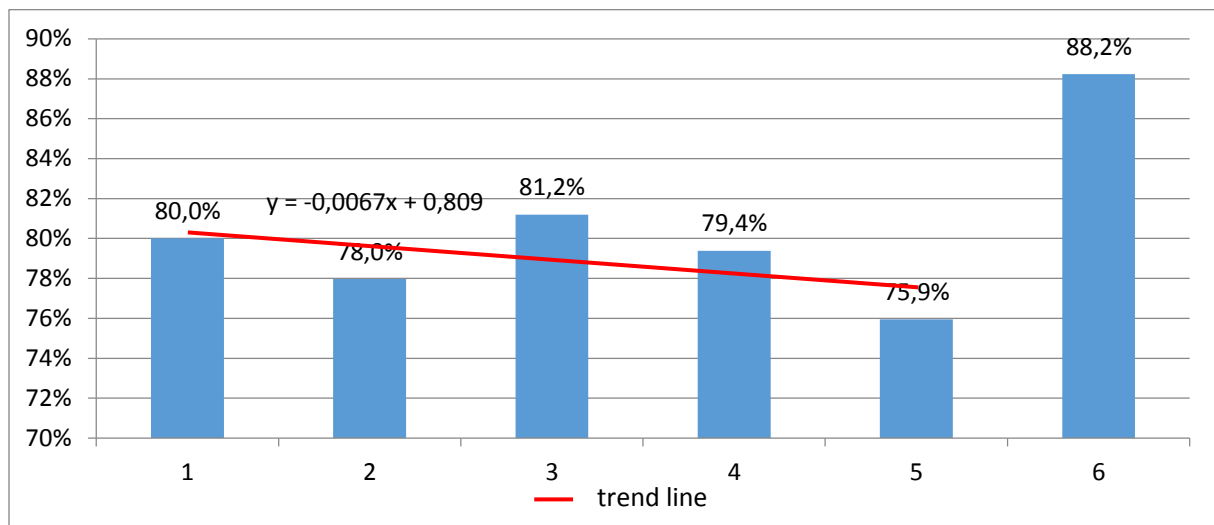
Table 4. Grouped answers of respondents who claimed that they didn't learn anything new after seeing the exhibition

Groups of answers*	Number of responses
I already knew that	19
I don't know	10
It was presented at school	9
I could learn more	6
I go to technical school with this profile	5
The exhibition is designed for younger visitors	1

* The name of elements of the exhibition were taken from the terms contained in the questionnaires.

On the basis of answers to this question one may wonder how did the exhibition affect the increase of knowledge about renewable energy sources among visitors. The answer to this question can be found when comparing answers to question no 8 ("Did you learn anything new about renewable energy at the exhibition?") with answers to question no 1 ("Please rate your knowledge about renewable energy sources before visiting the exhibition").

Figure 25. The percentage of responders who defined their level of knowledge about renewable Energy in question no 1 (1- no knowledge, 6- expert knowledge), who claimed that the exhibition taught them something new.

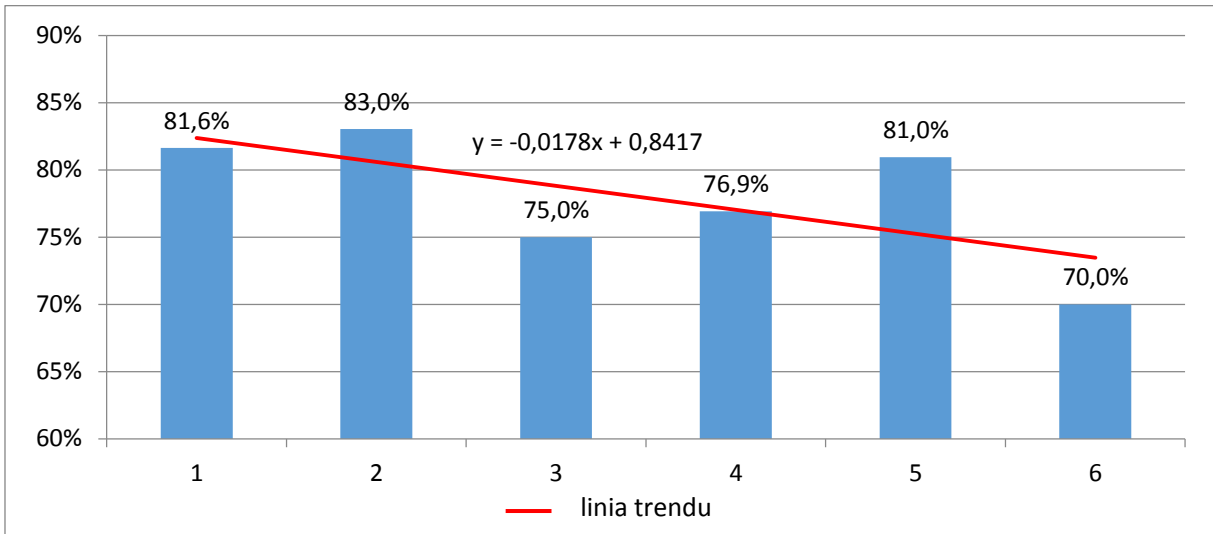


Regardless of the assessment of their knowledge before visiting the exhibition, all respondents indicated that they had learned something new. It is puzzling that even people who declared their knowledge before visiting the exhibition as "expert knowledge" in 88.2% said they learned something new. The possible explanation for this fact could be that among the respondents aged 6-22, 16.4% identified themselves as experts, whereas in the group of 23+ only 4.5% of the respondents identified themselves as such. Youth, who before visiting the exhibition, with some "excessive ease" identified themselves as the experts in answers to question number 8, later indirectly admitted that they overestimated their knowledge before visiting the exhibition.

Analyzing answers to this question, not taking those who identified themselves as experts into consideration, the trend is evident (see the trend line), which can be described as follows: "The less I knew about renewable energies, the more I learned".

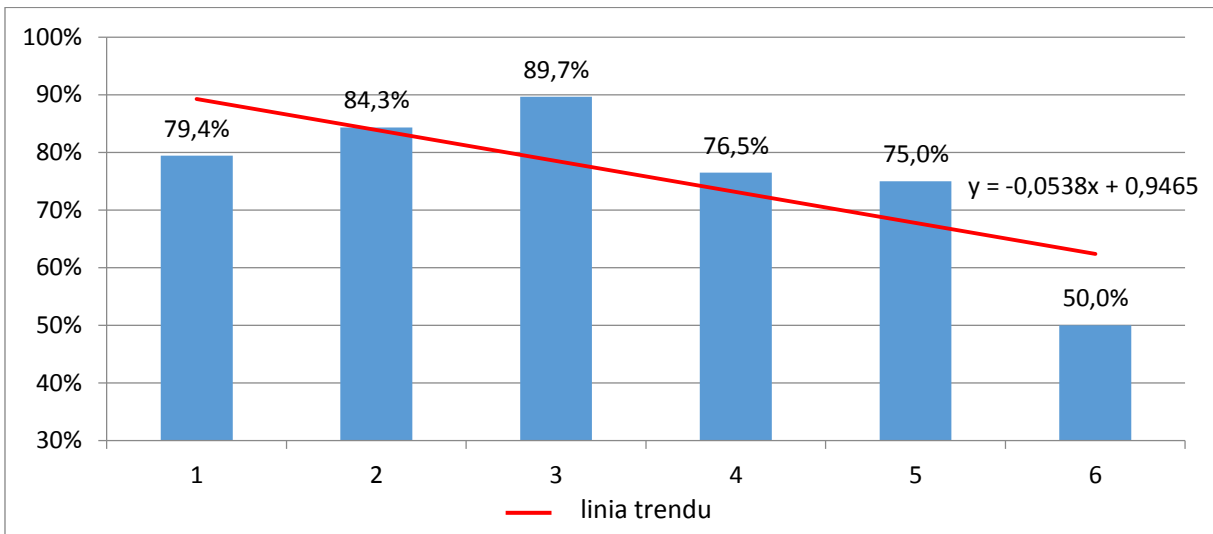
Other responses to questions that can be analyzed are whether there are any interrelations between the descriptions of the exhibits (question 3), the difficulty of using the exhibits (question 4) and the declarations of the respondents as to whether the exhibition taught them something new. Due to the relatively small number of questionnaires, the following graphs should be considered only graphically.

Figure 26. The percentage of people evaluating the comprehension of the description of the exhibits (question 3, 1 - understandable, 6 - incomprehensible), who claimed that the exhibition taught them something new (with a trend line)



The trend line on the chart declines with the lower rating of exhibit descriptions. So, the better understanding of the descriptions, the more knowledge on the presented topic is gained.

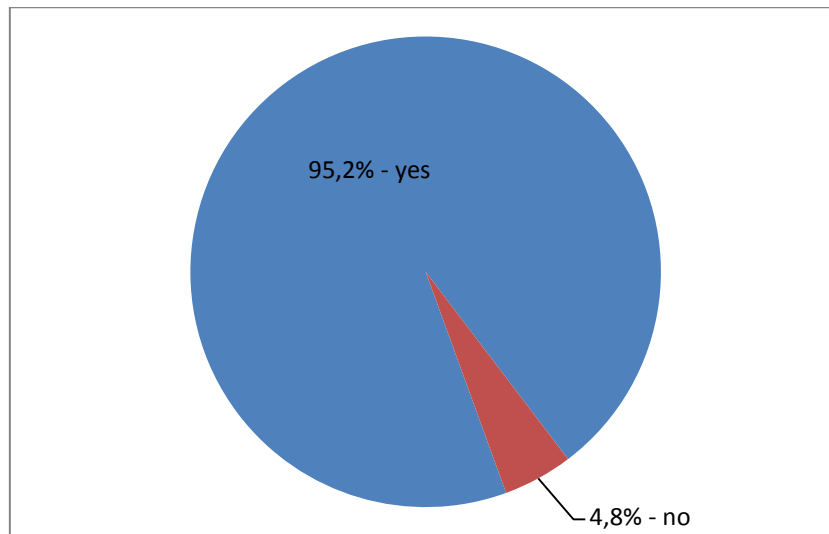
Figure 27 . The percentage of people evaluating interactive exhibits as easy to handle (question 4, 1 - understandable, 6 - incomprehensible) who claimed that the exhibition taught them something new (with a trend line)



The trend line on the chart declines with the uneasiness of handling the exhibits. The easier to handle the interactive exhibits are, the greater the number of people who declared that the exhibition taught them something new.

3.2.9. Would you recommend the exhibition in Humanitarium to your friends?

Figure 28. Distribution of answers to question „Would you recommend the exhibition in Humanitarium to your friends?“



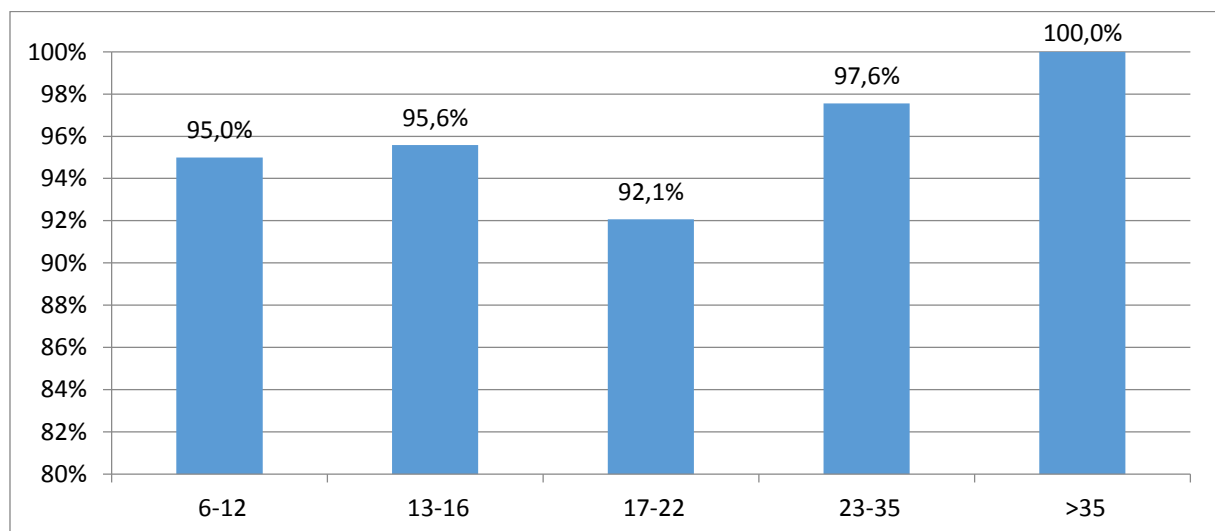
In this question, a total of 480 correctly answered questions were analyzed.

In absolute values, the results were as follows:

Answer	Yes	No
Number of answers	457	23

The majority of respondents (95,2%) would recommend the exhibition to their friends. Noteworthy is the fact that out of 80 respondents, who in previous question claimed that they didn't learn anything new, 69 would recommend the exhibition to their friends.

Figure 29. The number of respondents from different age groups that would recommend the exhibition in Humanitarium to their friends



100% of respondents aged over 35 would recommend the exhibition to their friends. In other age groups the results were similar and they varied from 92,1% in age group of 17-22 to 97,6% in age group of 23-35.

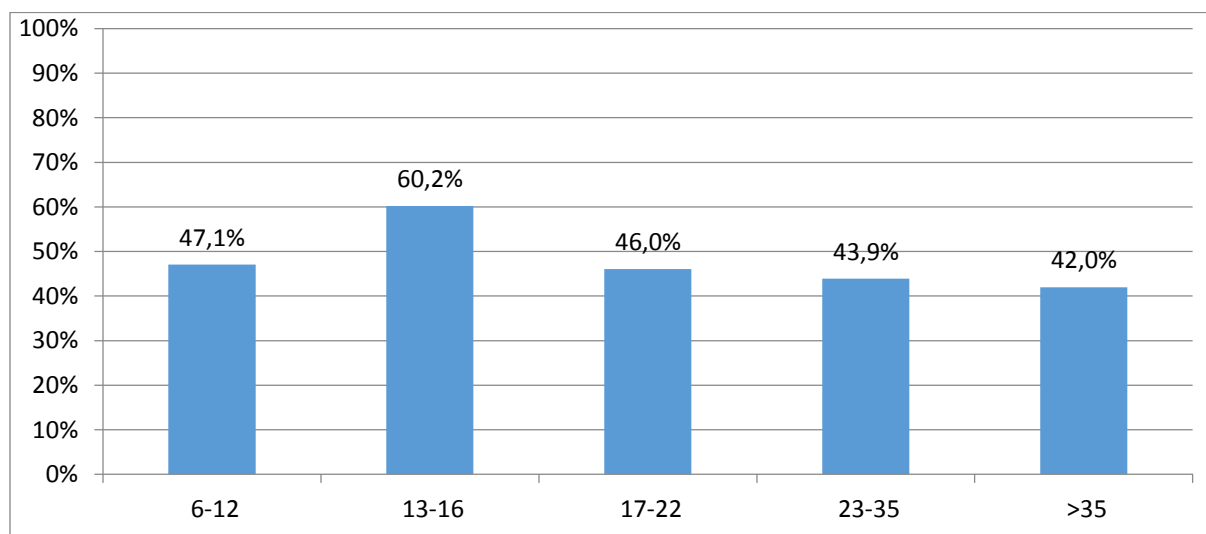
Analyzing those results taking gender into consideration, 96,5% of women and 93,7% of men would recommend the exhibition to their friends.

100% of students, employees and self-employed respondents and said that they would recommend the exhibition to their friends, whereas 94,4% of pupils and 95,8% of teachers would recommend the exhibition in Humanitarium to their friends.

3.2.10. What, in your opinion, should be improved on the exhibition?

In this question, a total of 246 correctly answered questions were analyzed.

Figure 30. Participation of respondents from different age groups answering to question number 10



Most often respondents aged 13-16 – 60,2% and 6-12 – 47,1% answered this question. The least frequent answers were given by respondents aged over 35 - 42,0% and 23-35 – 43,9%.

Among all men who participated in the survey 50,9% responded to question number 10.

Among all women who participated in the survey 50,4% responded to question number 10.

All responses were summarized in three groups: negative observations (respondents defined deficiencies, which they saw on the exhibition), proposals for change (respondents submit proposals for changes in the organization of the exhibition) and opinions (respondents gave their opinions without specifying it).

The following table presents the respondents' answers in groups named according to the most common phrases/terms used in the questionnaires.

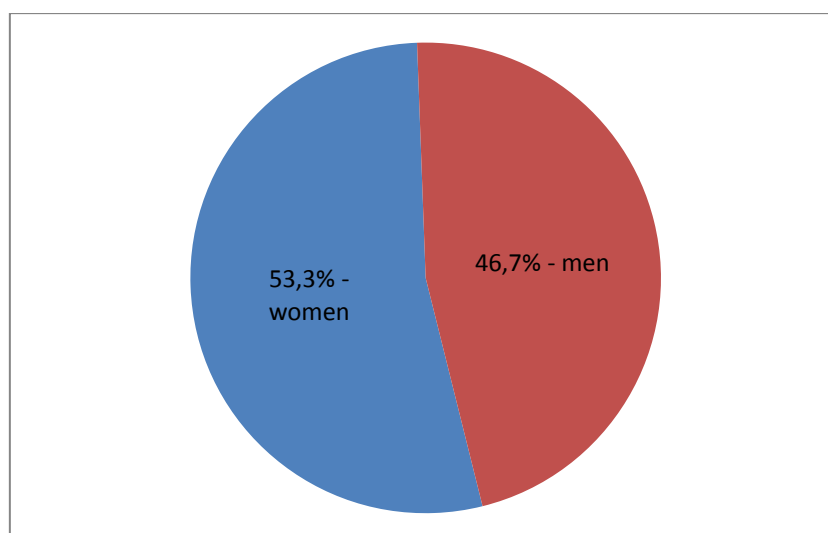
Table 5. Summary of responses to the question „What should be improved on the exhibition in Humanitarium?”

Negative observations		Number of answers
	Broken exhibits	24
	Too much noise, the animators are hardly heard	20
	Poor organization of time	3
	Not enough pencils	3
	Too less advertising	1
Proposals for change		

	Bigger exhibition with more exhibits	32
	Animators should be heard better	20
	There should be more animators on the exhibition	17
	Mad house (optical labyrinth) should be more crooked	9
	The lighting and colours of the exhibition should be improved	3
	There should be more experiments	3
	There should be ceiling in Mad house	2
	There should be more places to sit	1
	More complicated phenomena should be presented	1
	There should be more information about the future of renewable energy sources and places that use RES as main source of energy	1
Opinions		
	nothing	138
	I don't know	6
	everything	1

3.2.11. Gender

Figure 31. The participation of women and men in question number 10



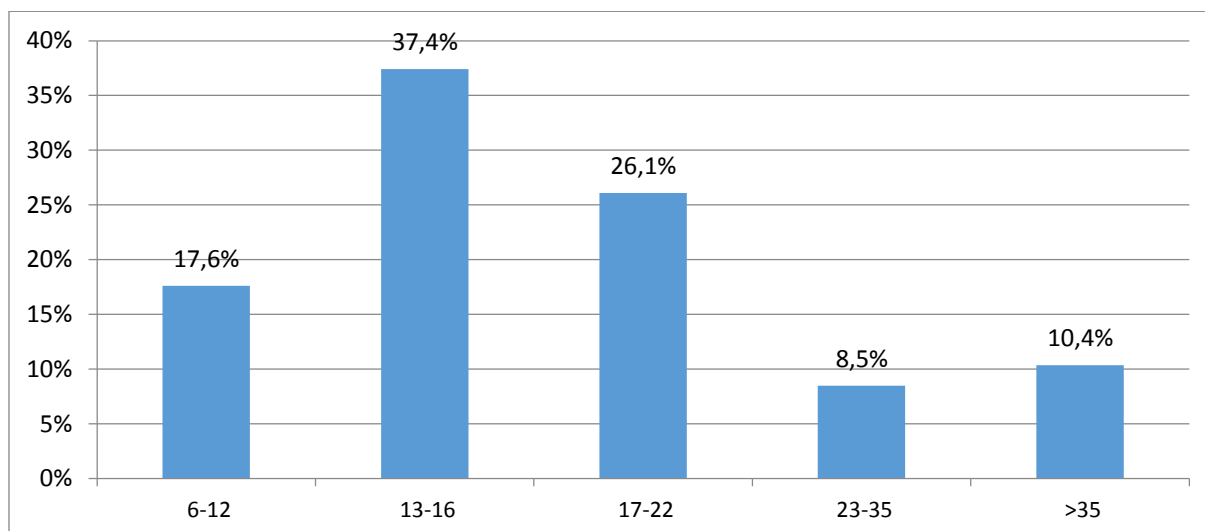
In this question, a total of 484 correctly answered questions were analyzed.

In absolute values, the results were as follows:

Answer	Women	Men
No of answers	258	226

3.2.12. Age range

Figure 32. Age structure of the respondents



In this question, a total of 483 correctly answered questions were analyzed.

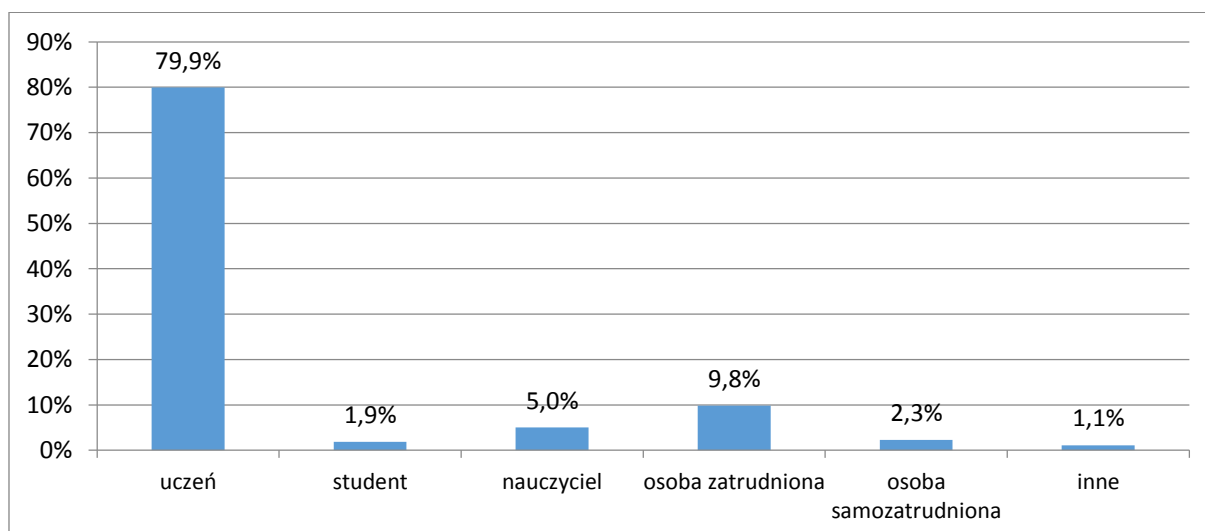
In absolute values, the results were as follows:

Age	6-12	13-16	17-22	23-35	>35
No of answers	85	181	126	41	50

Due to the organization of the exhibition, most of the people who took part in the survey were in the age group of under 22 - 81,1%. The largest group of people who took part in the survey were people aged 13-16 - 37,4%. Respondents aged over 23 years made 18,9% of all the people who took part in the survey.

3.2.13. Occupation

Figures 33. Occupational structure of respondents



In this question a total of 478 correctly answered questions were analyzed.

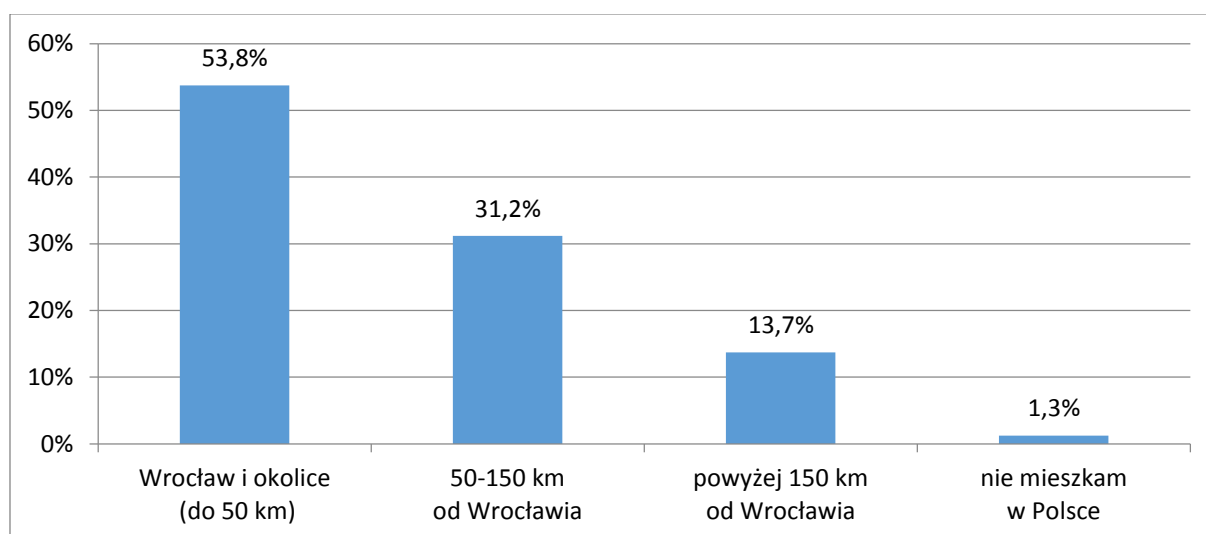
In absolute values the results were as follows:

Rate	Pupil	Student	Teacher	Employee	Self-employed	Other
Number of answers	382	9	24	47	11	5

79,9% of all people who took part in the survey were pupils. The share of other occupational groups fluctuated between 9,8% (self-employed) and 1,1% (other). The respondents can be also grouped into two main categories: learners – 81,8% (pupils and students) and working people – 18,2% (teachers, employees, self-employed and other).

3.2.14. Place of residence

Figure 34. Place of residence of the respondents



In this question, a total of 480 correctly answered questions were analyzed.

In absolute values the results were as follows:

Place of residence	Wrocław and direct neighborhood (up to 50 km)	50-150 km from Wrocław	Over 150 km from Wrocław	I don't live in Poland
Number of answers	258	150	66	6

The largest group of respondents were people from Wrocław and the neighborhood up to 150 km - 85.0%, out of which 63.2% were guests from Wrocław and the direct neighborhood up to 50 km, and 36.8% from areas located 50 to 150 km from Wrocław.

The distance from the place of residence to the exhibition also influenced the age structure of the visitors. This is especially visible in the group of 6-12 years. Among the visitors from Wrocław and the surrounding area, these respondents accounted for 22.8%. In the group of 50-150 km from Wrocław they were only 10.0%. The proportion of the remaining 13 to 22 year-olds is different. Among the visitors from Wrocław and the surrounding area they were 54.7%, and in the case of visitors from more distant places (50-150 km) 78.0%.

3.2.15. Please share other comments

In this question, a total of 108 correctly answered questions were analyzed.

They can be sorted in the following groups according to the most common terms used by the respondents in the questionnaires:

Table 6. Summary of responses to question number 15

Groups of answers	Number of answers
No comment	37
It was a great experience	37
Repetition of information about the most attractive element of the exhibition	6
Nice and customer oriented exhibition staff	6
Some of the exhibits didn't work properly	5
There should be more exhibits	5
Not enough animators to help	4
Comment on the questionnaire	3
The exhibition is uninteresting for older visitors	1
It's boring during the break between laboratories and workshops	1
I couldn't eat the pickle after the experiment even though it smelled so nice	1
The areas in front of the Humanitarium building should be developed	1

Most of the above comments were positive. Only a few answers were negative and they referred to broken exhibits and too few animators on the exhibition.

4. Summary of the questionnaire results

The analysis of the survey clearly indicates that the respondents rated the exhibition at a very high level. All of the evaluated elements of the exhibition (interactive exhibits, workshops, laboratories and multimedia applications) were highly classified (percentage of positive scores: workshops - 96.9%, laboratory - 95.9%, interactive exhibits - 94.5% and multimedia applications - 87.8%). In individual age groups, those figures ranged from 100.0% (workshops in the age group 6-12 years and laboratory in the age group over 35 years) to 85.1% (multimedia applications in the 17-22 age group). The "not appealing at all" answers were negligible (laboratory - 0.5%, workshops - 0.7%, interactive exhibits - 0.7% and multimedia applications - 3.6%). 83.2% of respondents said that they learned something new after visiting the exhibition. 95.2% of respondents would recommend exhibition to their friends, which indicates the attractiveness of the project's elements.

Other, more detailed elements of the exhibition were also highly rated:

- Descriptions of the interactive exhibits were assessed as „understood” by 88,2% of the respondents (marks 1 to 3 on a six-point scale).
- User-friendliness of the interactive exhibits was also rated very high – 93,8% of respondents claimed that it was user-friendly (marks 1 to 3 on a six-point scale).
- Intelligibility of educational materials was also rated very high – 94,4% of respondents claimed that the materials were easy to understand (marks 1 to 3 on a six-point scale).

A summary assessment of the elements of the exhibition can be one of the answers to question number 10 in the questionnaire „What would you improve on the exhibition?“ - 56,1% of the answers was „nothing“.

On the other hand, one should keep in mind that:

- 11,8% of the respondents claimed that the descriptions of the interactive exhibits were „hard to understand“ (marks 4 to 6 in a six-point scale). In particular age groups the ratings were as follows : 6-12 age group - 21.0%, , 13-16 age group - 12.3% and - 17-22 age group - 9.0%.
- 6.2% of respondents reported difficulties in handling the exhibits (marks 4 to 6 on a six-point scale). In particular age groups the ratings were as follows: 6-12 age group - 7.2%, 13-16 age group - 7.3%, and 17-22 age group - 4.0%.
- 5.6% of respondents had some problems with understanding educational materials (marks 4 to 6 on a six-point scale). The highest number of problems was reported by respondents aged 6-12 years - 9.7%. In the other youth groups, the proportion of people reporting this problem was as follows: 6.7% in 13-16 and 4.0% in 17-22.

The responses in descriptive parts of the questionnaire included criticism of the elements of the exhibition:

- broken exhibits,
- bad acoustics – too much noise, the animators are hardly heard,
- too few animators to help on the exhibition,
- poor organization of time breaks between laboratories and workshops,
- the area in front of Humanitarium is not developed,
- too little advertising,
- not enough seats on the exhibition,
- not enough pens.

Proposals for changes in the organization of the exhibition:

- bigger exhibition with more exhibits,
- animators should be heard better,
- there should be more animators on the exhibition,
- mad house (optical labyrinth) should be more crooked,
- the lighting and colours of the exhibition should be improved,
- there should be more experiments,
- there should be ceiling in Mad house,
- there should be more places to sit,
- more complicated phenomena should be presented,
- there should be more information about the future of renewable energy sources and places that use RES as main source of energy,

The assessment of the exhibition would be incomplete if it were not for an attempt to answer the question of whether and to what extent knowledge of the visitors had broadened after visiting the exhibition. The questionnaires provide answer to this question. 83.2% of respondents stated that the exhibition taught them something new. In particular age groups the division looked as follows: over 35 years - 94.0%, 23-35 age group - 92.5%, 6-12 age group - 92.9%, 13-16 age group - 83.3%,

and 69.6% for age group 17-22. This gradual decline in the number of people who learnt something new was explained by the respondents themselves, saying that "it was at school" or "I already knew that". It should be also noted that regardless of how the respondents assessed their knowledge of renewable energy sources before visiting the exhibition, after seeing it, they stated that their knowledge has broadened.

Analysis of the answers to questions 3 and 4 in comparison to question number 8 shows some dependencies. The more understandable were the descriptions of the exhibits (question 3), the more often they stated that they learned something new (question 8). Similar situation can be seen when it comes to interactive exhibits (question 4). The easier they were to handle, the more often the respondents stated that they had learned something new.

5. Conclusions and recommendations

The collected data in the survey indicates that responders rated high or very high all elements of the exhibition, both in terms of organization and in terms of acquiring new knowledge on renewable energy sources. Criticisms and negative ratings of the elements of the exhibition are relatively low. Project participants' comments about the insufficient number of pens to fill questionnaire forms were quite common.

Respondents also drew attention to the following organizational disadvantages: broken interactive exhibits, insufficient number of animators to help, insufficient number of chairs on the exhibition and poor organization of breaks between seeing the exhibition with an animator, workshops and laboratories.

The attractiveness of the exhibition decreased gradually according to the age of respondents (in age range from 6 to 22 years). Therefore, the exhibition should include more complex and difficult exhibits and tasks for older groups.

The above problem was frequently reported by responders in the questionnaires in form of comments about need to extend the exhibition, both in terms of the number of exhibits, and the total area of the building. Project participants also pointed out that the green area around Humanitarium building should be more developed.

The most frequently mentioned critical comments concerned the broken exhibits. As the exhibition is interactive, all the exhibits can be used by the visitors (hands-on experience). This fact, unfortunately causes the risk of breaking the some of the elements of the exhibits. Therefore, it is necessary to organize a better system of checking the condition of the exhibits. The group leaders (animators) should pay particular attention to the efficiency of the exhibits during the presentation and, depending on the problem, remove the obstacles themselves, or report the damage immediately after the tour. Technical staff should fix the reported problems immediately, and only in case of major failures do the maintenance after Humanitarium's working hours, when the exhibition is closed for the guests. In addition to regular controls of the technical condition of the exhibits, more detailed technical check-ups should be introduced after the exhibition opening hours. Taking such steps could prevent the damage of the exhibits during the tours.

The respondents also pointed out a few organizational shortcomings. First of all, the noise on the exhibition was mentioned. Another disadvantage reported by the visitors was not sufficient number of the staff on the exhibition and poor organization of time between workshops and laboratories. To avoid such shortcomings in the future, there should be more exhibition staff available for the visitors. It would be an advantage if they were equipped with a microphone, so they could be heard better by the guests. The groups of visitors should be also smaller and they should be provided with some additional hand-on experiments to shorten the breaks between laboratories and workshops. Those few organizational changes would definitely lead to a better customer service and as a result less complaints or negative comments.

Many of the comments in the questionnaires directly or indirectly referred to the condition of exhibition premises. There were suggestions, such as: to improve the decoration, lighting or noise in the object. However, most comments concerned the need to expand the exhibition. Respondents repeatedly pointed out the need to increase the number of exhibits, laboratories and workshops. Some of the responders suggested introducing hands-on stands with more advanced experiments. This, however would be only possible if new, independent educational paths for younger and older visitors were introduced, which again is related to the enlargement of the exhibition premises.

However, comments found in the questionnaires concerned not only the exhibition itself, but also other parts of the Humanitarium's building. For example, respondents made critical comments on the space designed for people waiting to enter the exhibition. They reported that Humanitarium's hall is too small and it has too few places to sit. The accumulation of visitors (groups waiting to enter the exhibition and those who are leaving the exhibition) cause a lot of congestion and noise in the hall which annoy the visitors.

It would be necessary to build a few rooms, which on the one hand could be used as waiting space for those who want to visit the exhibition, and on the other hand as a place where teachers, after visiting Humanitarium, could summarize and systematize knowledge gained on the exhibition. Then, the hall would be used only for a relatively short time and it would not cause any congestion or noise.

Another aspect commented in the questionnaires was the surrounding of Humanitarium's building. It is worth considering whether it would be possible to arrange the green areas in such a way that could be used for educational purposes. The green areas that surround the Humanitarium's building could be used to create additional educational paths to broaden the exhibition.

Another problem is the location of Humanitarium. Although the building is surrounded by beautiful, quiet green areas, it is located on the outskirts of Wroclaw which has a poor local communication system. That fact causes problems for individual guests, who frequently mentioned problems with getting to see the exhibition. The solution could be to move Humanitarium to the city center. It is highly probable that this change would significantly affect the number of individual guests.