1, 2, 3, code ! - Cycle 3 activities - Lesson 1.4. How to encode and decode a binary message

Summary	Continuing on from the previous lesson, students apply what they have learned to encode a short worded message in binary code, then decode a message in binary code they receive.
Key ideas *(see Conceptual scenario)*	"Information" • Binary code makes it possible to represent all kinds of data, especially numbers and letters.
Inquiry-based methods	Experimentation
Equipment	For each group • Handout 31
Glossary	List of elements, bit, binary code
Duration	1 hour

Introductory question

The teacher reminds the students that they have received a message from the base that a storm is coming. The base team asked for information: the time rover will return to base.

Today, the students will code their reply in binary.

Activity: Encode a message for the base in binary (as a class, then in groups)

The teacher notes that the message the students must send to the base has only capital letters, spaces and periods (28 types of characters). They ask students to determine the smallest number of bits they need to encode each letter and suggest, if necessary, to look back at their notes from the previous lesson (Handout 30). The class agrees to limit coding to five bits per character.

The teacher hands out the top of Handout 31. They give students five minutes to create a correspondence between characters and five-bit combinations. During the group discussion, the class creates the following correspondence table:

5 bits	**00000**	**00001**	**00010**	**00011**	**00100**	**00101**	**00110**	**00111**
Letter	A	B	C	D	E	F	G	H
5 bits	**01000**	**01001**	**01010**	**01011**	**01100**	**01101**	**01110**	**01111**
Letter	I	J	K	L	M	N	O	P
5 bits	**10000**	**10001**	**10010**	**10011**	**10100**	**10101**	**10110**	**10111**
Letter	Q	R	S	T	U	V	W	X
5 bits	**11000**	**11001**	**11010**	**11011**	**11100**	**11101**	**11110**	**11111**
Letter	Y	Z	point	Space	*No meaning (these can be used for other punctuation signs if desired)*			

The teacher tasks the student groups with using this correspondence table to encode the following text in binary:

TEN MINUTES

They hand out the middle section of Handout 31. The class gets:

Letter	T	E	N		M	I	N	U	T	E	S
5-bits group	10011	00100	01101	11011	01100	01000	01101	10100	10011	00100	10010

Challenge: Decoding a message sent by base (in pairs)

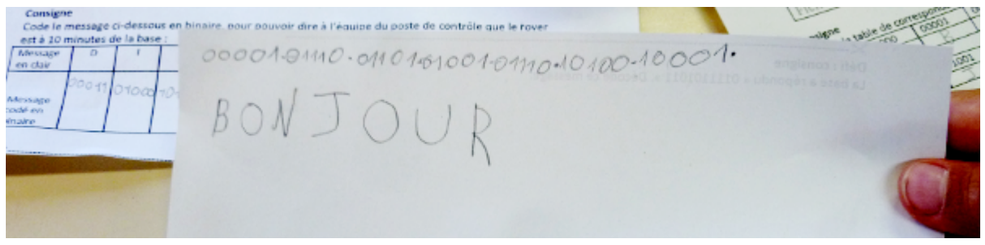
The teacher gives students the base's final reply (Handout 31) that the students must decode:

0111001010

Dividing the message into five-bit combinations gives students 01110 and 01010, which according to the table corresponds to the letters O and K. The message received from the base is "OK."

Individual exercise: Encoding and decoding binary messages.

The teacher gives the students 10 or 15 minutes to encode short messages and to pass them to fellow students to decode. Students enjoy this activity, which helps them consolidate what they learned in class.



Fourth Grade class, Carole Vinel, Paris

Conclusion

The class reviews the conclusion from the previous lesson, especially with regard to the following idea: binary code makes it possible to represent all types of data, especially texts.

Further study (unplugged)

To help students better understand why electronic instruments often require binary data representation, an analogy can be made using electric circuits that include the same number of light bulbs as the number of bits used for coding. Each bulb is linked to a switch. You can place each switch in an open/closed position (either 0/1 or OFF/ON). These are the only two states possible for a switch. For electronic devices, the electronic components are not light bulbs or switches, but they work in a similar way: they can be powered via electricity or not. It is practical to distinguish between these two states and coding information in binary.

<< Lesson 1.3

Sequence I
