

ASTRONOMY EVENTS AT ASCHAFFENBURG UNIVERSITY TO ATTRACT FUTURE STUDENTS

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ABSTRACT. In 2023, the German Federal Ministry of Education and Research and the German organisation for science communication “Wissenschaft im Dialog” jointly proclaimed a “Science Year 2023” in Germany with the motto “Our Universe”. One of the numerous events that have been supported has been that of the project “Zirkus UNI-versum”, which took place in summer 2023 at Aschaffenburg University of Applied Sciences. This project, and other activities for schools, intend to stimulate the interest of pupils in STEM subjects and to attract future engineering students.

KEYWORDS: Astronomy, education, STEM, lecture, planetarium, rocket propulsion, career orientation.

1. INTRODUCTION

In 2023, the German Federal Ministry of Education and Research (BMBF) and the German organisation for science communication “Wissenschaft im Dialog” (German for: Science in dialogue) jointly proclaimed a “Science Year 2023” with the motto “Our Universe” [1]. In the “Science Year 2023”, people in Germany from science, politics, and society looked from Earth into space and back to Earth again from a variety of perspectives. From exhibitions to school activities to participation opportunities: the “Science Year 2023” invited young and old to an exciting exchange with science and research. One of the numerous events that have been supported has been the project “Zirkus UNI-versum” (in English: “Circus UNI-verse”), which took place in summer 2023 at TH Aschaffenburg – University of Applied Sciences. The logo of the project is shown in Figure 1.

“Wissenschaft im Dialog” (WiD) is a non-profit company in Germany, based in Berlin, that was founded in 2000 by the leading German science organisations. WiD receives significant support from the Federal Ministry of Education and Research. “Wissenschaft im Dialog” is committed to discussion and exchange about research in Germany and implements cross-organisational communication. Thereby, it organises dialogue events, exhibitions or competitions and develops new formats for science communication. The goal that the scientific organisations are pursuing with the joint initiative is to strengthen the dialogue between science and society, including controversial research topics [2].

2. THE EVENT “ZIRKUS UNI-VERSUM”

2.1. ASTRONOMY LECTURE AND STAR SHOW

On a hot summer day in 2023, two school classes from the local high school “Kronberg-Gymnasium” visit the Campus of the TH Aschaffenburg – University of Applied Sciences, for the astronomy event “Zirkus



FIGURE 1. Logo of the project “Zirkus UNI-versum”.

UNI-versum”. After a warm welcome, they proceed to the large university lecture hall. Here they can not only see the lecture hall and take a seat in the audience, but also experience an astronomy lecture. A real professor addresses them and presents knowledge about the stars and the movement of the earth and the other planets around the sun and through our milky way. In addition, the pupils are not just listening, but they have the opportunity to become part of this interactive event (see Figure 2). During the lecture, they are integrated into a question-and-answer session on who wants to be an astronaut and who is the fastest person of the world.

The interactive format of the lecture shows positive feedback from the pupils to the topic of astronomy and space travel. Although most of them don’t want to become an astronaut, they learn that we all are astronauts already as we are travelling through the universe in our “star-ship” Earth. Most people are fascinated by the view of the stars in the night sky and are keen to understand better what can be seen there. During the lecture, they see and understand



FIGURE 2. School classes from the local high school “Kronberg-Gymnasium” experienced an interactive astronomy lecture.

that the star constellations on the sky are changing over the year as well as during the progression of the night due to the rapid rotation of the Earth. The earth moves much faster than the fastest man in the world can run. The haven of tranquillity amidst the rotating starry sky is Polaris, the North Star. How to find its position on the sky has been the last content of the lecture. With good attention, the pupils has been well prepared for the following part of the event: the visit of a small indoor planetarium (see Figure 3).

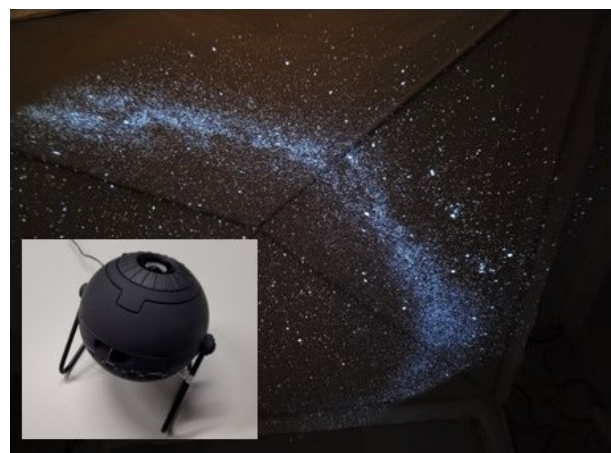
The visitors look at the starry sky with an indoor planetarium. A pavilion set up in the lecture hall serves as a projection surface for the star projector. The projected stars orbit the North Star. The meaning of circumpolar constellations can be explained well in this way. The students can orientate themselves in the sky using familiar constellations and get to know new constellations (e.g. Big Dipper, Orion, Taurus, Leo, Cassiopeia).

2.2. ROCKET PROPULSION

After enjoying the meditatively quiet atmosphere in the planetarium tent, the pupils find more action and self-engagement during the next part of the programme. The question behind the following topic is how to move on in space for a closer look at astronomical objects. Satellites, space telescopes and spacecrafts are important tools for astrophysicists. Propulsion in absence of gravity and in vacuum is different from our usual concepts to move which work well on earth, such as walking, driving or swimming. None of them works in space, therefore rocket propulsion is used. This topic is closely connected to the research on catalysts for satellite propulsion, which takes place at Aschaffenburg University. The main idea of these investigations is explained to the students through a short poster presentation. Catalysts in the rocket engines convert hydrogen peroxide into the hot gases oxygen and water vapour. These are emitted through a blast pipe and thereby provide the thrust [3].



(A). In a tent inside the lecture hall, the professor invites pupils to the planetarium show.



(B). By means of a projector, many stars and the milky way appear on the canopy of the tent.

FIGURE 3. Impressions of the show in the indoor planetarium.

To get their own experience with rocket propulsion, the pupils are equipped with rocket cars and after a short explanation, they start a rocket car race in the auditorium (see Figure 4). If the balloon is filled with air and it is ensured that the car is aligned in the right direction, the race can start. Whose car goes the furthest? The emotions run high and the rocket cars run far.

Afterwards, the fascinating principle of rocket propulsion is impressively demonstrated with the launch of a water rocket on the campus grounds. After the collective countdown, it reaches a height of almost eighty meters and thus rises higher than all the trees and buildings on the campus, as depicted here in Figure 5.

2.3. DISCOVERING OUR SOLAR SYSTEM

After the outdoor rocket experience, the pupils head back into the university building. In another room, an interactive exhibition of our solar system has been established, as shown in Figure 6. Planetary models are shown, and lots of information about the planets



(A). Rocket car with inflated balloon and blast pipe.



(B). Pupils starting a rocket car race in the lecture hall.

FIGURE 4. Impressions of the rocket car race.



FIGURE 5. Rocket launch on the campus grounds.



FIGURE 7. Astronaut posing in front of an ESO picture of the Orion nebula.



FIGURE 6. Exhibition of our solar system with flying planets and a motorised model of our solar system as well as movable walls with informative posters.

and other objects of our solar system can be found on different posters. In a quiz, the pupils can test their knowledge or fill in the information they obtained from the posters. The prospect of a small price (some chocolates with astronomical designation) gives additional motivation.

To take home more than just pictures in mind, the pupils get the possibility to take photographs of themselves in front of a huge picture of the Orion

nebula star-formation region as it is seen by an infrared camera of ESO's Very Large Telescope. In order to make the experience and the photo even more special, they can dress up as an astronaut, as shown here in Figure 7.

3. EXPERIENCE-ORIENTED MARKETING TO ATTRACT FUTURE STUDENTS

In this chapter, the activities at Aschaffenburg University are placed in a larger economic and social context.

3.1. SOCIETAL TRENDS IN STEM EDUCATION

In Germany, professionals in the so-called STEM occupations are in demand. However, the number of new students entering these fields has been steadily declining in the recent years, even more than the expected decline attributed to demographic effects (see Figure 8). According to the German Federal Statistical Office (Destatis 2024), in the academic year 2022, approximately 305 200 new students in Germany chose a STEM subject for their first semester, which was 0.6 percent less than in the previous year 2021 [4].

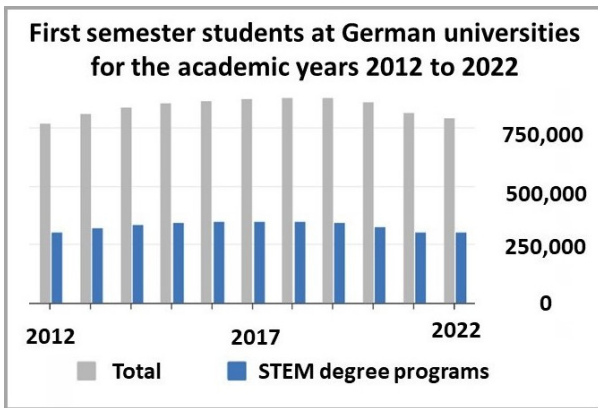


FIGURE 8. Number of first semester students for the years 2002 to 2022. This figure is based on a press release of the German Federal Statistical Office (Destatis 2024) [4].

Thereby, the number of new students in STEM subjects has been steadily declining since 2018 (see Figure 8). Despite promising job prospects, women still choose to study STEM subjects less frequently than males. However, the proportion of women among first-year students in the first semester in the STEM area has slightly increased – while it was 31 percent in 2002, it increased to 35 percent in 2022 [4].

The Bertelsmann Foundation asked young people in Germany about their prospects for their professional future [5]. These are the results of a survey commissioned by the foundation, for which they surveyed 1 666 young people nationwide. When it comes to finding the right career, only a quarter of young people are convinced that there is enough information about choosing a career and that it is easy to find your way around. In contrast, 53 percent of young people are overwhelmed by the information on offer [5] (Figure 9).

After all, slightly more than one out of three young people (36 percent) know “very well” or at least rather well” about their desired career (see Figure 10). Even some (14 percent) said that there was no study orientation at all at their school [5].

3.2. COUNTERMEASURES

To counteract this societal trend, career and study orientation has been established in the state of Bavaria as part of the school curriculum: “Career and study orientation” is anchored in the curriculum for general education and at secondary schools as a cross-curricular educational and developmental goal [6]. Additionally, in recent years, numerous initiatives and communication formats were developed in the school environment to make the future career paths and prospects transparent to students during their school years. Especially engineering programs face the challenge of conveying to students that professional potential extends beyond the sum of individual disciplinary teachings in school. Therefore, multidisciplinary experiences and a multi-perspective approach should also guide the

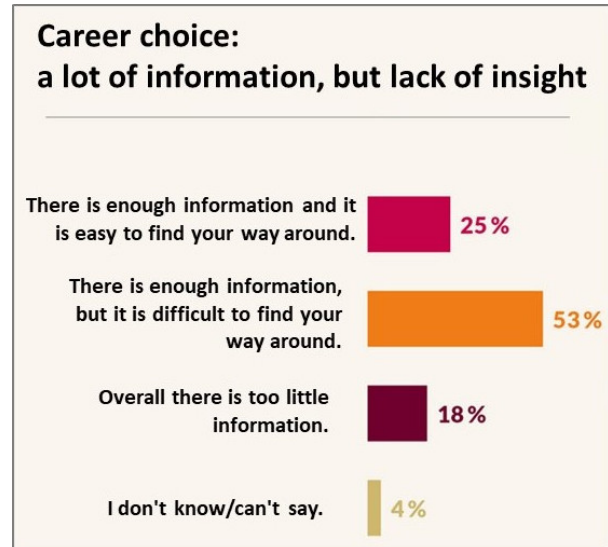


FIGURE 9. Statistics on information about the career choice. This figure is based on a report of the Bertelsmann Foundation [5].

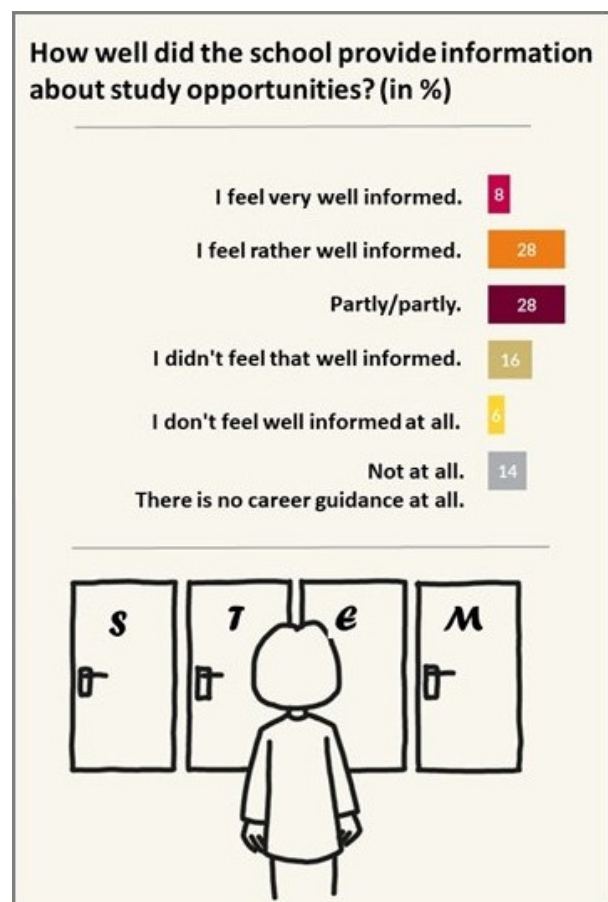


FIGURE 10. Statistics on information given by schools on study opportunities. This figure is based on a report of the Bertelsmann Foundation [5].

student outreach program for STEM promotion at Aschaffenburg University.

Thereby, especially students without an academic background – first-generation students for their families – can be engaged much better through positive practical experiences in the STEM field than through informational events, such as lectures or information fairs.

3.3. MARKETING APPROACH

The marketing approach from economy can also be applied to pupils decision to study STEM subjects, which, for students, represents just one choice among many other options. More fundamentally, pupils have the choice of pursuing a university degree or alternatively, a vocational training personally offers the greatest benefit. The declining numbers of STEM students indicate the need for a new advertising concept.

The purpose of advertising can be reduced to three essential influencing goals: information, timelines, and emotion [7]. The choice of which of these influencing goals to select is depending on the situation. However, it will be explained below why the influencing goal of emotion is gaining increasing relevance, especially for Experiential Marketing, and thus is crucial for the mentioned relationship with consumers. Smilansky ultimately describes the sum of perceptions as experience. The part of the brain responsible for interpreting the environment through the five senses would also be responsible for memories and experiences. This is the reason why consumers particularly remember moments that they have experienced using multiple senses simultaneously [8]. Consequently, all events and perceptions are linked to emotions. Depending on how strong this feeling is or how many senses it was experienced with, consumers remember these moments even years later.

As in saturated markets, it is challenging for customers to select the best product. In doing so, customers are open to helpful information, whether consciously or unconsciously, from which they can draw guidance. This situation is very similar to that of pupils who are facing a variety of information about different career prospects and are seeking orientation.

Providing this guidance for future students is the project “School Contacts” at Aschaffenburg University and, in particular, also the event “Zirkus UNI-versum”: It allows students to approach the answer to their question about their own career prospects while having fun. To achieve this, the concept of “Experience Modules” is developed, which allows pupils to experimentally and often playfully immerse themselves in the world of university with various themes: small laboratory experiments in which they participate, exciting topics in lecture format, or even campus games. All modules have one goal: to give pupils a sense of campus life and learning that they have not experienced before.

3.4. THE PROJECT “SCHOOL CONTACTS”

The communication concept at Aschaffenburg University enables a low-threshold engagement with scientific concepts and fosters a positive curiosity to pupils about the option of pursuing higher education for their own career paths. This is particularly important if universities also aim to reach first-generation students in rural areas. In collaboration with the school administrations of the eight elected partner schools of Aschaffenburg University, the questions of the upcoming student generation regarding their career orientation are addressed.

An important objective of the project “School Contacts” and also of the event “Zirkus UNI-versum” – besides the promotion of astrophysics – is the experience-based introduction of current student generations to the option of “studying” for their own career path. It focuses not only on individual pupils, but also on entire classes, preferably entire grade levels. Often, pupils do not know if they should dare to pursue a degree – and then decide against it without having experienced Aschaffenburg University from the inside. Moreover, it is not just the buildings, but also the people in the buildings: the professors, the scientific staff, and of course current students. The individual “Experience Modules” are age-appropriate and tailored to the target audience. They are offering something to everyone, regardless of their academic inclination. In addition, with this concept, more and more professors and other teaching staff who actually teach students are reaching out to the pupils. This creates not a facade, but an authentic impression that builds trust.

At Aschaffenburg University, in the “Experience Modules” of the project “School Contacts”, we show and discuss subject areas that are neglected in canonised school education – focused on “school subject knowledge” – and where the application relevance for pupils cannot be established well enough. This is the case with engineering disciplines where, for example, mathematics and physics are taught in school, but the pupils as a whole (except maybe in advanced courses) cannot experience the fascination that can arise from these disciplines. Moreover, the field of astronomy and the described project “Zirkus UNI-versum” are particularly suitable for sparking pupils’ fascination for future studies in the STEM area.

The experience is paramount here, according to the motto “experience studying in the region”. Aschaffenburg University is presented as an attractive place to be and to learn in a positive atmosphere. Therefore, pupils can plan their further education much more soundly: It is difficult to make a decision for or against something without knowing exactly what one is deciding for or against and what to expect. When schools engage particularly in career and study orientation in collaboration with Aschaffenburg University, they can access around ninety “Experience Modules” and other special formats for their pupils as selected partner schools. A close and regular exchange between

the school, pupils, and Aschaffenburg University is a central component of this program, setting it apart from other universities.

As mentioned above, by the astronomy event “Zirkus UNI-versum” a further perspective for a possible career in science is provided and the important role of astronomy for educational purposes is taken into account. Questions like those after the origin, development and border of the universe as well as the deep understanding of Dark Matter or Black Holes will never be solved completely. The scientific view of the world will never be completed but always proceed and develop through those who are working on it. Astronomy events for pupils can help to deliver them this insight [9].

4. CONCLUSION AND OUTLOOK

The “Science Year 2023 – Our Universe” has facilitated the project “Zirkus UNI-versum”, which took place in summer 2023 at Aschaffenburg University of Applied Sciences. Two school classes from the local high school “Kronberg-Gymnasium” experienced the astronomy event “Zirkus UNI-versum” on the campus of Aschaffenburg University. The successful event was repeated in summer 2024 with around 150 pupils as participants. They first participated in an interactive astronomy lecture given by a professor. An improvised circus tent in the darkened lecture hall served as the screen for the integrated planetarium star show, it felt like looking at real stars in the night sky. For their own exploration of the night-sky, the pupils obtained small cardboard star maps to assemble themselves as a homework, and some sweet “astronomical” gifts. Over the following summer evenings, they certainly will have observed the sky with a different perspective.

Another highlight was the rocket car race on the floor of the lecture hall and the exclusive launch of a water rocket on the campus grounds. After the collective countdown, the rocket reached a height of around eighty meters and thus rose higher than all the trees and buildings on the campus.

The astronomy event successfully presented Aschaffenburg University as an attractive local education facility. Pupils playfully immersed themselves into the world of astronomy and took home memories of an emotional and delighting as well as informative event on the university campus. Such events – and other activities for schools – intend to stimulate the interest of pupils in STEM subjects and to attract future engineering students.

ACKNOWLEDGEMENTS

The activities of the project “Zirkus UNI-versum” took place as part of the “Science Year 2023” with the motto “Our Universe” and were financially supported by the organisation “Wissenschaft im Dialog” and the German

Federal Ministry of Education and Research (BMBF). The authors want to thank Melanie Hartmann from the project “School Contacts” for the organisation of the event and Emma Waltersbacher from “Wissenschaft im Dialog” for her participation and her support. In addition, many thanks go to the supporting team at Aschaffenburg University.

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