V-Rock transporte le rocher à TU Delft

Dominique Ngan-Tillard

9-6-2025

BRING THE FIELD TO TU DELFT

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THE VROCK EXPERIENCE

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OUR AMBITION

Make VROCK a benchmark tool that boosts students' confidence when encountering real outcrops for the first time. This advantage will accelerate the acquisition of more in-depth scientific skills during essential real-world fieldwork. VROCK offers tailored teaching in a secure environment and contributes to inclusive education.

Dominique Ngan-Tillard, Pierre-Olivier Bruna, Hugo Oostman, Palash Kachhy
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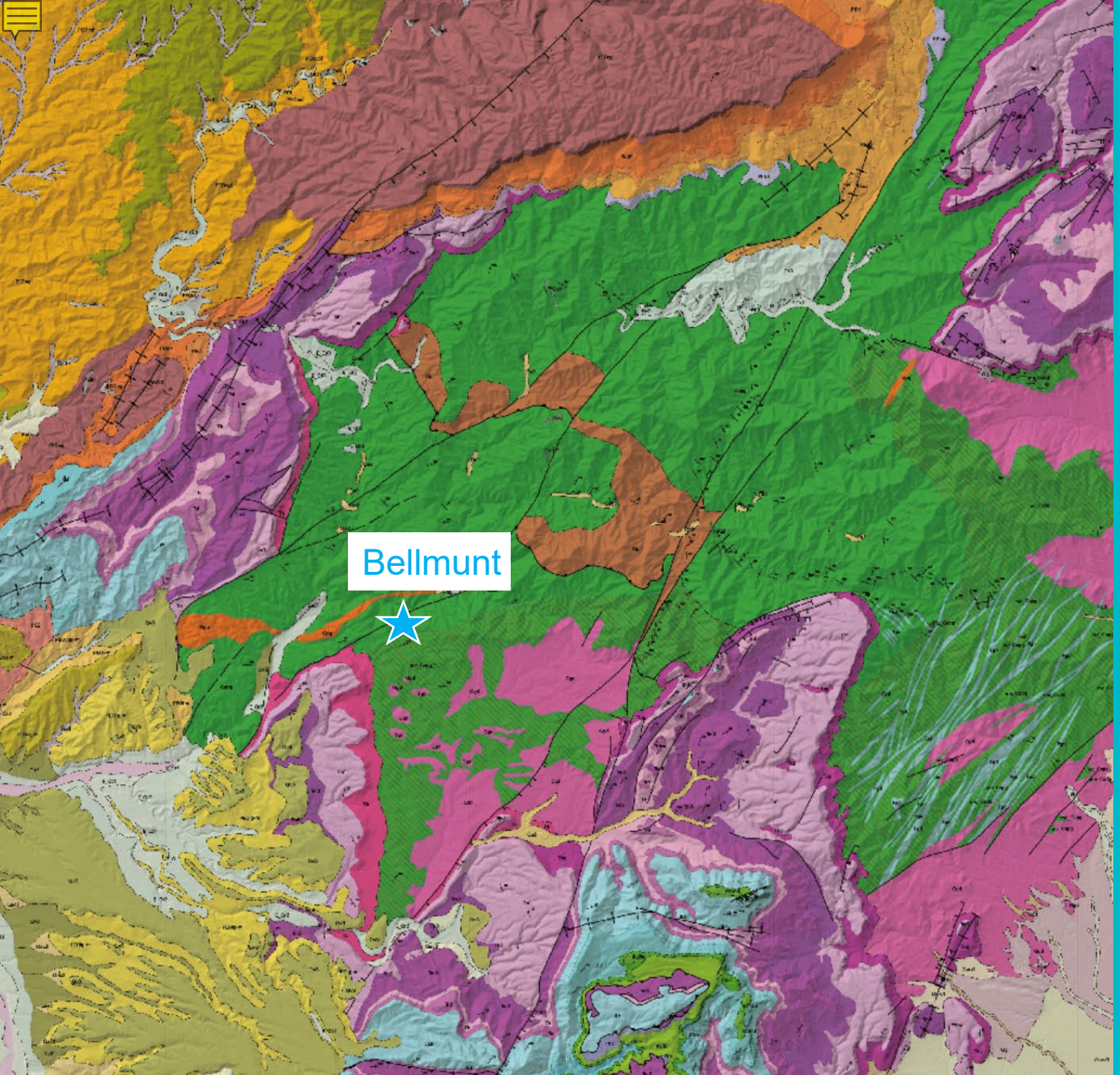

1- Objectives

V-Rock, outil de **Réalité Virtuelle** qui:

- **prépare** nos étudiants à leurs vrais camps de terrain
- les **transporte** face à un affleurement a Bellmunt, NE Spain
- leur apprend à
  - **sécuriser** leur environment
  - **observer** l'affleurement
  - recueuillir les donnés essentielles pour **caractériser** le massif
  - avant de les utiliser pour **classifier le rocher** ou mener des **calculs de stabilité**

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2- De la capture d’image à la visualisation en VR

- Prise de vues par **drone**
- Approche photogrammétrique **Structure from Motion (SfM)**

  Filtrage, Alignment, Géoréférence des images Création d’un nuage de points dense, élimination des points peu fiables, Maillage, Nettoyage Decimation, exportation (inages texture+ maillage+ nuage)

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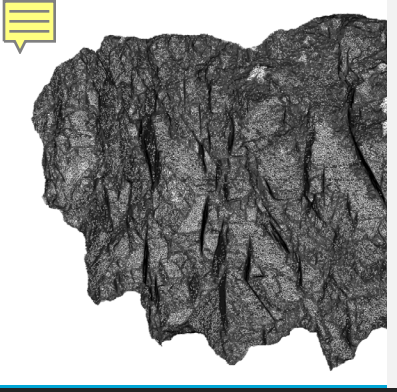
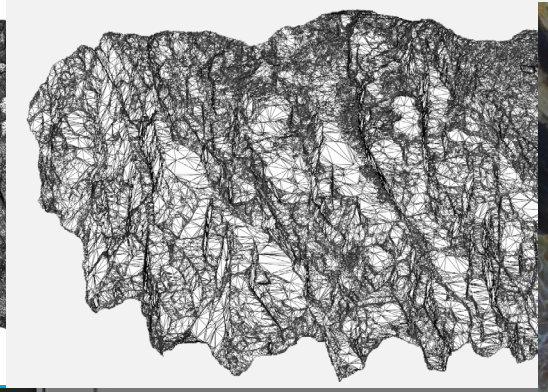
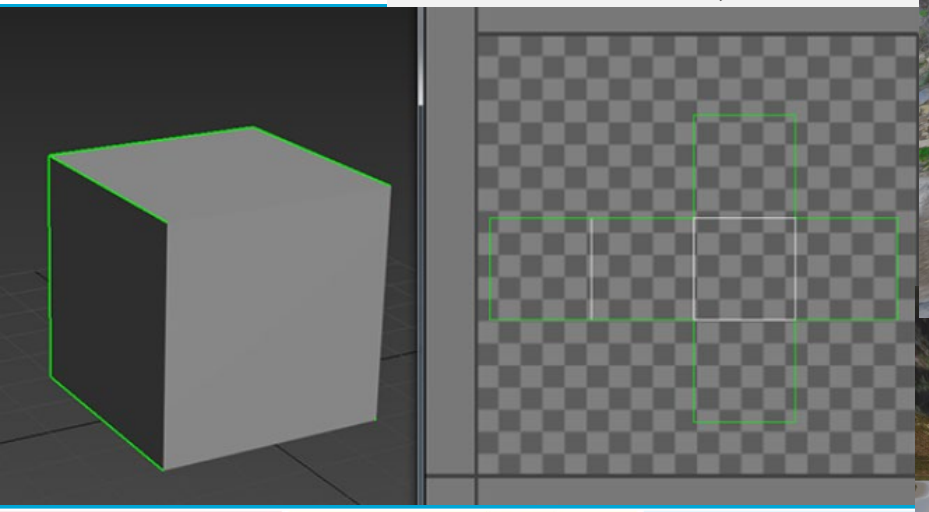
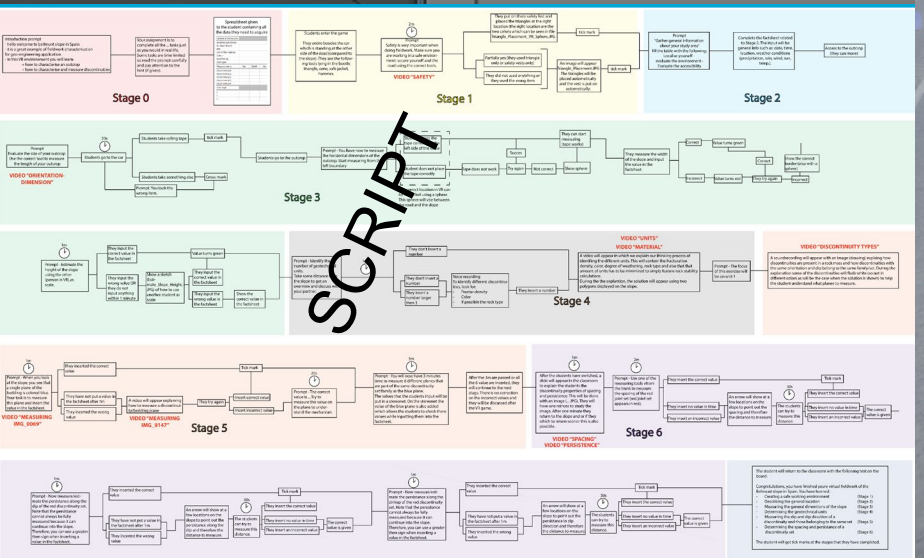








2- De la capture d'image à la visualisation en VR

- Optimisation du modèle en VR
  - Lissage, réparation et **décimation du maillage**
  - Inversion des normales et fusion
  - Ajout des couleurs et autres par **dépliage des coordonnées UV**
  - Représentation de la Région d'intérêt en haute résolution
  - Elargissement de la scène
- Boîte à **outils géologiques**
- Implémentation du **script**

3- V-Rock demo

- Classe d'initiation aux **contrôleurs**
- Plusieurs **perspectives**
- **Aide** à la demande
- **Travail en binôme**
  - l'homme de terrain
  - la pilote du drone et son laser

Après la classe

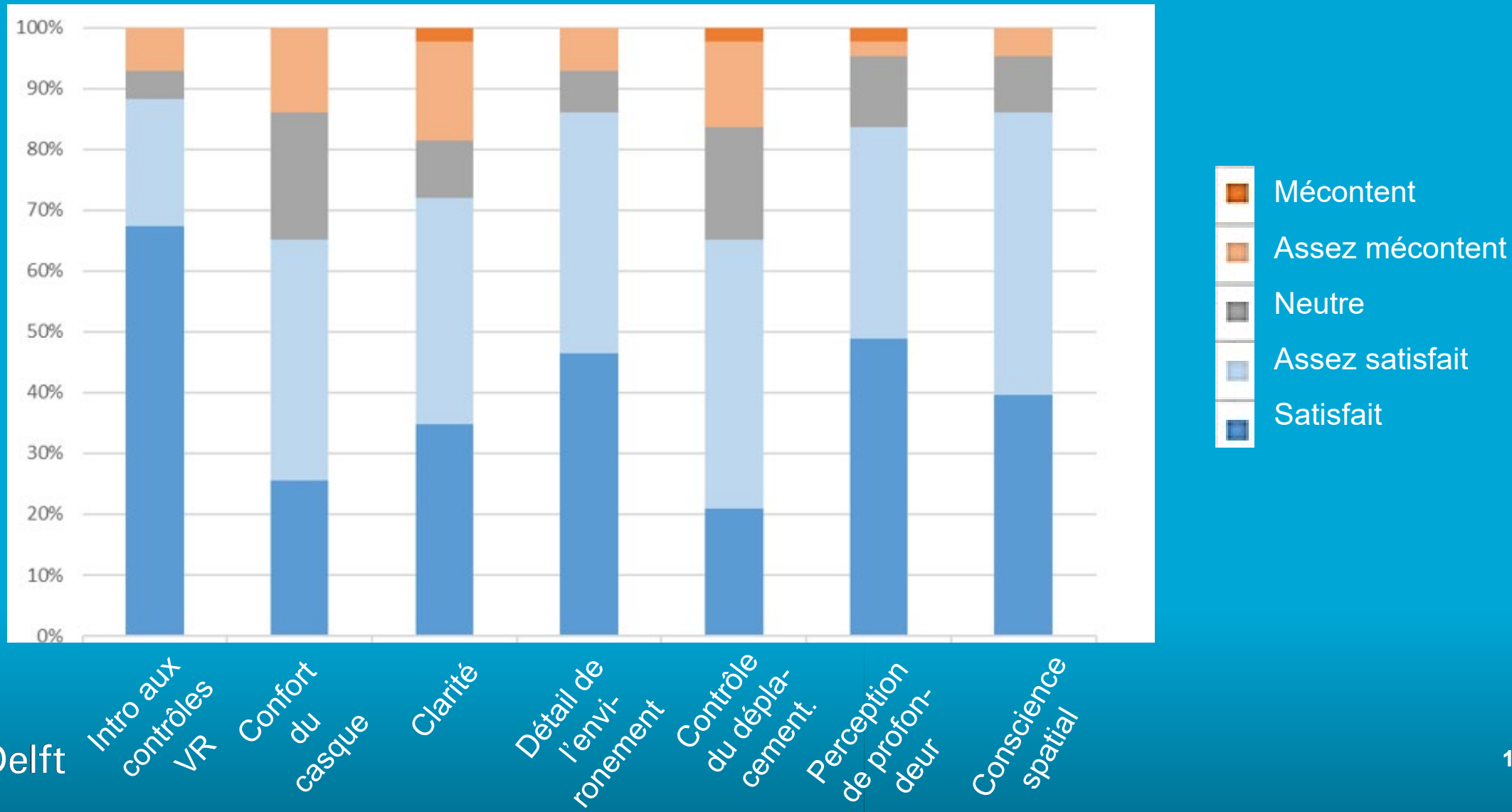
Après V-Rock

Après la journée de terrain

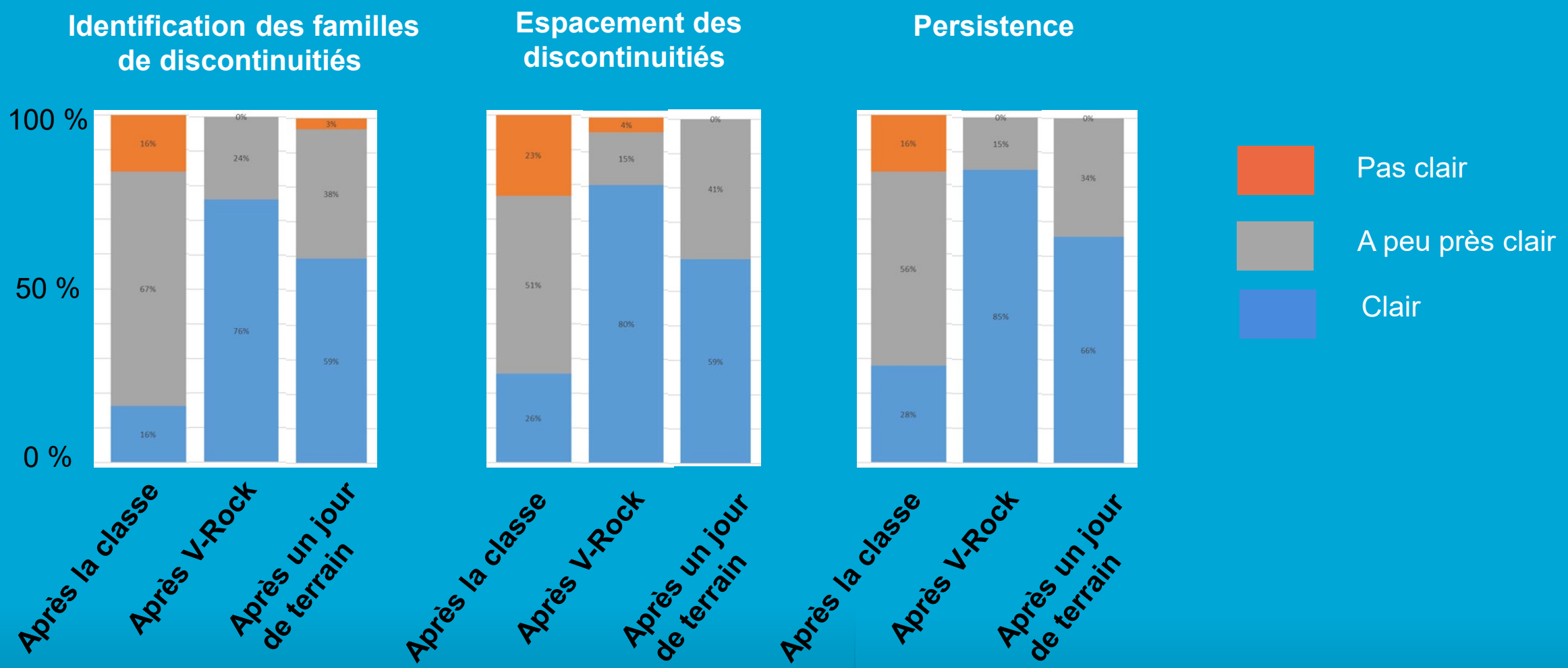
4- Validation

- **Implementation en cours** de mécanique des roches/ géologie de l'ingénieur- BSc/ MSc
- **Enquête sur le niveau de confort et confiance** des étudiants
- **Evaluation des performances**

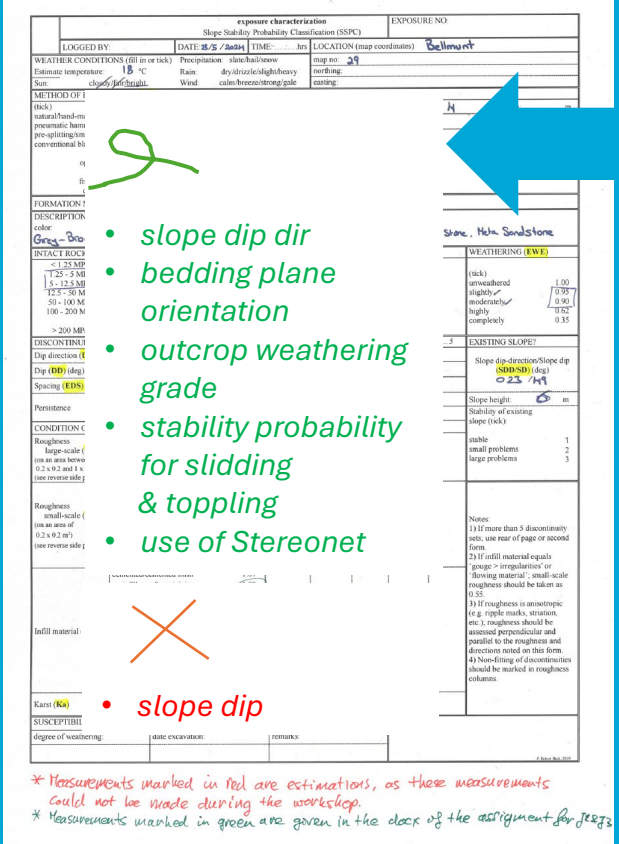
4- Validation – Qualité de l'expérience VR



4- Validation - Niveau de confiance



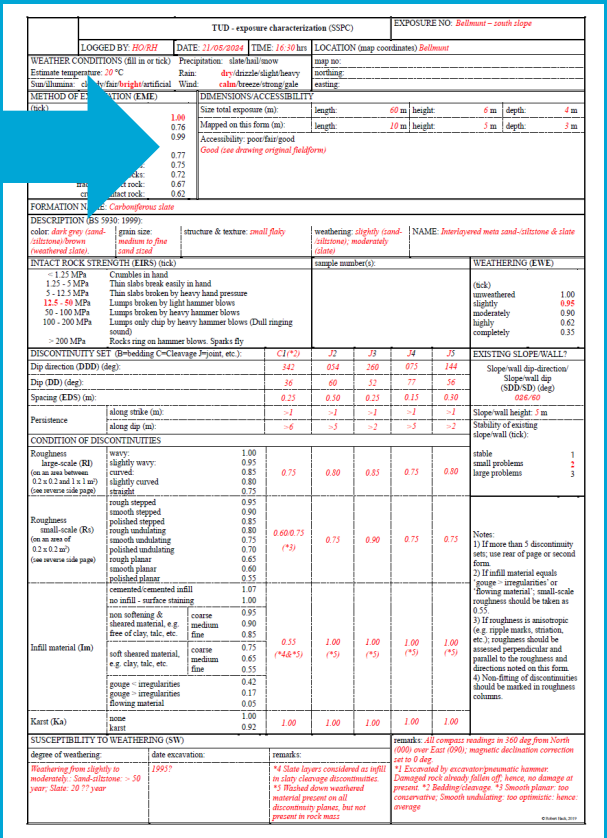
4- Validation - Didactique - Performance



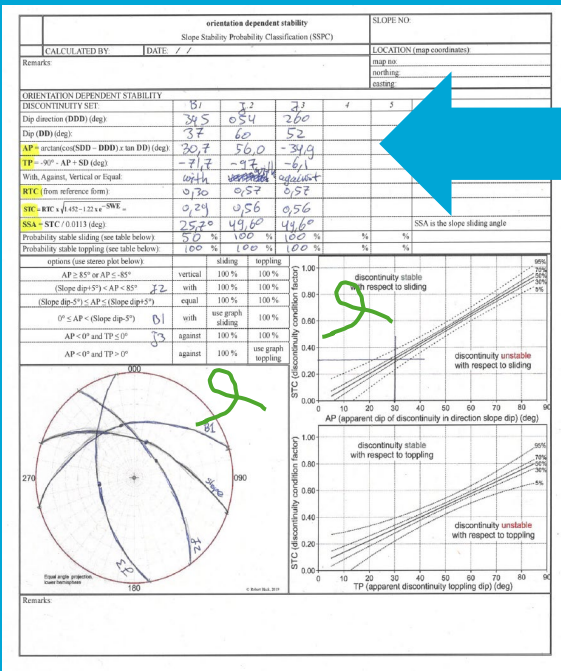
- slope dip dir
- bedding plane orientation
- outcrop weathering grade
- stability probability for slidding & toppling
- use of Stereonet

- slope dip

Étudiants en VR



Expert sur site



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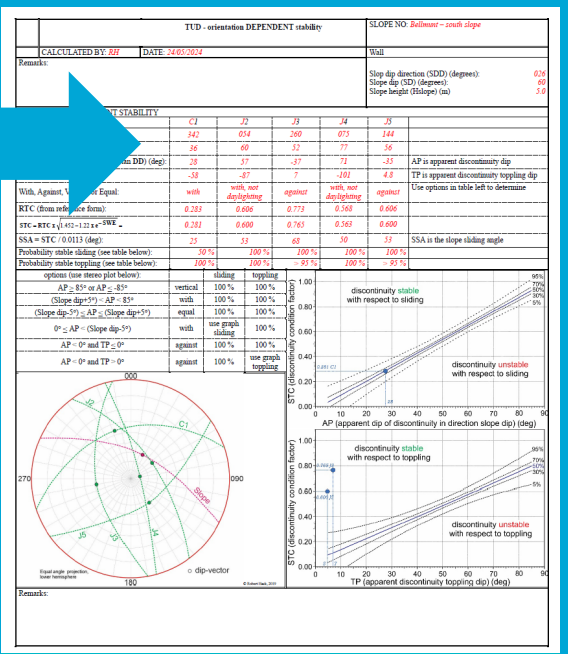
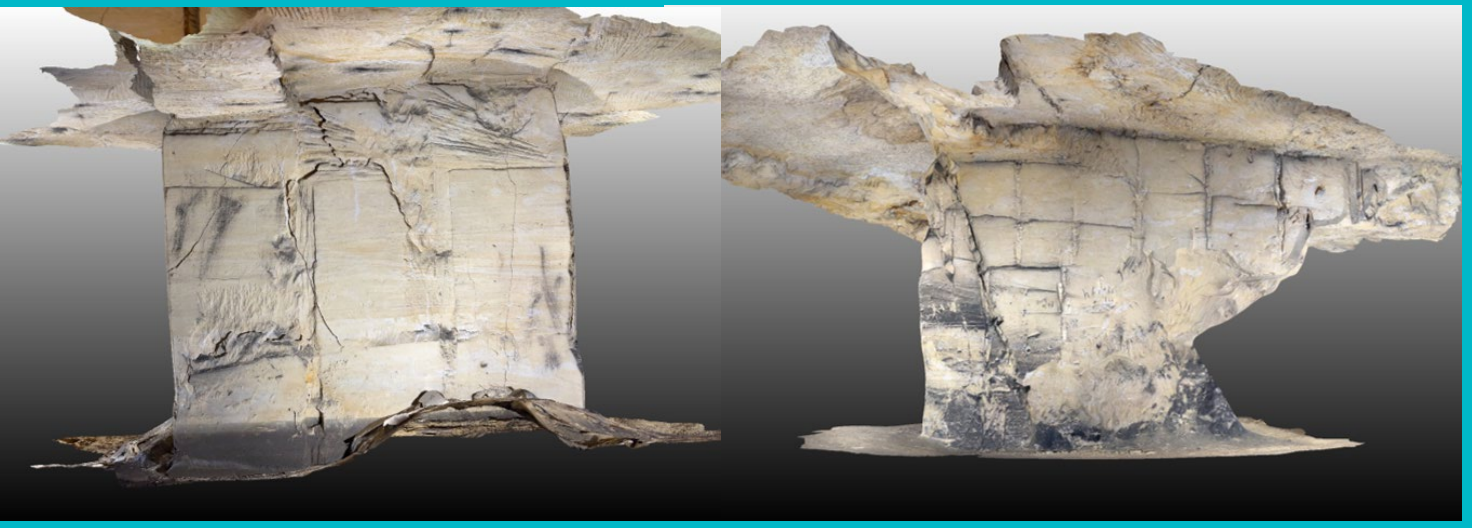


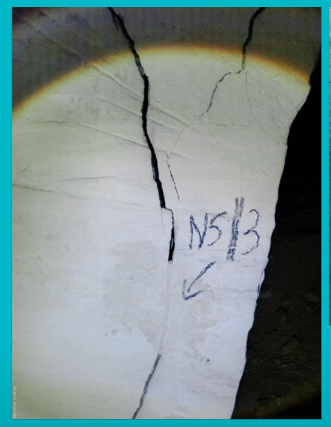
Expert

A suivre…

Gestion des risques post-miniers

Inspection de mine en chambre et pilliers





5- Conclusions

V-Rock, outil didactique

- **renforce la confiance** des étudiants lorsqu'ils rencontrent des affleurements réels pour la première fois.
- **accélère l'acquisition de compétences** scientifiques plus approfondies lors des camps de terrain essentiels.

V-Rock, outil évolutif

- peut intégrer des **dimensions sensorielles** pour une immersion renforcée
- peut accélérer à **d'autres apprentissages**

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