

### 1 Fostering intellectual curiosity in children

Intellectual curiosity has been positively correlated with academic performance (0.20), together with general intelligence (0.35) and conscientiousness (0.20)<sup>[1]</sup>. It has also been linked to the scientific revolution<sup>[2]</sup>.

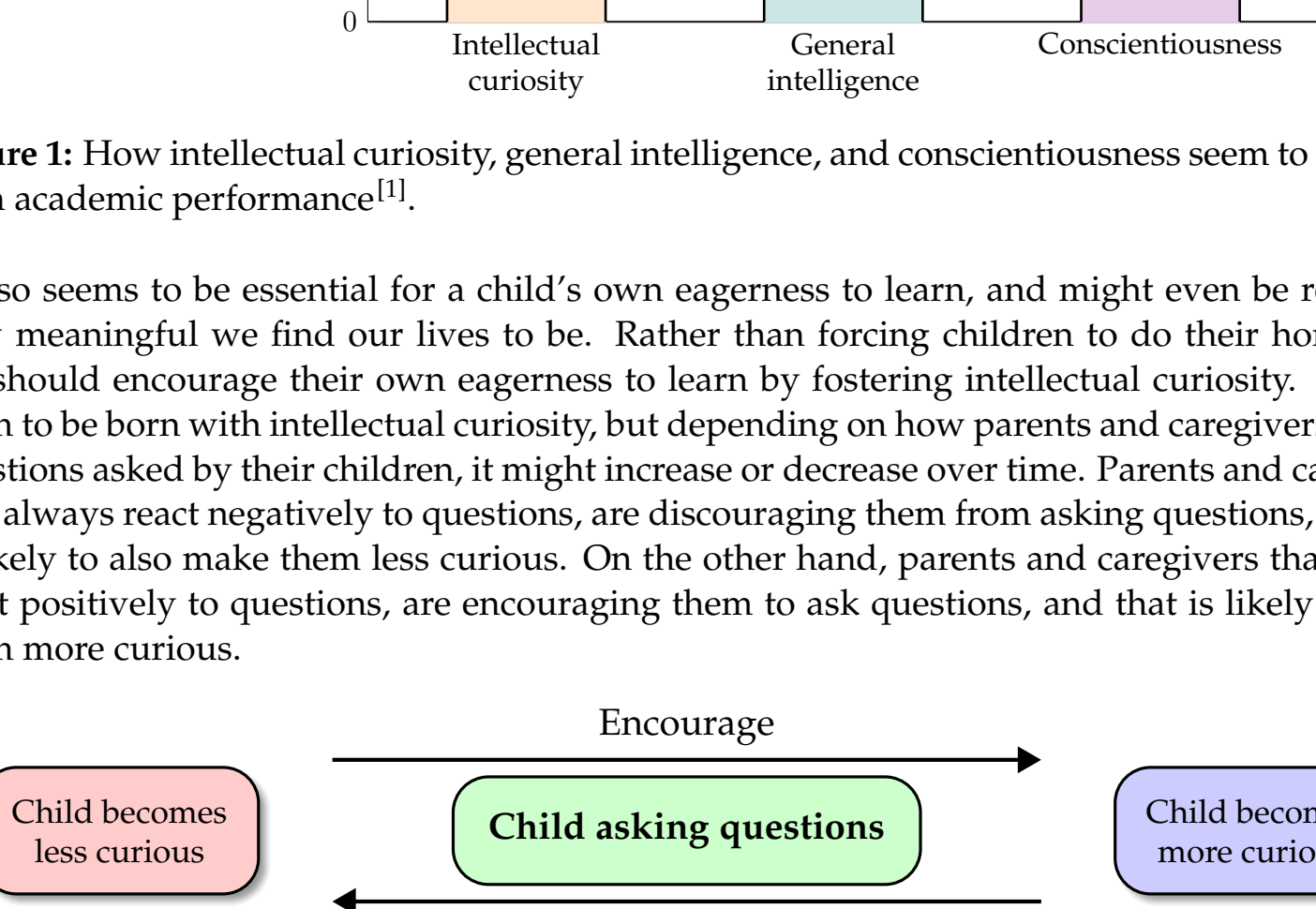


Figure 1: How intellectual curiosity, general intelligence, and conscientiousness seem to correlate with academic performance<sup>[1]</sup>.

It also seems to be essential for a child's own eagerness to learn, and might even be related to how meaningful we find our lives to be. Rather than forcing children to do their homework, we should encourage their own eagerness to learn by fostering intellectual curiosity. Humans seem to be born with intellectual curiosity, but depending on how parents and caregivers react to questions asked by their children, it might increase or decrease over time. Parents and caregivers that always react negatively to questions, are discouraging them from asking questions, and that is likely to also make them less curious. On the other hand, parents and caregivers that always react positively to questions, are encouraging them to ask questions, and that is likely to make them more curious.

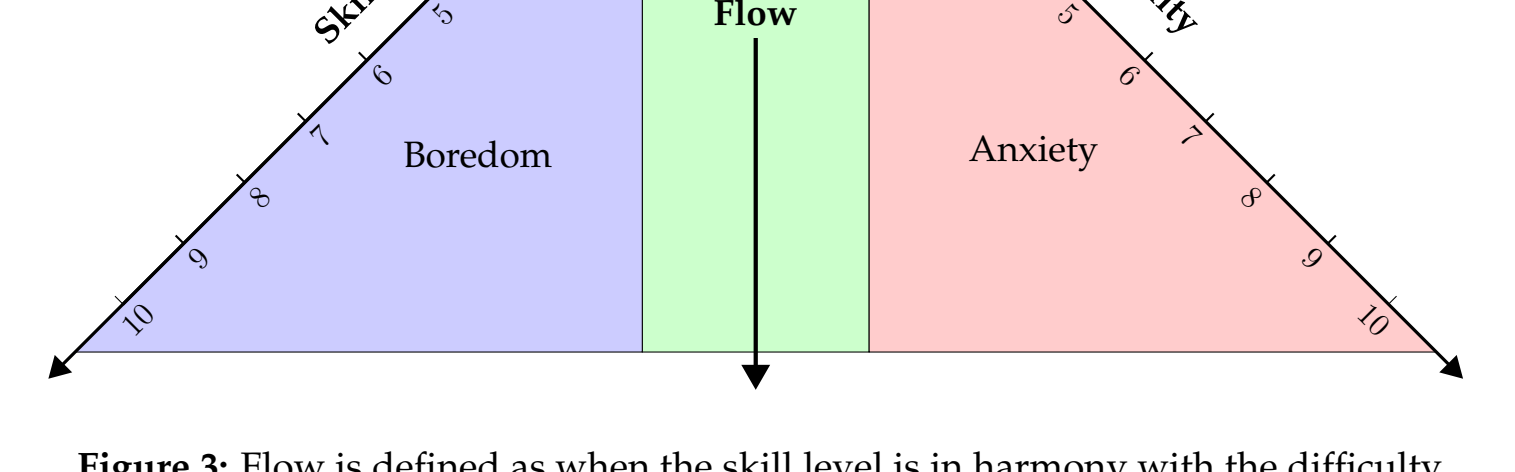


Figure 2: How parents and caregivers might influence the development of intellectual curiosity in children.

### 2 Children should learn at their own pace

Rather than forcing children to learn at the same pace, each student should be allowed to progress at its own pace. If students acquire a higher skill level than the difficulty of what they are supposed to learn, they tend to get bored and disturb other students. While if they don't have a sufficiently high skill level for what they are supposed to learn, they tend to become anxious and might give up on what they are supposed to learn. Ideally, the skill level should be in harmony with the difficulty of what they are supposed to learn. This has been defined by the psychologist Mihaly Csikszentmihalyi as flow<sup>[3]</sup>.

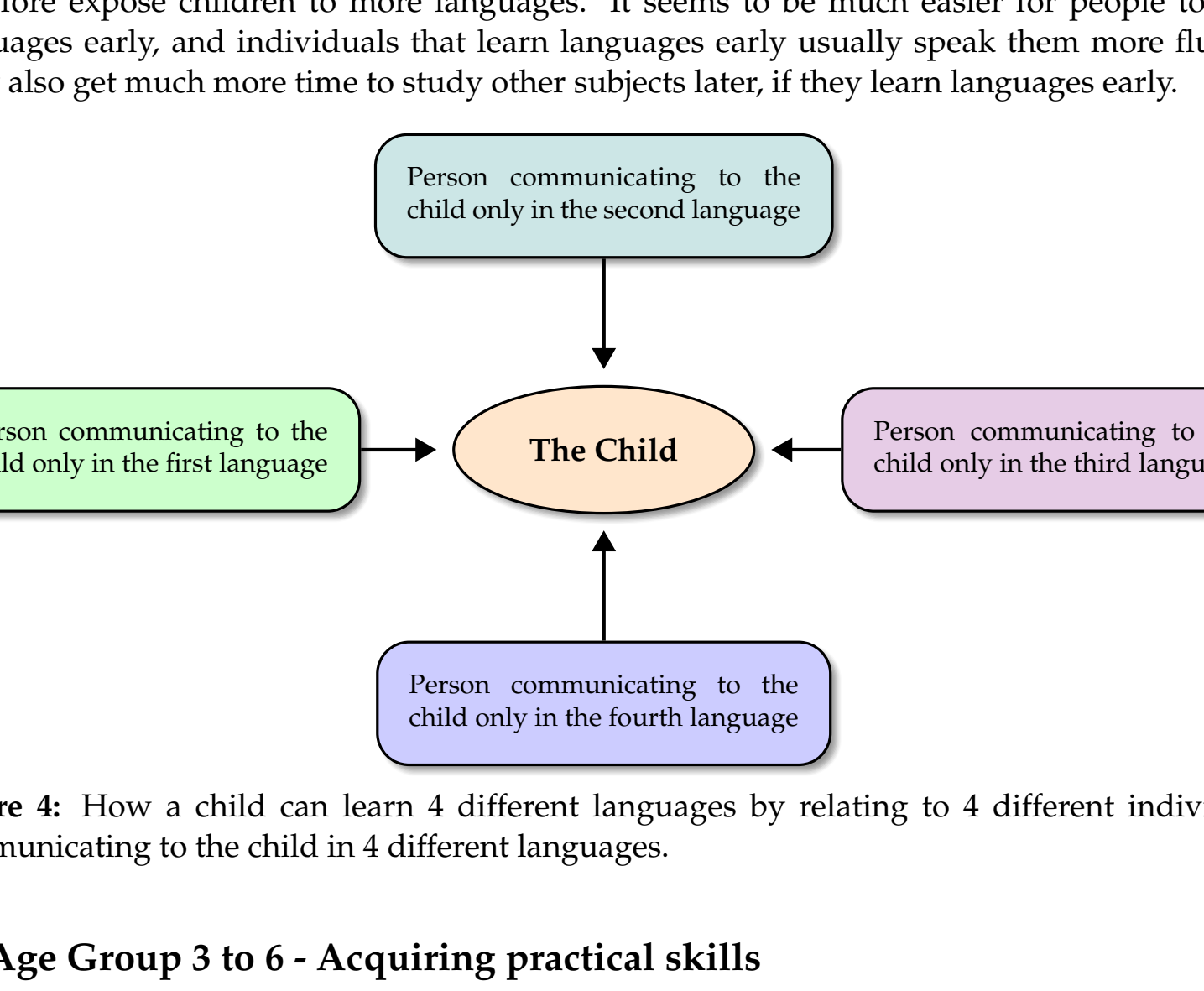


Figure 3: Flow is defined as when the skill level is in harmony with the difficulty.

### 3 Educating children in mixed age groups

By putting children into mixed age groups, each child gets the experience of being both the pupil during the beginning of a phase and the experience of being a guide for younger children towards the end of a phase. By being guides for younger children, they develop themselves to become more considerate and responsible, in a similar fashion to how older siblings often develop themselves to become more considerate and responsible. In this educational system we propose to put children into these mixed age groups:

0-3 years	Learning languages
3-6 years	Acquiring practical skills
6-9 years	Learning basic theories
9-12 years	Learning about exotic phenomena
12-15 years	Acquiring amicable social skills
15-18 years	Learning abstract theories
18-21 years	Reflecting on society

### 4 Age Group 0 to 3 - Learning languages

According to modern research, most babies can learn up to four languages if they are exposed to it in a proper manner<sup>[4,5]</sup>. Still, most monocultural babies of today grow up learning only one language; the mother tongue of their parents. Kindergartens and day care facilities should therefore expose children to more languages. It seems to be much easier for people to learn languages early, and individuals that learn languages early usually speak them more fluently. They also get much more time to study other subjects later, if they learn languages early.

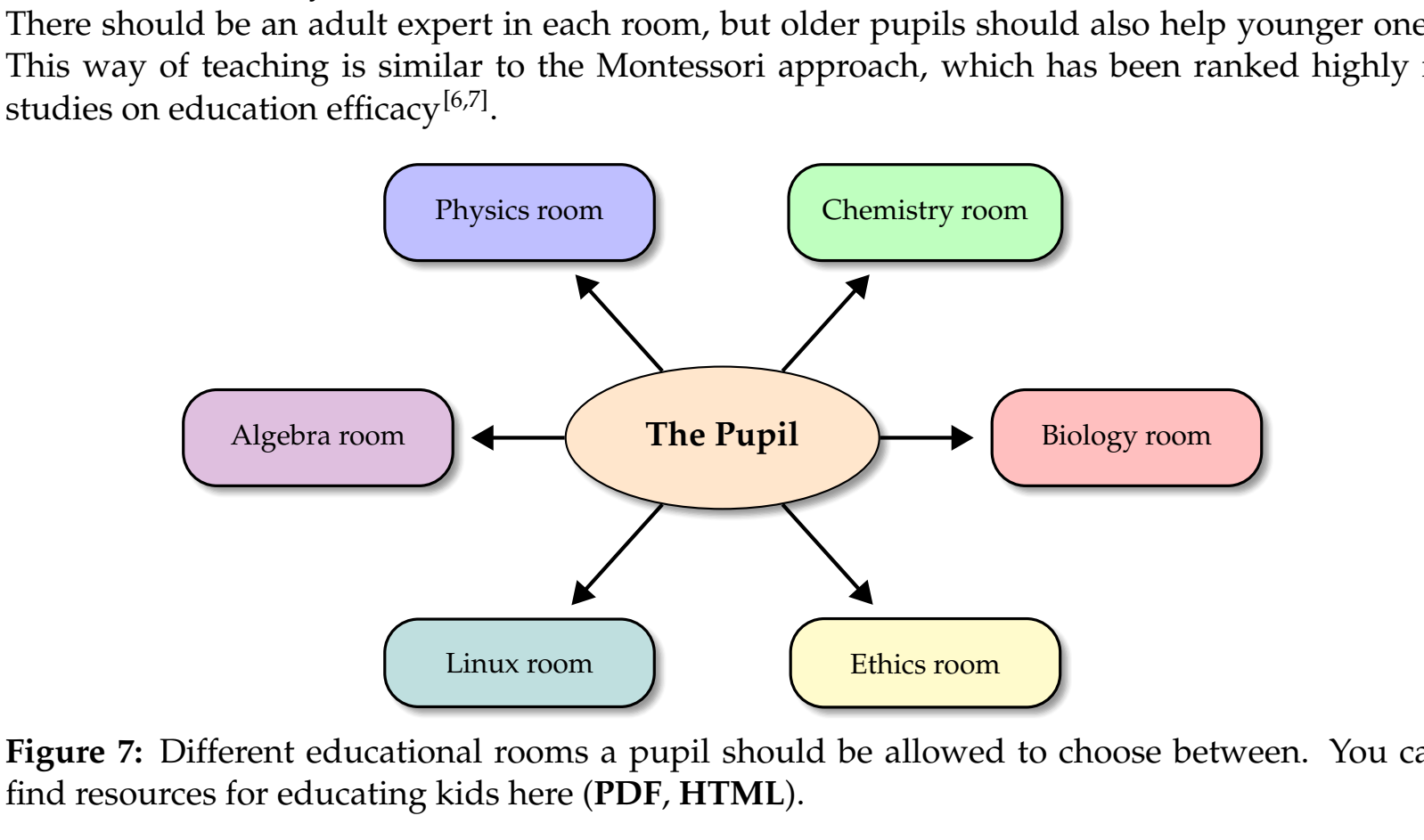


Figure 4: How a child can learn 4 different languages by relating to 4 different individuals communicating to the child in 4 different languages.

### 5 Age Group 3 to 6 - Acquiring practical skills

At this age, the child should acquire practical skills; such as counting, swimming, painting, and learning to read and write. They can also start to use tablets at this age, and should start to build molecules models with molecular building kits at this age, since it will be helpful for understanding chemistry later.

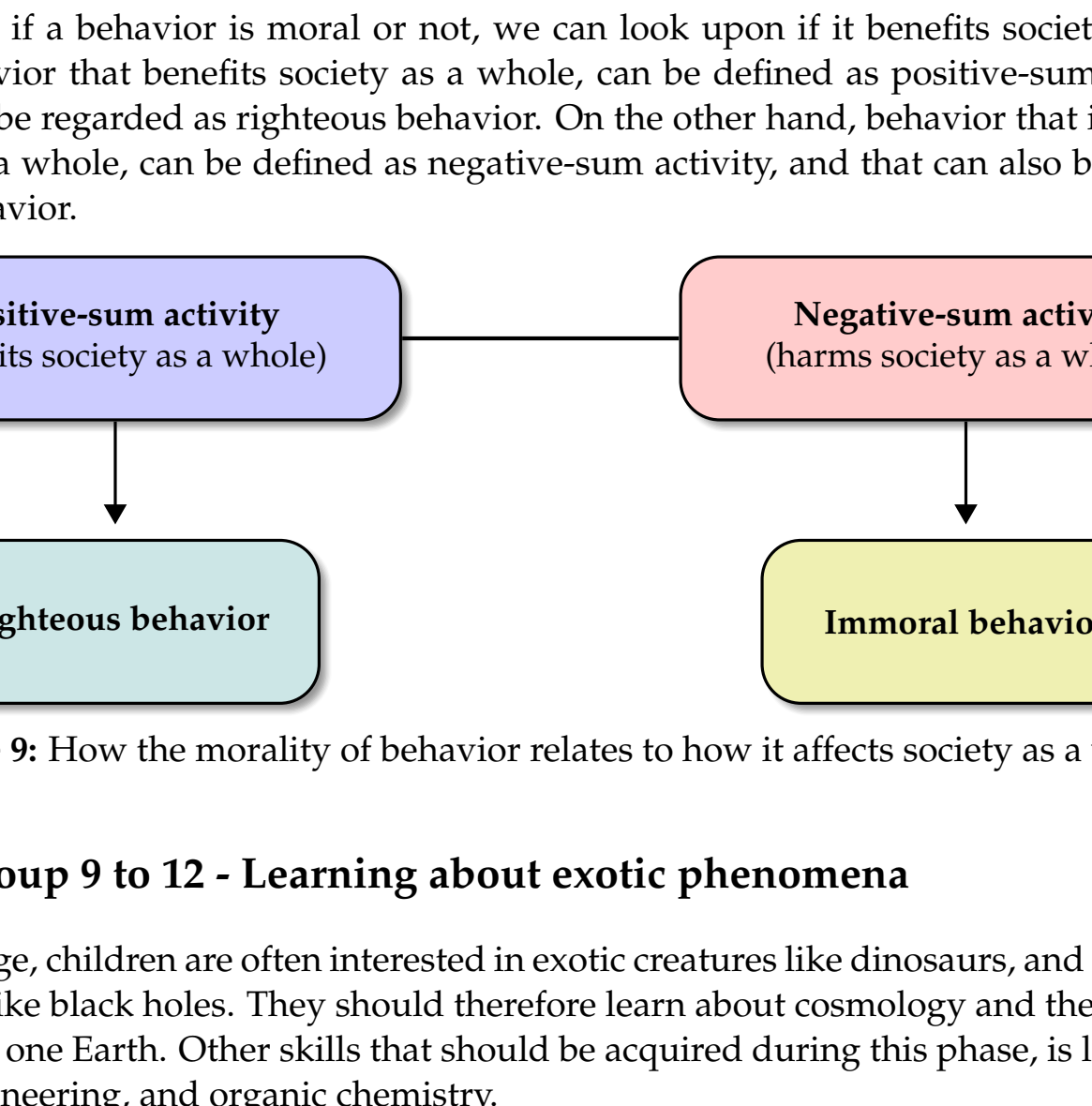
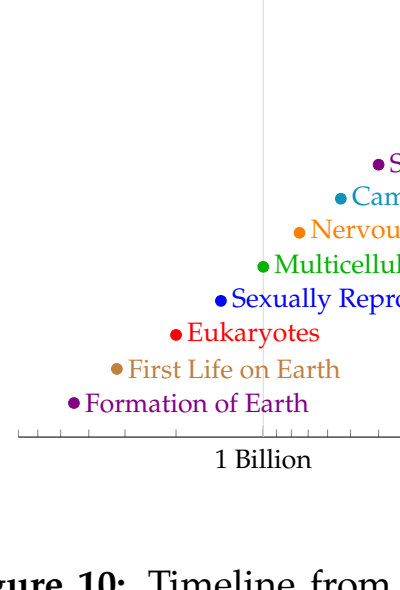


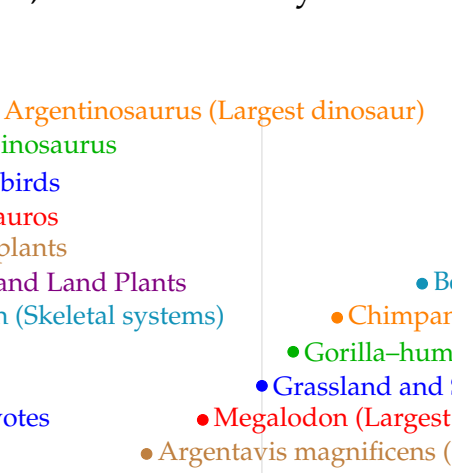
Figure 5: Different practical skills to acquire during the this phase.

#### 5.1 Building molecular models


**Assignment:** Build this medicinal molecule with the molecular building kit:



Aspirin



The child uses the molecular building kit to make aspirin



Teacher checks if structure is correct

If it is correct it is registered in database

**After finishing the course:**

- Diploma with all the medicinal molecules built with the molecular building kit.
- Photos of the child with the most complex models of the medicinal molecules built.

Figure 6: Children can start making the simplest models of medicinal molecules already when they are 3 years old. As they grow older, they should be able to make more and more complex models of medicinal compounds.

- Common Solvents, Acids and Bases (PDF, HTML)
- Simple Medicinal Molecules (PDF, HTML)
- Common Medicinal Molecules (PDF, HTML)
- Complex Medicinal Molecules (PDF, HTML)

### 6 Age Group 6 to 9 - Learning basic theories

The main objective of education should not be for the children to get good grades, but rather to foster an interest in learning. To promote an interest for learning, there should be different educational rooms. In these rooms, there should be fun games and experiments. These rooms should be open all the time, while the school is open. Pupils can choose themselves which room they want to go to, but they can only be 3 hours in a room before they need to change to a different room. They also need to have a minimum amount of hours in each room each week. There should be an adult expert in each room, but older pupils should also help younger ones. This way of teaching is similar to the Montessori approach, which has been ranked highly in studies on education efficacy<sup>[6,7]</sup>.

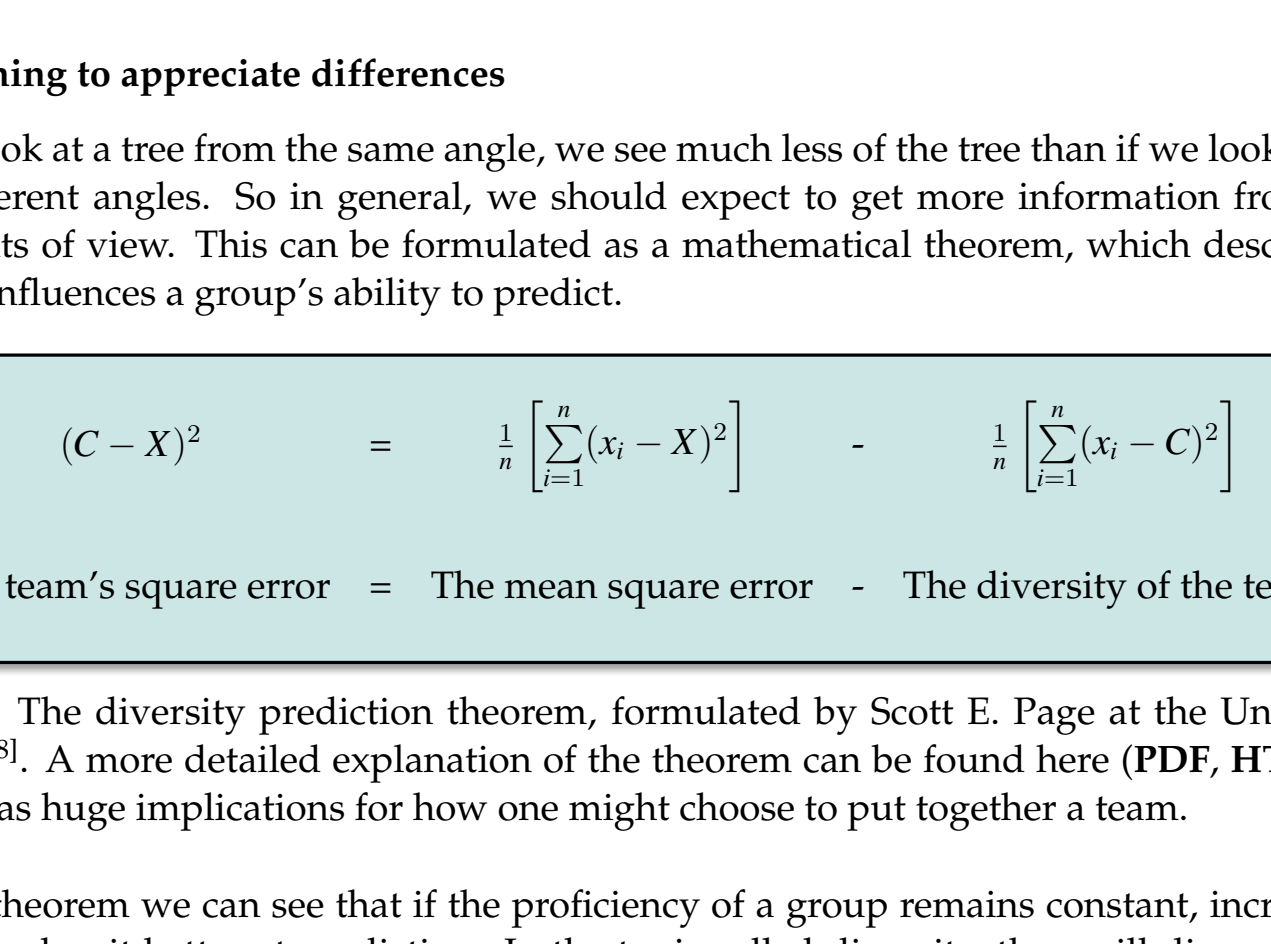


Figure 7: Different educational rooms a pupil should be allowed to choose between. You can find resources for educating kids here (PDF, HTML).

#### 6.1 The chemistry of halogens and alkali metals

In order to understand chemical reactivity, they should start with learning about the halogens and alkali metals. Read more about this here: (PDF, HTML)

#### 6.2 Learning to benefit society as a whole

Children should be thought basic ideas about morality from they are very young. Such as that stealing, lying and hurting other people is wrong. And to be helpful, respectful and cooperate with other people. Much of this can be based upon the idea that you should treat other people like you want them to treat yourself, and that if all of us follow this simple rule we can make our society better for all of us.

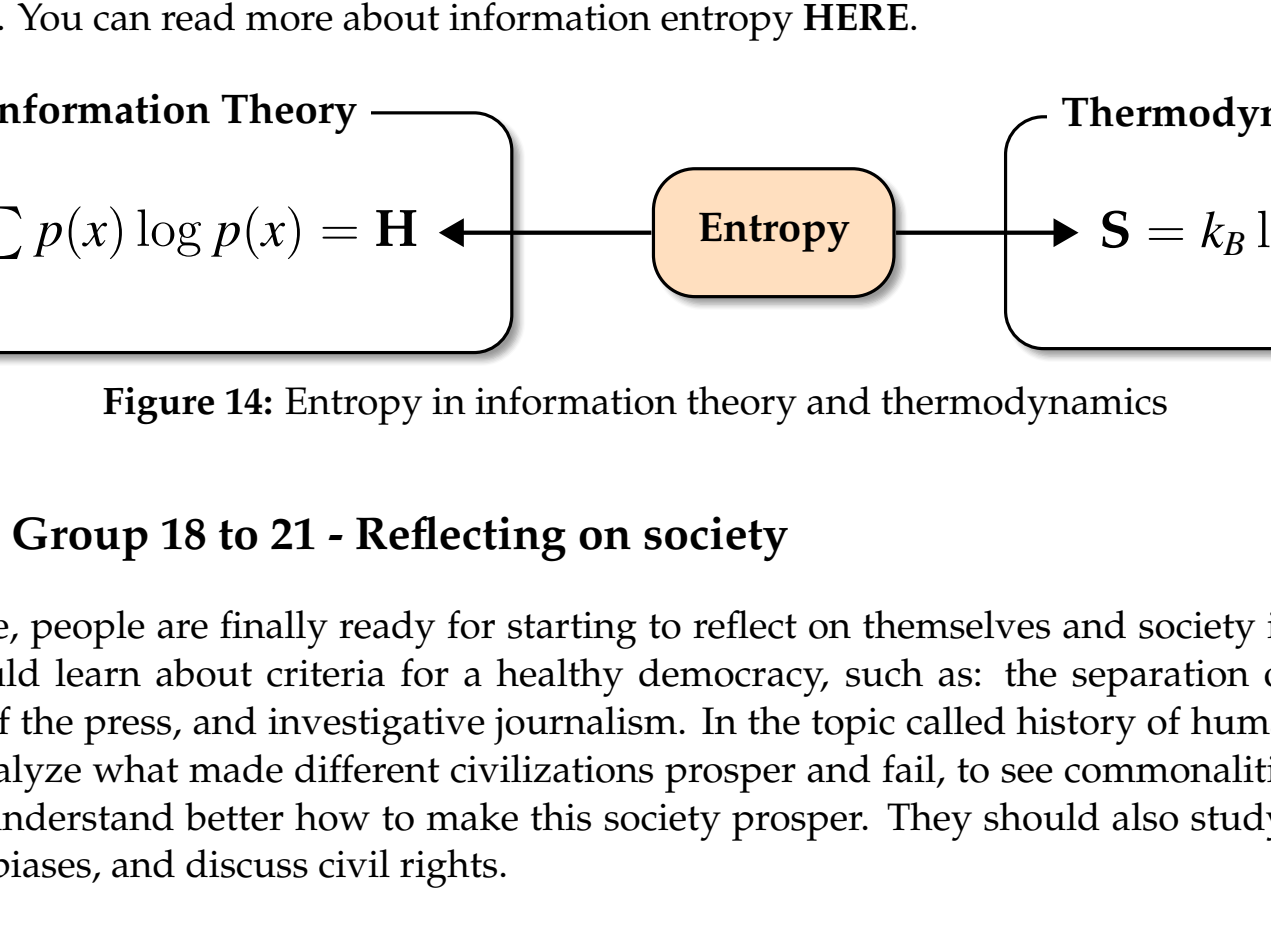


Figure 8: How we can make the world better for all of us if we all follow the law of reciprocity, or that we cannot expect other people to treat us well unless we show them the same courtesy.

To determine if a behavior is moral or not, we can look upon if it benefits society as a whole, or not. Behavior that benefits society as a whole, can be defined as positive-sum activity, and that can also be regarded as righteous behavior. On the other hand, behavior that is detrimental to society as a whole, can be defined as negative-sum activity, and that can also be regarded as immoral behavior.

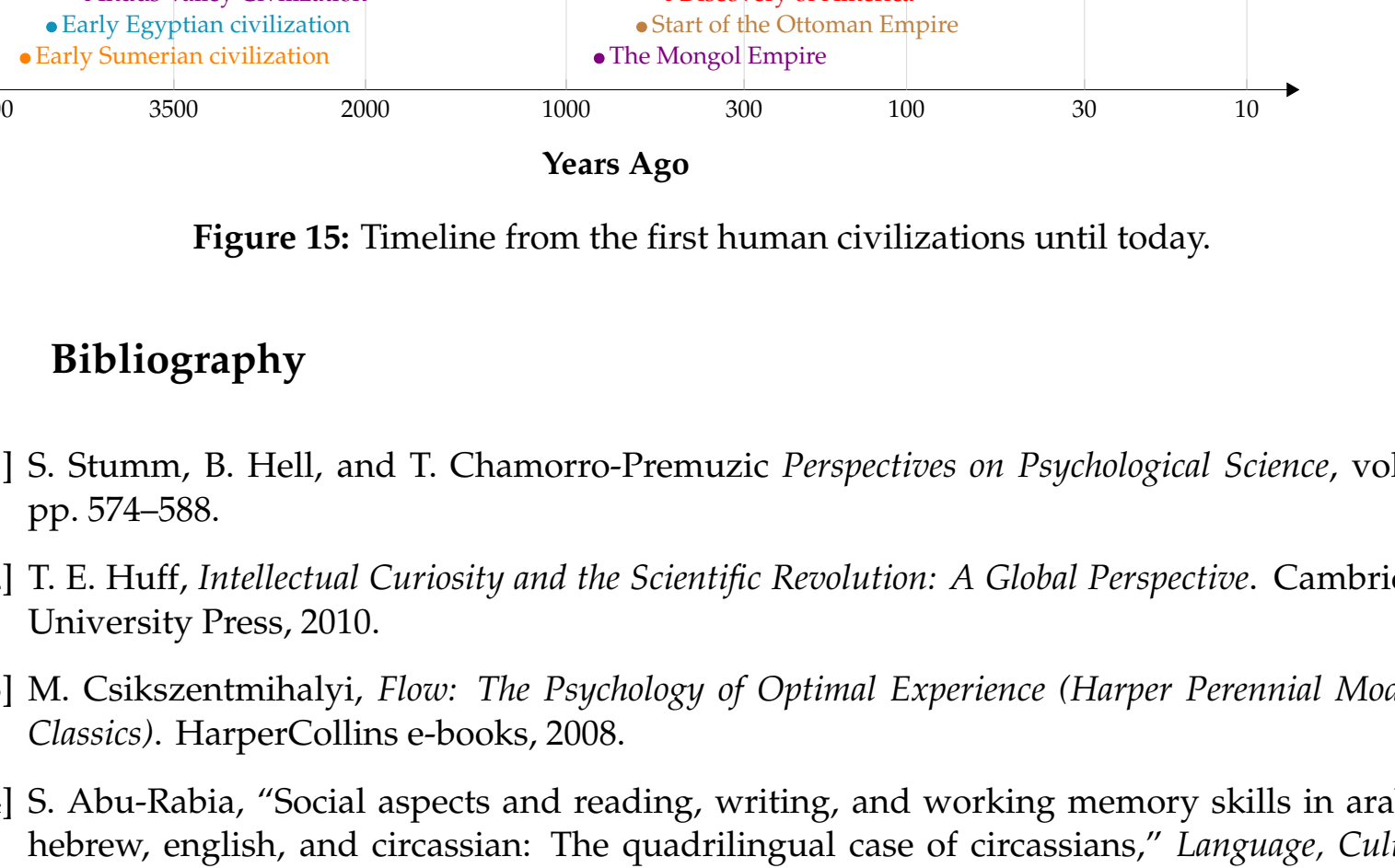


Figure 9: How the morality of behavior relates to how it affects society as a whole.

### 7 Age Group 9 to 12 - Learning about exotic phenomena

During this age, children are often interested in exotic creatures like dinosaurs, and exotic natural phenomena like black holes. They should therefore learn about cosmology and the evolutionary history of life on Earth. Other skills that should be acquired during this phase, is linear algebra, software engineering, and organic chemistry.

#### 7.1 The evolutionary history of life on Earth

In the topic called evolutionary history, children should learn about how life has evolved on Earth; from the first microbes to the mammals to today. Here children will also learn about dinosaurs, and other fun creatures of the past, such as the giant shark megalodon and the saber-toothed cat. They will also learn about how modern humans evolved from other primates. This course will focus upon the cellular changes that have occurred over time, so that the children acquire a basic understanding of cellular biology. It will also focus upon how different multicellular systems developed, such as the nervous system and the skeletal system. Interactions between different species, such as the symbiosis between flowering plants and insects, will also be covered.



Figure 10: Timeline from the first life on Earth until the appearance of anatomically modern humans.

### 8 Age Group 12 to 15 - Acquiring amicable social skills

At this age, the amount of sexual hormones start to increase as people get into puberty. This can be a very difficult time for many teenagers, and they often become much more interested in their social environment than in education. Therefore, instead of wasting time trying to teach them things they aren't interested in, they should mostly be allowed to engage in activities they enjoy, such as dancing, theater and playing music. It is however also a period when lots of teenagers are harassed by their peers, or feel socially embarrassed because they are different. A course about the benefits of diversity should therefore be compulsory, where they learn to appreciate their differences. At this age many parents also start to feel that their children won't listen to them anymore. Teenagers also become extremely prone to group thinking at this age. It therefore seems like an appropriate time for them to have a course about intellectual humility and critical thinking skills.

#### 8.1 Intellectual humility and critical thinking skills

Humility can be regarded as the middle point between servility and arrogance. In the course, they will analyze the disadvantages with arrogance and servility for themselves and society in general.



Figure 11: Negative traits associated with arrogance and servility, and how humility can be considered to be the middle ground between servility and arrogance.

They will also practice on being humble, for example by practicing on not speaking as if they know something, when they don't. And by practicing on not speaking as if they are sure, when they aren't. Learning how to check if other people are telling the truth will also be a part of this course.

#### 8.2 Learning to appreciate differences

If we all look at a tree from the same angle, we see much less of the tree than if we look at it from many different angles. So in general, we should expect to get more information from having more points of view. This can be formulated as a mathematical theorem, which describes how diversity influences a group's ability to predict.

$$(C - X)^2 = \frac{1}{n} \sum_{i=1}^n (x_i - X)^2 - \frac{1}{n} \sum_{i=1}^n (x_i - C)^2$$

The team's square error = The mean square error - The diversity of the team

Figure 12: The diversity prediction theorem, formulated by Scott E. Page at the University of Michigan<sup>[8]</sup>. A more detailed explanation of the theorem can be found here (PDF, HTML). The theorem has huge implications for how one might choose to put together a team.

From the theorem we can see that if the proficiency of a group remains constant, increasing the diversity makes it better at predicting. In the topic called diversity, they will discuss how this theorem implicates how one might choose to put together a team. They should also experiment with putting together groups with different levels of diversity, and measure how good they are at predicting compared to each other.

### 9 Age Group 15 to 18 - Learning about abstract theories

At this age, teenagers start to feel more at peace with the sexual hormones, and they are able to divert more of their attention to topics that aren't related to their social environment. Their brains are also sufficiently developed to start having more abstract topics, such as calculus, the theory of relativity and quantum chemistry. Other important topics they should learn about include information theory and Bayesian machine learning.

#### 9.1 How to update belief in a hypothesis according to new evidence

Machine learning is used in a wide variety of fields today, such as pattern recognition, customer analytics, fraud detection and scientific research. Bayes' theorem is used in many of the most advanced machine learning algorithms, but is also central in the philosophy of science, and in modern research into cognitive biases. They will learn about this theory, and much more, in the topic about machine learning.



Figure 13: Bayes' theorem, showing how to rationally update belief in a hypothesis according to new evidence. A more detailed explanation of the theorem can be found here (PDF, HTML).

#### 9.2 How information theory relates to thermodynamics

Information theory was traditionally developed by Claude E. Shannon for signal processing, channel coding, and data compression. Today, it is also used in quantum computing<sup>[9]</sup> and even in modern theories about black hole entropy<sup>[10]</sup>. This is because information entropy can be linked to thermodynamical entropy at a quantum scale<sup>[11]</sup>. In order to understand entropy properly, they need to understand it both from the perspective of information theory and from the perspective of thermodynamics (which they will learn about in the topic about basic physics and in the topic about basic chemistry). Information entropy relates to average of possibilities in a message. You can read more about information entropy HERE.



Figure 14: Entropy in information theory and thermodynamics

### 10 Age Group 18 to 21 - Reflecting on society

At this age, people are finally ready for starting to reflect on themselves and society in general. They should learn about criteria for a healthy democracy, such as: the separation of powers, freedom of the press, and investigative journalism. In the topic called history of humanity, they should analyze what made different civilizations prosper and fail, to see commonalities, so that they can understand better how to make this society prosper. They should also study common cognitive biases, and discuss civil rights.

#### 10.1 Things that are important for people to learn in a healthy democracy

In the topic called civics and politics, they should learn about criteria for a healthy democracy, such as: the separation of powers, freedom of the press, investigative journalism and civil rights. They should also learn about major political ideologies, such as: capitalism, socialism, environmentalism, nationalism, monoculturalism, multiculturalism and globalism. Furthermore, they will learn about multilateral tax treaties, the difference between a flat and progressive tax, and analyze how this might relate to entrepreneurship, innovation and the global wealth inequality.

#### 10.2 Learning from the history humanity

History should be taught quite late, since it is important for people to understand it properly. Older teenagers also seem to be more interested in it. Rather than learning national histories, they should learn about the history of humanity. In this topic, they should analyze what made different civilizations prosper and fail, to see commonalities, so that they can understand better how to make this society prosper. They should also try to find commonalities between periods when our understanding was advancing quickly, such as Greece in 5th century BC, the Tang dynasty in China, the Islamic Golden Age, and the Italian Renaissance.



Figure 15: Timeline from the first human civilizations until today.

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