Magnetic flux and Faraday's law

- Magnetic field $\vec{B}$ (given)
- Surface S with perimeter loop (given)
- Surface area A (given)
- Area vector $\vec{A} = A\hat{n}$ (my choice)
- Positive direction around perimeter: ccw (consequence of my choice)
- Magnetic flux: $\Phi_B = \int \vec{B} \cdot d\vec{A} = \int \vec{B} \cdot \hat{n} dA$
- Consider situation with $\frac{d\vec{B}}{dt} \neq 0$
- Induced electric field: $\vec{E}$
- Induced EMF: $\mathcal{E} = \oint \vec{E} \cdot d\vec{\ell}$

  (integral ccw around perimeter)
- Faraday's law: $\mathcal{E} = -\frac{d\Phi_B}{dt}$