INTERGENERATIONAL BRIDGE: LINKING FAKE NEWS EVALUATION WITH ATTITUDE TOWARD SCIENCE

BRANKO LOBNIKAR,[1] BRIGITA KRSNIK HORVAT,[2] AJDA ŠULC[1]

[1] University of Maribor, Faculty of Criminal Justice and Security, Ljubljana, Slovenia
branko.lobnikar@um.si, ajda.sulc@um.si
[2] University of Maribor, Maribor, Slovenia
brigita.krsnik@um.si

Post-truth misinformation undermines trust in science; schools may foster "information resilience" by combining evaluative competence with awareness of societal harms. Data from a 2025 survey conducted as part of the oooScience! project were used to compare teachers' and students' responses (N = 1,071; teachers n = 246, upper-secondary students n = 825) on seven Likert-type statements measuring perceived misinformation-evaluation competence, perceived societal/democratic threat, and the perceived protective role of comprehensible science communication. Attitudes towards science were assessed using a 15-item semantic differential (lower scores indicate more positive attitudes). Teachers scored higher on a core fake-news composite (g = 0.86) and on a teaching/communication composite (g = 0.61). Overall attitudes towards science were moderately positive and did not differ significantly on the global index. However, teachers rated science's societal utility more positively, whereas students rated status/visibility aspects more positively. Correlational and moderated regression analyses showed that FN_teaching predicted more favourable science attitudes among students, whereas associations among teachers were negligible. Results suggest an instructional "visibility gap": making verification practices and comprehensible science communication more explicit may strengthen students' information resilience and trust in science.

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1 Literature Review: Linking Fake News Evaluation with Attitudes Toward Science

Contemporary misinformation is embedded in a post-truth media ecology that challenges evidentiary norms and complicates judgements about what counts as credible knowledge (Marsh & Yang, 2017; Mason et al., 2018). In crises such as COVID-19, misinformation can escalate into an infodemic that shapes attitudes and erodes trust in science, institutions, and the media, suggesting that resilience requires multi-level responses (Scardigno et al., 2022; Mason et al., 2018). The science-society interface is further strained in "conflicting authority" settings, where evaluating sources depends on how audiences interpret authority claims and the affective drivers of belief (Lynch & Hunter, 2020). A persistent issue is that "fake news" is often conflated with misinformation (unintentional) and disinformation (intentional). Systematic reviews show that this ambiguity hampers the accumulation of knowledge, measurement validity, and targeted interventions because motives, production processes, and dissemination channels differ (Domenico et al., 2021).

Vulnerability is not merely ignorance. Political and identity alignment can override veracity, producing a pattern of concordance over truth, in which agreement predicts belief and sharing more than accuracy (Schwalbe et al., 2024). Sharing is influenced by belief reinforcement and framing; therefore, accurate evaluation does not necessarily guarantee the dissemination of truth (Piksa et al., 2023; Schwalbe et al., 2024). Cognitive reflection supports discernment, whereas network homogeneity and socio-technical dynamics—such as cognitive inertia and virality—affect exposure and the propagation of information (Facciani & Steenbuch-Traberg, 2024; Lima et al., 2024). Correlational evidence links cognitive failure and worldview to susceptibility, highlighting the need to incorporate psychological factors into literacy strategies (Lacap et al., 2025).

Susceptibility varies across the lifespan: older adults appear more prone to sharing fake news, highlighting the relevance of cognitive ageing to intergenerational resilience (Brasher & Schacter, 2020). Perceived stakes do not reliably protect audiences; no clear personal-relevance effect has been found for high-stakes misinformation (Ceccarini et al., 2023). These patterns support linking perceived evaluation capacity and threat awareness to attitudes towards science, because trust and epistemic orientations reflect identity, networks, cognition, and discourse (Scardigno et al., 2022; Schwalbe et al., 2024; Facciani & Steenbuch-Traberg, 2024).

While responses based on literacy remain significant, their limitations are evident. Survey data indicate that information literacy is instrumental in identifying fake news, whereas other literacies are less reliably predictive (Jones-Jang et al., 2019). Incentives across platforms may still promote sensationalist or identity-affirming content; therefore, educational initiatives should be complemented by institutional and platform-aware strategies (Bulger & Davison, 2018; Mason et al., 2018). Additionally, instruction must encompass algorithmic and machine learning systems that influence exposure, thereby complicating the detection of manipulative or synthetic media (Valtonen et al., 2019). Policy efforts frame media literacy as a response to the phenomenon of truth decay, thereby reinforcing its importance in fostering institutional trust and resilience within democratic systems.

Design cues may increase deliberation (e.g., fake-news flags) but are unlikely to be sufficient without strategies that address identity-driven motivations (Moravec et al., 2019; Piksa et al., 2023; Schwalbe et al., 2024). Inoculation-style "prebunking" can build resistance by exposing audiences to manipulation techniques in advance and can weaken the links between exposure, belief, and sharing (van der Linden, 2019; Roşu et al., 2023).

Sustaining trust in science also requires communication that is comprehensible and socially meaningful, particularly where distrust is fuelled by post-truth narratives and institutional contestation (Scardigno et al., 2022; Lynch & Hunter, 2020). Researcher-school interactions and technology-enabled engagement (e.g., virtual lab tours) can support understanding of research and foster positive science orientations (Davies et al., 2012; Kiyuka et al., 2024). Teachers' perspectives and explicit classroom routines are central, while non-formal stakeholders can extend critical thinking and media literacy beyond the classroom (Tkáčová et al., 2022; Delaney et al., 2022; Vrabec et al., 2023). Overall, school information resilience can be conceptualised as an intergenerational, organisational capacity that combines perceived evaluative competence, threat awareness, and clear science communication (Tkáčová et al., 2022; Vrabec et al., 2023; Lobnikar et al., 2025). The key gap is not whether fake news exists or whether literacy matters, but how perceived evaluative competence and threat awareness relate empirically to attitudes towards science across teachers and upper-secondary students in one national context, informing school-level practices oriented towards explicit media- and science-literacy goals and comprehensible science communication (Bulger & Davison, 2018; Davies et al., 2012; Jones-Jang et al., 2019; Lobnikar et al., 2025).

Accordingly, this study examines how perceived capacity to evaluate fake news, perceived societal/democratic threat, and the perceived protective role of comprehensible science communication relate to attitudes towards science among Slovenian teachers and upper-secondary students, and whether these associations differ between the two groups.

2 Description of Methodology, Instrumentation, and Sample

The study draws on complementary survey datasets collected in Slovenia during the oooScience! activities, targeting upper-secondary students and teachers. Participation was voluntary, and respondents were guaranteed complete anonymity. Consent for data collection, processing, and storage was obtained from all participants. Data collection took place between June and December 2025.

In total, N = 1,071 respondents participated, comprising 246 teachers (23.0%) and 825 students (77.0%). Gender was reported by n = 1,068 participants: 51.5% female, 43.9% male, and 4.6% preferred not to answer. The teacher subsample was predominantly female (73.9% female; 22.0% male; 4.1% prefer not to say; valid n = 245), whereas the student subsample was more balanced (44.8% female; 50.4% male; 4.7% prefer not to say; valid n = 823). Age was reported by n = 1,069 participants and ranged from 13 to 69 years (M = 23.96, SD = 15.11). Teachers were aged 21–69 (M = 50.15, SD = 10.05; n = 245), and students were aged 13–22 (M = 16.18, SD = 1.19; n = 824). Analyses were conducted on valid responses; therefore, the effective sample size may vary across specific variables and models due to item nonresponse.

Data were collected using two parallel online questionnaires — one for upper-secondary students and one for teachers — designed to capture (a) respondents' overall image of science and (b) key components of information resilience in a school context, namely perceived competence to evaluate information, perceived societal threat from misinformation, and the perceived role of clear scientific communication and teachers' educational practices in mitigating fake news.

Fake news/information evaluation was measured with seven Likert-type items (1 = strongly disagree, 5 = strongly agree) with an additional "don't know" option. The "don't know" responses were coded with user-defined missing codes and treated as missing in all analyses. The items captured (a) perceived ability to recognise distorted/false information and to distinguish credible from fake news, (b) perceived severity of fake news as a societal problem in Slovenia and as a threat to democracy, and (c) perceived usefulness of comprehensible communication of scientific results for differentiating verified facts from misinformation. Two items were role-adapted: teachers evaluated their own competence in clearly communicating scientific results and the extent to which they explicitly highlighted relevant teaching skills, whereas students evaluated their teachers on these two aspects. Internal consistency was acceptable to good (teachers: Cronbach's $\alpha = .748$; students: $\alpha = .818$). The latent structure was examined using exploratory factor analysis (Principal Axis Factoring; listwise deletion), indicating suitability for factor extraction (KMO = 0.884; Bartlett's test χ^2 (21) = 3015.737, $p < .001$) and supporting a single-factor solution (eigenvalue = 3.896; 48.36% explained variance; loadings λ = .608–.750). For group comparisons, and to avoid inappropriate pooling of role-adapted items into a single cross-group index, we computed two composite variables: *FN_core* as the mean of the five items common to both questionnaires requiring at least four valid responses (MEAN.4), and *FN_teaching* as the mean of the two role-adapted teaching/communication items requiring both responses (MEAN.2). Differences between teachers and students on these composites were tested using independent-samples t-tests with Welch's correction, complemented by bootstrap percentile 95% confidence intervals (1,000 resamples) and effect sizes (Hedges' g).

To assess science's overall image, we used 15 bipolar items (semantic differential, e.g., Beneficial to society vs. Not beneficial), with lower scores indicating a more positive view. The structure was examined using an exploratory factor analysis (EFA) with Principal Axis Factoring (PAF) and Oblimin rotation, with listwise deletion of missing data. Sampling adequacy was excellent (KMO = 0.934), Bartlett's test was significant ($\chi^2(105) = 6858.104$, $p < .001$), and communalities ranged from 0.382 to 0.683. EFA revealed three correlated factors: (1) societal relevance/utility, (2) status, visibility, benefits, and (3) integrity, autonomy, and public-good orientation. Due to intercorrelations and dominance of the first factor, we treat the construct as mainly unidimensional with three facets. We use an overall index and facet scores where needed. Internal consistency was high: teachers (N=246) had Cronbach's α = .917, students (N=825) α = .905 (15 items). Both instruments collected demographics (gender, age).

3 Results and interpretation

Attitudes towards science in Slovenia were assessed using a 15-item semantic differential comprising bipolar adjective pairs (e.g., useful–not useful, trustworthy–not trustworthy). For interpretation, lower scores indicate a more positive evaluation (closer to the positive pole), whereas higher scores indicate a more negative evaluation. At the level of individual semantic-differential items, science in Slovenia was evaluated predominantly positively (the modal response category was "partly positive" across all items), although respondents expressed more ambivalence towards status-related and institutional aspects. The most positive evaluations concerned the usefulness of science to society (M = 1.98; 76.6% "very/partly positive") and its contribution to Slovenia's development (M = 1.97; 76.2% positive). Science was also widely seen as future-oriented (M = 2.06; 73.5% positive). Moderately positive ratings were observed for science being interesting (M = 2.31; 65.2% positive), useful in everyday life (M = 2.31; 66.3% positive), internationally recognised/influential (M = 2.33; 64.2% positive), objective/impartial (M = 2.36; 59.6% positive), and trustworthy (M = 2.26; 65.7% positive). The greatest reservations/neutrality emerged for items tapping influence, public communication, and institutional embeddedness: perceived influence on politics (M = 2.75; 45.6% positive; 31.7% neutral), independence from politics (M = 2.71; 46.5% positive; 31.0% neutral), and public promotion/communication of science (M = 2.65; 48.6% positive; 31.9% neutral). Ratings were similarly more ambivalent regarding science as a well-paid activity (M = 2.61; 49.3% positive; 31.7% neutral).

For the composite indicator of attitude towards science (mean across the 15 bipolar items; N = 1,048, listwise computation), the mean was M = 2.36 (SD = 0.65) with a median of 2.30. The interquartile range (P25 = 1.93; P75 = 2.80) indicates an overall moderately positive evaluation of science, with most responses clustering between "partly positive" and "neither positive nor negative", and relatively few extreme negative evaluations. Consistent with the exploratory factor structure, facet-level descriptive statistics indicate that positive evaluations were most pronounced for societal relevance/utility, whereas status/visibility-related aspects were rated more cautiously. (a) *Societal relevance and utility of science*: M = 2.17 (SD = 0.72; N = 1,058) — the most positive facet, reflecting perceptions of science as useful, development-oriented, future-oriented, and applicable to everyday life. (b) *Status, visibility, and instrumental benefits*: M = 2.62 (SD = 0.81; N = 1,061) — the least positive facet, consistent with higher neutrality or negativity for perceived political influence, public promotion/communication, and pay. (c) *Integrity, autonomy, and public-good orientation*: M = 2.46 (SD = 0.76; N = 1,061) — an intermediate evaluation, suggesting that science is seen as relatively trustworthy and objective, but with greater ambivalence about independence from politics and orientation towards the public good.

Because the three facet scores were conceptually related and empirically correlated, group differences between teachers and students were examined using a one-way multivariate analysis of variance (MANOVA) with respondent category (teachers vs. students) as the between-subjects factor and the three facet scores as dependent variables. Box's test indicated heterogeneity of covariance matrices across groups (Box's M = 76.26, F = 12.65, $p < .001$), so the multivariate effect was interpreted primarily using Pillai's trace, which is more robust under such conditions. The MANOVA revealed a significant multivariate effect of group (Pillai's Trace = .190, F = 81.44, $p < .001$, $\eta p^2 = .190$), indicating that teachers and students differed in their overall profiles across the three facets.

Follow-up univariate tests revealed significant group differences for two facets. For *societal relevance/utility*, teachers reported more positive evaluations (lower scores) than students (teachers: M = 1.94, SD = 0.77, n = 243; students: M = 2.24, SD = 0.69, n = 805, F = 33.52, $p < .001$, $\eta p^2 = .031$). For *status/visibility and instrumental benefits*, students reported more positive evaluations than teachers (teachers: M = 2.95, SD = 0.77, n = 243; students: M = 2.51, SD = 0.79, n = 805, F = 58.57, $p < .001$, $\eta p^2 = .053$). The groups did not differ significantly on *integrity/autonomy/public-good orientation* (teachers: M = 2.40, SD = 0.85, n = 243; students: M = 2.48, SD = 0.73, n = 805, F = 1.88, $p = .170$, $\eta p^2 = .002$). Notably, because the outcomes were derived from a semantic differential, lower values indicate more positive evaluations, and therefore, the direction of the mean differences should be interpreted accordingly.

To test whether the groups differed in the overall (predominantly unidimensional) attitude toward science index, we conducted an independent-samples t-test. Teachers (M = 2.33, SD = 0.67, n = 243) and students (M = 2.37, SD = 0.64, n = 805) did not differ significantly in the overall index. Using Welch's correction (given unequal group sizes), the difference was not significant (t = −0.89, p = .375). The effect size was negligible: Cohen's d = −0.07, Hedges' g = −0.07. The small, non-significant mean difference indicates that the two groups were broadly similar in their overall attitudes toward science. The findings show a strong similarity between teachers' and students' attitudes towards science, with no significant difference in the overall index. However, MANOVA indicates they differ in specific areas: teachers view science more favourably for societal relevance and utility, while students value its status, visibility, and benefits more. No significant differences exist in integrity, autonomy, and public-good facets, suggesting differences are in how each group prioritises different aspects of science.

We then examined the distributions and descriptive statistics for each item on *the Fake News/Information Assessment Scale*. In both subsamples, responses generally leaned towards agreement; however, teachers consistently reported higher mean scores than students across all items. Among teachers, the highest means were observed for perceiving fake news as a threat to democracy (M = 4.48, SD = 0.79, N = 241) and for the view that clear, comprehensible communication of scientific results would help distinguish verified facts from misinformation (M = 4.28, SD = 0.80, N = 240). Teachers also rated fake news as a salient societal problem in Slovenia (M = 4.12, SD = 0.86, N = 240). Self-assessed ability to recognise distorted or false information (M = 3.80, SD = 0.77, N = 238) and to distinguish credible from fake news (M = 3.79, SD = 0.79, N = 242) were somewhat lower but remained within the agreement range. For the role-adapted teaching/communication items[1], teachers reported moderately positive evaluations (a: M = 3.56, SD = 0.87, N = 239; b: M = 3.96, SD = 0.83, N = 244).

Among students, mean scores were lower and clustered around 3.5. Students rated their ability to distinguish credible from fake news as highest (M = 3.53, SD = 0.96, N = 759) and expressed similar levels of agreement that fake news is a problem in

[1] (a) *"I believe I have sufficient knowledge and skills to communicate scientific findings clearly, which would help distinguish between fake news and verified facts."* (b) *"In my work with pupils/students, I explicitly draw their attention to the knowledge and skills that would help them distinguish between fake news and verified facts."*

Slovenia (M = 3.56, SD = 0.96, N = 715) and a threat to democracy (M = 3.53, SD = 1.01, N = 706). Perceived usefulness of comprehensible scientific communication was comparable (M = 3.51, SD = 0.97, N = 705). The lowest mean was found for self-assessed ability to recognise distorted or false information (M = 3.39, SD = 0.97, N = 731). For the role-adapted items[2] where students evaluated their teachers, both means were lower than those reported by teachers (a: M = 3.35, SD = 0.96, N = 720; b: M = 3.20, SD = 1.00, N = 721), suggesting a less favourable perception of instructional support for developing skills to differentiate between verified facts and misinformation.

Next, we compared teachers and students using two composite measures. On *FN_core* (the mean of five substantively identical items), teachers scored higher (M = 4.09, SD = 0.52, N = 241) than students (M = 3.51, SD = 0.72, N = 698). Welch's independent-samples t-test indicated a statistically significant difference (t = 13.42, p < .001). The effect size was large (Hedges' g = 0.86). These results indicate that, relative to students, teachers reported higher perceived competence in recognising and distinguishing false information and simultaneously expressed stronger agreement that fake news constitutes a serious societal and democratic challenge, as well as stronger endorsement of clear scientific communication as a protective factor against misinformation. On *FN_teaching* (the mean of the two teaching/communication items), teachers again scored higher (M = 3.76, SD = 0.71, N = 239) than students (M = 3.27, SD = 0.83, N = 688). This difference was statistically significant (t = 8.78, p < .001. The effect size was medium (Hedges' g = 0.61).

Because *FN_teaching* relies on role-specific items- teachers assessing their practice and students evaluating teachers- this pattern reflects a perspective difference: teachers view their scientific communication and emphasis on relevant skills more positively than students do. Both item and composite analyses show consistent intergenerational differences. Teachers' higher *FN_core* scores suggest greater confidence in their evaluative abilities and a stronger framing of misinformation as a societal and democratic threat, possibly due to professional socialisation and exposure to public discourse. Conversely, students' lower scores indicate

[2] (a) "*I believe my teachers have sufficient knowledge and skills to communicate scientific findings clearly, which helps us distinguish between fake news and verified facts.*" (b) "*During lessons, my teachers explicitly highlight the knowledge and skills that would help us distinguish between fake news and verified facts.*"

ambivalence or situational confidence, with many agreeing but remaining uncertain about translating awareness into concrete evaluation skills. The pattern for *FN_teaching* reveals a potential "instructional alignment gap": teachers think they communicate clearly and signal verification skills well, while students are more reserved. This gap may stem from teachers considering general clarity or examples sufficient, whereas students expect explicit, practice-oriented guidance, such as routines and criteria. To improve students' informational resilience, teaching strategies must become more routine and visible in classrooms, emphasising concrete skills such as source verification and cue detection, rather than just stressing trustworthiness. The self- versus other-rating difference highlights perception gaps that can guide better communication and teaching methods.

We conducted correlational analyses between fake-news composites and attitudes towards science, using Pearson correlations for teachers and students with pairwise deletion. Both groups showed moderate positive associations: higher scores on the core fake-news dimension were associated with higher scores on the teaching/communication dimension (teachers: $r = .548$, $p < .001$, $N = 236$; students: $r = .433$, $p < .001$, $N = 633$).

In the teachers' subsample, neither the core fake-news composite (*FN_core*) nor the teaching/communication composite (*FN_teaching*) showed a significant link with the attitude-towards-science index ($r = .033$, $p = .612$, $N = 238$ for *FN_core*; $r = -.016$, $p = .807$, $N = 236$ for *FN_teaching*). The same pattern was observed across three attitude factors, with correlations with *FN_core* and *FN_teaching* being small and non-significant. Overall, teachers' attitudes towards science seem largely independent of their self-reported evaluations of fake news and teaching practices. In the *students' subsample*, *FN_core* again showed no meaningful association with the overall attitude-towards-science index ($r = .052$, $p = .176$, $N = 682$) and was essentially unrelated to the "social relevance/benefit" dimension ($r = -.032$, $p = .402$, $N = 689$). However, *FN_core* showed small positive correlations with two dimensions: status/visibility/instrumental benefits ($r = .113$, $p = .003$, $N = 692$) and integrity/autonomy/public good ($r = .098$, $p = .010$, $N = 692$). Given the scoring direction (higher values indicate more negative attitudes), these small positive associations indicate that higher *FN_core* scores were linked to slightly more negative views of science on these two dimensions, although the effect sizes were modest.

By contrast, the teaching/communication composite (*FN_teaching*) showed a consistent pattern of negative associations with students' attitudes towards science: overall attitude index ($r = -.191$, $p < .001$, $N = 675$), social relevance/benefit ($r = -.194$, $p < .001$, $N = 680$), status/visibility/instrumental benefits ($r = -.140$, $p < .001$, $N = 684$), and integrity/autonomy/public good ($r = -.145$, $p < .001$, $N = 683$). Interpreted in light of the scoring direction, these results suggest that students who more positively evaluated teachers' clear communication of scientific results and the explicit emphasis on relevant skills for distinguishing misinformation from verified facts tended to express more favourable attitudes towards science (lower attitude scores). The pattern is specific to students and the teaching/communication dimension, implying that perceived classroom communication and explicit skill-signalling may be more closely linked to students' science attitudes than their general self-perceived competence in evaluating fake news.

To examine whether the association between perceived fake news, related teaching practices and attitudes towards science differs between teachers and students, we conducted a moderated linear regression with attitudes towards science as the dependent variable (higher scores indicate more negative attitudes). Group membership was dummy-coded (0 = teachers, 1 = students). The predictor *FN_teaching* was mean-centred and entered together with group in the first step, followed by the interaction term (*FN_teaching* × *group*) in the second step to test moderation and quantify the incremental variance explained by the interaction. The main-effects model was statistically significant ($R^2 = .023$, $F = 10.684$, $p < .001$), with higher *FN_teaching* scores associated with less negative (i.e., more favourable) attitudes towards science ($B = -0.119$, 95% CI [−0.170, −0.067], $p < .001$), whereas the group main effect was not significant. Adding the interaction term produced a small but statistically significant improvement in model fit ($\Delta R^2 = .004$, F-change = 3.957, $p = .047$), and the interaction coefficient was negative ($B = -0.130$, 95% CI [−0.258, −0.002], $p = .047$), indicating that the relationship between *FN_teaching* and attitudes towards science was stronger among students than among teachers. Interpreted substantively, this pattern suggests that students who more positively evaluate teachers' clear communication of scientific results and explicit emphasis on skills for distinguishing misinformation from verified facts tend to report more favourable attitudes towards science. In contrast, the same association is negligible in teachers' self-reports.

4 Discussion

Addressing the study's aim, teachers reported higher perceived fake-news evaluation and a greater perceived societal/democratic threat than students, yet overall attitudes towards science were similarly moderately positive. The key link emerged for students: more positive ratings of teachers' clear science communication and explicit verification-related teaching predicted more favourable science attitudes, whereas associations for teachers were negligible.

In line with post-truth/truth-decay accounts, the results suggest that school-level information resilience hinges on making epistemic standards visible and actionable, especially under 'conflicting authority' (Huguet et al., 2019; Mason et al., 2018; Lynch & Hunter, 2020). Beyond general media-literacy messaging, classrooms should institutionalise routine, explicit verification practices and transparent source criteria, paired with clear communication of scientific results (Bulger & Davison, 2018; Davies et al., 2012). Brief inoculation/prebunking activities may complement these routines by foregrounding standard manipulation techniques (van der Linden, 2019).

Because the findings are based on cross-sectional self-reports and role-adapted items, future studies should include behavioural measures and longitudinal/experimental designs to test causal effects on discernment and science attitudes (Jones-Jang et al., 2019).

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About the authors

Branko Lobnikar, who holds a PhD in Human Resource Management, is a Full Professor of Security Studies at the Faculty of Criminal Justice and Security, University of Maribor. He has co-authored numerous publications covering human resource management, organisational behaviour, workplace deviance and plural policing.

Brigita Krsnik Horvat, MA, is the coordinator of the *Fake News and Conspiracy Theories? Let's Empower (Ourselves For) Science! (oooZnanost!/oooScience!) Project* funded by the European Union's Horizon Europe Research and Innovation Programme under the Marie Skłodowska-Curie Grant Agreement No 101162611, and head of the Office for Stable Funding of Scientific Research Activities and Complementary Schemes.

Ajda Šulc, PhD, is a Teaching Assistant at the Faculty of Criminal Justice and Security, University of Maribor. Her research focuses on the media's construction of reality, intolerance and hate speech — particularly online hate communication — as well as peer and school violence.