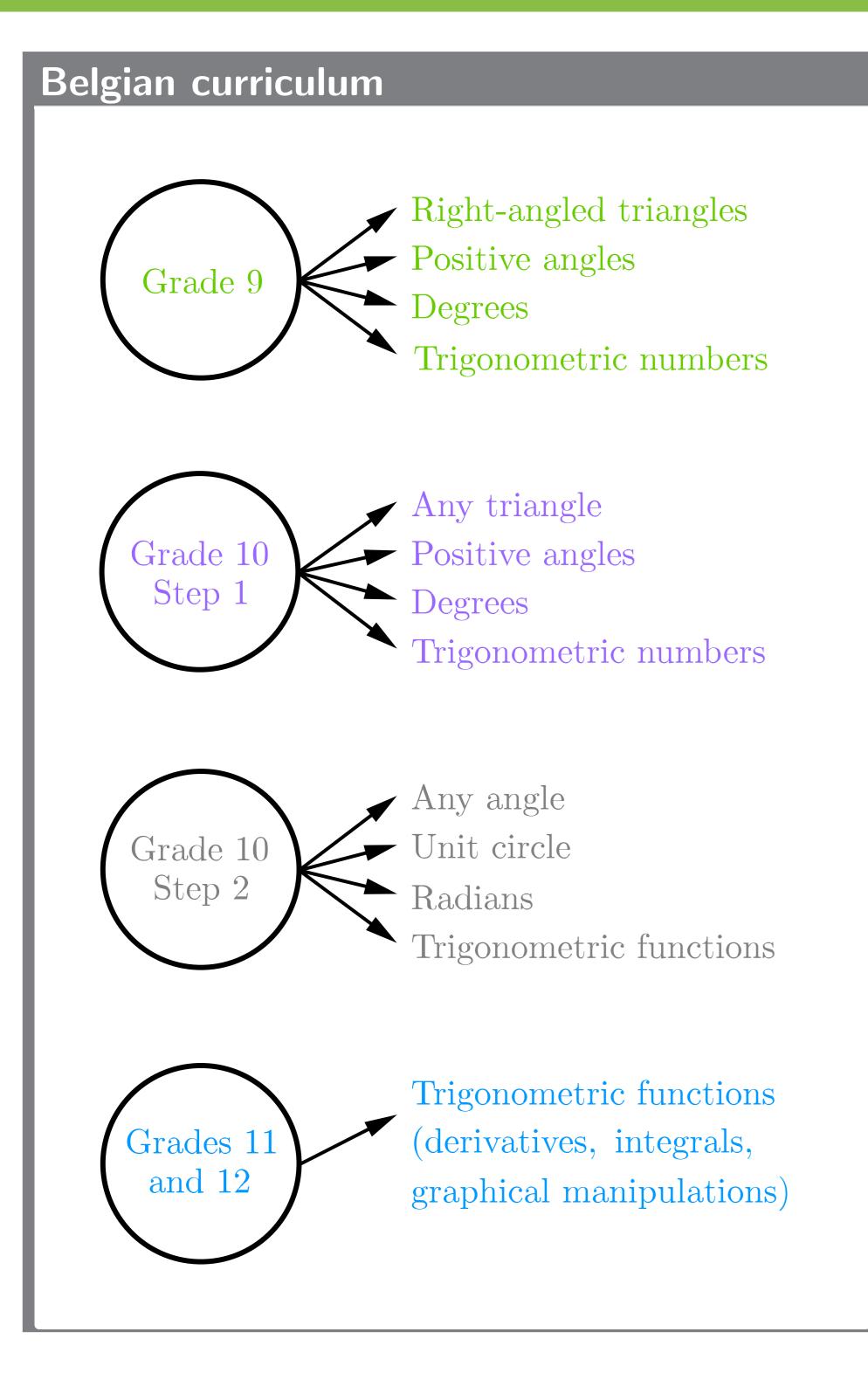
Teaching trigonometry with dynamic geometry

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Trigonometry in education



Student's difficulties and mistakes

In litterature [2][4][6][7]

- The length of an arc depends on both the angle and the radius.
- Angle of 0° and 90° are not easy to work with in triangles.
- Degrees and radians are proportional. Degrees are beautiful numbers, radians are irrationals, ugly numbers. Why changing ?
- In the unit circle, cosine are abscissa but moving in the cosine function, cosine become ordinates.
- $\pi, \frac{\pi}{4}, \frac{\pi}{6}, \dots$ are writings, not real numbers.
- Angle measurement depends on the length of its sides.

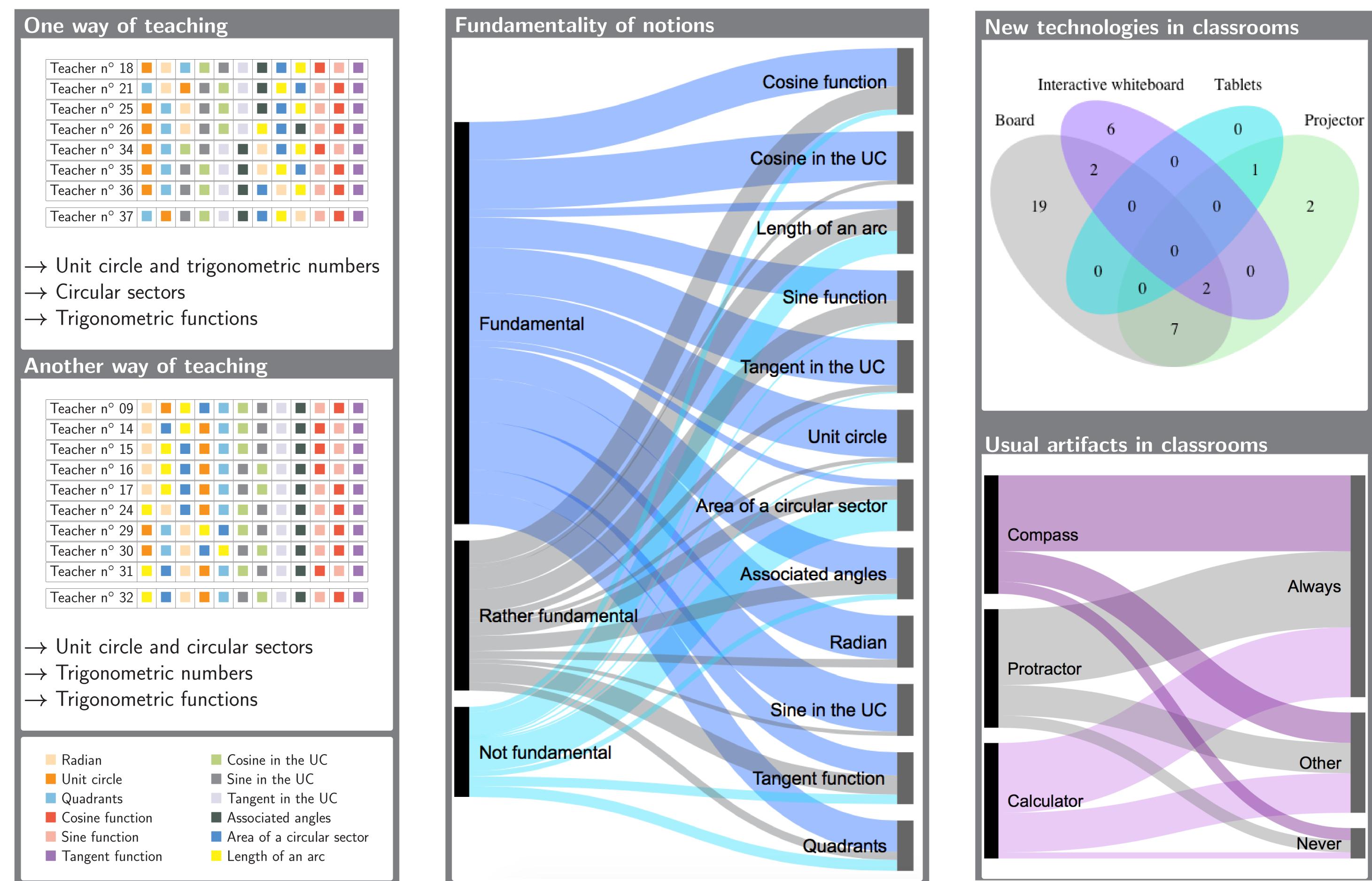
Our teacher survey

- The π fractions are hard to handle when graduating an axis.
- Angles and trigonometric numbers are hard to **distinguish**.
- An angle has only one sine, but a sine can be associated to several angles.
- Trigonometric functions are hard to associate to the unit circle.
- Radians are not concrete and $\pi = 180$.
- Units are mixed : $\cos(\pi) = -1$ radian.
- Usual algebra rules are misused : $\cos(a + b) = \cos(a) + \cos(b)$.

Our aims, at Step 2

- Compare the different knowledges from the didactic transposition of CHEVALLARD [3].
- Building a lesson using dynamic geometry to illustrate the Step 2.
- Following the artifact/instrument theory of RABARDEL [5] and the didactic ingeneering process of ARTIGUE [1] to build this lesson.

Teacher's opinion



Teacher n° 09						
Teacher nº 14						
Teacher n° 15						
Teacher n° 16						
Teacher n° 17						
Teacher n° 24						
Teacher n° 29						
Teacher n° 30						
Teacher n° 31						
Teacher n° 32						

References

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- [2] BLOCH, I., Activité... la mesure des angles en radians au lycée, *Petit x 80* (2009), 47-53
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- [4] PROULX, J., L'histoire de la trigonométrie comme outil de réflexion didactique, Bulletin de l'Association Mathématique du Québec XLIII, 3 (2003), 13-27
- [5] RABARDEL, P., Les hommes et les technologies, Armand Colin, pp.239, 1995. https://doi.org/10.1017462 [6] TANGUAY, D., Degrés, radians, arcs et sinusoïdes, Petit x 82 (2010), 59-71 [7] VADCARD, L., Conception de l'angle chez les élèves de seconde, Recherches en didactique des mathématiques 22, 1 (2002), 77-117